### **Posterior cruciate ligament injury**

**Definition and description**

Your posterior cruciate ligament (PCL) runs along the back of your knee and connects your thigh bone to the top of your lower leg bone. This ligament keeps your bones in place and helps your knee move smoothly. When the PCL is sprained or torn, it’s called a posterior cruciate ligament injury.

Posterior cruciate ligament injuries can happen to anyone, but they’re especially common among skiers and athletes who play baseball, football or soccer.

Posterior cruciate ligament injuries are far less common than ACL (anterior cruciate ligament) tears. In fact, PCL injuries make up less than 20% of all knee ligament injuries. Most commonly, PCL tears occur with other ligament injuries. Isolated PCL tears are even less common.

### **How does a posterior cruciate ligament injury affect my body?**

A PCL injury can cause mild, moderate or severe damage. Healthcare providers rate posterior cruciate ligament injuries in four different categories:

* **Grade I.** A partial tear is present in the ligament.
* **Grade II.** There’s a partial tear and the ligament feels loose.
* **Grade III.** The ligament is completely torn, and the knee is unstable.
* **Grade IV.** The PCL is injured, and another knee ligament is damaged.

People with posterior cruciate ligament injuries may have short- or long-term symptoms. Typically, long-term symptoms occur when an injury slowly develops over time.

### **Can you walk with a PCL injury?**

It depends. In mild cases, people may still be able to walk and their symptoms may be less noticeable. However, many people have difficulty walking after a PCL injury — especially if the damage is severe.

### **Do PCL tears hurt?**

Generally, yes. Pain is one of the leading symptoms of a torn PCL. Discomfort may be mild or severe.

### **What happens if a child tears their PCL?**

In most cases, pediatric PCL injuries can be treated with non-surgical methods. However, if your child’s PCL injury is severe, surgical options may be explored.

## **Symptoms and Causes**

PCL injuries usually occur with severe knee trauma. You may develop a problem with your PCL if you:

* Fall onto a bent knee.
* Are hit hard on the front of your knee (think dashboard in a motor vehicle accident).
* Bend your knee too far backward.
* Dislocate your knee.
* Land improperly after a jump.

What are the symptoms of a posterior cruciate ligament injury?

People with PCL injuries may experience a wide range of symptoms, including:

* Pain that worsens over time.
* Swelling and inflammation.
* A feeling of instability in the knee.
* Stiffness.
* Difficulty walking.
* Trouble going down the stairs.

## **Diagnosis and Tests**

Your healthcare provider will examine your knee, check your range of motion and ask about your symptoms. They may also request imaging tests to determine the extent of damage. These tests may include:

* X-rays.
* Magnetic resonance imaging (MRI).
* A CT (computed tomography) scan.

## **Management and Treatment**

It depends on the severity of your PCL injury. Common posterior cruciate ligament treatments include:

* **Crutches.** Your healthcare provider may recommend using crutches to limit how much weight you put on your knee.
* **Knee brace.** Bracing your knee can address instability — a common PCL symptom.
* **Physical therapy.** Certain exercises can help strengthen and stabilize your knee.
* **Surgery.** If your PCL injury is severe, surgery may be necessary for full rehabilitation. In most cases, knee arthroscopy is performed to reconstruct your ligament. This procedure is less invasive compared to traditional surgical methods.

### **Are there complications following PCL surgery?**

Though complications are rare, there are certain risks associated with knee arthroscopy. These include:

* Infection.
* Bleeding.
* Blood clots.
* Swelling.
* Stiffness of the knee joint.

### **PCL injury recovery time**

Recovery time can vary from person to person. If your injury is mild, it may only take about 10 days to heal. If you’ve had surgery to repair your PCL, recovery could take about six to nine months.

### **How can I manage symptoms at home?**

If you’ve injured your PCL, there are ways to ease discomfort and promote healing. Recommendations include:

* **Rest.** Avoid any activity that places unnecessary stress on your knee.
* **Ice.** Apply a cold compress to the knee for 15 minutes, four times a day.
* **Compression.** Wrapping your knee in an elastic bandage helps reduce swelling.
* **Elevation.** Prop your leg up on a pillow so it’s above the level of your heart.
* **Pain relievers.** Take non-steroidal anti-inflammatory drugs (NSAIDs) to ease pain and swelling.

## **PCL Tear Treatment: Drug Information and Side Effects**

## Medications Used in PCL Tear Treatment

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

* Common drugs: Ibuprofen (Advil, Motrin), Naproxen (Aleve)
* Purpose: Reduce pain, swelling, and inflammation associated with PCL injuries.
* Side effects:
  + Gastrointestinal irritation or bleeding
  + Kidney problems, especially with long-term use or in patients with pre-existing kidney issues
  + Increased risk of cardiovascular events in some individuals
* Precautions: Patients with heart disease, high blood pressure, kidney disease, or history of stomach ulcers should consult their doctor before use

2. Acetaminophen (Tylenol)

* Purpose: Pain relief without anti-inflammatory effects.
* Side effects: Generally, well tolerated but can cause liver damage if taken in excessive doses or combined with other acetaminophen-containing products

3. Prescription Pain Medications

* May be prescribed for moderate to severe pain.
* Side effects: Constipation, drowsiness, nausea, risk of dependence with opioids. Patients should follow dosing instructions carefully

## Other Treatment Modalities (Non-Drug)

* Rest, ice, compression, and elevation (RICE/PRICE) to reduce swelling and pain initially
* Use of knee braces or splints to limit movement and protect the knee
* Physical therapy to restore strength, flexibility, and range of motion

## Surgical Treatment

* Indicated mainly for severe PCL tears (grade III), combined ligament injuries, or persistent instability after conservative treatment
* Surgery involves reconstruction using grafts from the patient or donor tissue
* Postoperative care includes pain management, bracing, and extensive physical therapy over several month

**Epidemiology**

Posterior cruciate ligament (PCL) tears account for approximately 2% of all acute knee injuries, with an estimated annual incidence of about 2 per 100,000 people They represent roughly 10% (range 2-23%) of all knee injuries overall

The average age of patients with PCL injuries is typically in the late 20s to early 30s, with studies reporting mean ages around 27.5 to 32.7 years Males are affected more frequently than females, with about two-thirds of cases occurring in men

PCL injuries often occur in association with other ligament injuries; isolated PCL tears constitute about 26-37% of cases, while the majority involve multiple ligament damage Cartilage lesions and meniscal tears are common concomitant injuries, occurring in approximately 21-26% of PCL injury cases

The leading causes of PCL tears are sports-related injuries and traffic accidents. Sports account for about 35-40% of PCL injuries, with soccer being the most common sport implicated (13.1% of cases) Traffic accidents, particularly motorcycle crashes and dashboard injuries, account for 45% of PCL injuries in some studies other mechanisms include falls onto a flexed knee and hyperextension or rotational forces

## **Outlook / Prognosis**

If your PCL injury is minor, you may heal without complications. However, if the ligament sustained severe damage, your knee could become weak and prone to reinjury unless you have surgery.

People who undergo PCL surgery generally notice improved stability and mobility following recovery. Keep in mind, however, you may still need to wear a knee brace during physical activities to protect your joint.

### **When can I go back to work or school?**

If you have a sedentary office job, you’ll be able to return to work rather quickly. However, if you have a job that requires physical exertion, such as lifting, you’ll need a few more weeks to recover. Ask your healthcare provider when you can return to work or school after your PCL injury.

**Prevention**

It can be difficult to prevent PCL injuries altogether. However, there are several things you can do to reduce your risk:

* Stretch before physical activities to keep your knee joints healthy.
* Use proper techniques when walking or running.
* Stay alert and use caution when playing sports.

### **When should I see my healthcare provider for a posterior cruciate ligament injury?**

Prompt medical attention is necessary after a serious PCL injury. You should contact your healthcare provider if:

* You have pain or swelling.
* You feel like your knee is unstable.
* Your foot feels numb.
* Your leg or foot changes color or feels cold.

If you are exhibiting any of these symptoms, seek care immediately. Your medical team can determine the cause of your knee pain and design a treatment plan to fit your needs.

## **Procedures and Timelines**

## Non-Surgical (Conservative) Treatment

* Indications: Mild to moderate PCL injuries (Grade I and II) with 5 to 10 mm posterior laxity and no significant instability.
* Management: Rest, ice, compression, elevation (RICE), knee bracing to limit motion, and physical therapy to reduce swelling, regain strength, and restore range of motion.
* Timeline:
  + Mild injuries may heal within about 10 days to a few months.
  + Physical therapy typically spans several weeks to months depending on recovery progress.
  + Patients can often return to normal activities gradually as symptoms improve.
* Outcome: Many patients recover well without surgery, though some may develop long-term instability or arthritis if untreated.

## Surgical Treatment

* Indications:
  + Severe PCL injuries (Grade III) with ≥10 mm posterior instability.
  + Combined ligament injuries (e.g., PCL plus ACL or collateral ligaments).
  + Avulsion fractures or cases where conservative treatment fails.
* Procedure:
  + Arthroscopic PCL reconstruction is most common, involving removal of the torn ligament and replacement with a graft (autograft from patient’s own tissue or allograft from donor).
  + Single-bundle or double-bundle graft techniques are used; double-bundle aims to restore more normal knee kinematics.
  + Open surgery may be performed in complex cases or where arthroscopy is not feasible.
* Recovery Timeline:
  + Initial recovery involves crutches and knee bracing for several weeks.
  + Formal physical therapy begins 1 to 4 weeks post-surgery, focusing on strength, balance, and range of motion.
  + Full recovery typically takes 6 to 12 months, sometimes longer if multiple ligaments were involved or open surgery was performed.
  + Return to sports or high-impact activities usually occurs after 9 to 12 months, depending on healing and rehabilitation progress.
* Outcomes: Surgery generally improves knee stability and function; however, some patients may need to modify activity levels post-recovery.

## **Posterior Cruciate Ligament (PCL) Injury: De-Identified Doctor-Patient Conversation**

Patient:

Doctor, I twisted my knee during a fall a few days ago, and now I have pain and swelling at the back of my knee. It feels unstable sometimes. Could this be serious?

Doctor:

Based on your symptoms and the mechanism of injury, it’s possible you have a posterior cruciate ligament injury, or PCL tear. The PCL is one of the key ligaments that stabilizes your knee, especially preventing the shinbone from moving too far backward.

Patient:

How do you diagnose a PCL injury?

Doctor:

I’ll perform a physical exam to check for knee stability and tenderness. We may also order imaging tests like an MRI to confirm the diagnosis and see the extent of the injury, including any damage to other ligaments or cartilage.

Patient:

What are the treatment options? Do I need surgery?

Doctor:

Treatment depends on the severity of the tear. For mild to moderate injuries, we usually start with conservative management—rest, ice, compression, elevation, and physical therapy to strengthen the surrounding muscles and improve knee stability. Surgery is generally reserved for severe tears, especially if there’s significant knee instability or if other ligaments are injured.

Patient:

How long will it take to recover?

Doctor:

Recovery varies. With conservative treatment, many people improve within a few months, though full healing can take longer. If surgery is needed, rehabilitation typically lasts 6 to 12 months to regain strength and function.

Patient:

Are there any risks if I don’t have surgery?

Doctor:

If the PCL tear is mild and treated properly, many patients do well without surgery. However, untreated severe tears can lead to chronic knee instability, increased wear on the joint, and eventually arthritis.

Patient:

What can I do to help my recovery?

Doctor:

Follow the treatment plan carefully—avoid activities that strain your knee, use any braces as directed, and attend physical therapy sessions. Maintaining a healthy weight and strengthening your leg muscles will also support healing.

Patient:

Thank you, Doctor. I’ll do my best to follow your advice.

**REFERENCES**

[**https://my.clevelandclinic.org/health/diseases/21793-pcl-posterior-cruciate-ligament-tears**](https://my.clevelandclinic.org/health/diseases/21793-pcl-posterior-cruciate-ligament-tears)

[**https://emedicine.medscape.com/%20https:/emedicine.medscape.com/article/90514-overview**](https://emedicine.medscape.com/%20https:/emedicine.medscape.com/article/90514-overview)

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### **MCL (medial collateral ligament) tear**

**Definition and description**

An MCL tear is damage to the medial collateral ligament, which is a major ligament that’s located on the inner side of your knee. The tear can be partial (some fibers in the ligament are torn) or complete (the ligament is torn into two pieces). A ligament is a tough band of tissue that connects one bone to another bone or holds organs in place.

Your knees are made up of bones, ligaments, tendons and cartilage. The medial collateral ligament (MCL) is located on the inner side of your knee, and it’s eight to 10 centimeters in length. It connects your thigh bone (femur) to your shin bone (tibia). Your MCL also provides strength and stability to your knee joint. It’s one of four primary ligaments in your knee. The other three primary ligaments include:

* The anterior cruciate ligament (ACL).
* The lateral collateral ligament (LCL).
* The posterior cruciate ligament (PCL).

The word “medial” means “towards the middle or center.” When referring to ligaments, “collateral” means that the ligament is on one side of a joint. The medial collateral ligament is named such because the ligament is on the inner side of your knee (closer to the “middle line” of your body), and it’s located on the side of your knee joint.

### **STAGING/GRADING**

Your healthcare provider will describe your MCL tear as one of the following three grades:

* **Grade 1**: A grade 1 MCL tear is a mild tear in which less than 10% of fibers in your ligament are torn and your knee is still stable. You’ll likely have some tenderness and mild pain if you have a grade 1 tear.
* **Grade 2**: A grade 2 MCL tear is a moderate tear in which your MCL is partially torn — usually the superficial part of your MCL. Your knee will likely be loose when it’s moved by hand, and you’ll probably have intense pain and tenderness along the inner side of your knee.
* **Grade 3**: A grade 3 MCL tear is a severe tear in which your MCL is completely torn — both the superficial and deep parts. Your knee will likely be very unstable and loose, and you’ll probably experience intense pain and tenderness. It’s common for someone to have other knee injuries, especially damage to their anterior cruciate ligament (ACL), if they have a grade 3 MCL tear.

Anyone can experience an MCL tear at any age. MCL tears are a common injury for athletes, especially those who play sports like football, rugby, basketball and skiing.

MCL tears are fairly common. MCL tears are the most common knee ligament injury, and approximately 40% of all knee injuries involve the MCL.

### **Symptoms of an MCL tear**

The symptoms of an MCL tear can vary based on how severe your tear is. If your MCL (medial collateral ligament) is torn, you may experience the following signs and symptoms:

* Hearing a popping sound at the time of the injury.
* Experiencing pain in your knee.
* Having tenderness along the inner side of your knee.
* Having stiffness and swelling in your knee.
* Feeling like your knee is going to “give out” if you put weight on it.
* Feeling your knee joint lock or catch when you use it.

### **Can you still walk with a torn MCL?**

If you have a grade 1 (minor) MCL tear, you'll likely still be able to walk at the time of the injury, though it might be painful. A grade 2 (moderate) MCL tear could make it difficult to walk at the time of the injury since your knee won’t be as stable as it normally is. If you have a grade 3 (severe) MCL tear, it’ll be difficult to walk since your knee will be unstable, and you probably won’t want to walk since it’ll be very painful. In most cases, treatment for MCL tears involves using crutches to limit the amount of weight you put on your affected knee.

If you injure your knee, it’s important to contact your healthcare provider immediately or go to the nearest hospital, even if you can still walk on it.

### **What causes an MCL tear?**

Sudden and forceful turning, twisting and “cutting” can cause MCL tears. A direct blow to the outer side of your knee can also cause an MCL tear. MCL tears are most common in people who play certain sports like skiing, football, basketball and volleyball.

The following situations can cause an MCL tear:

* Planting one foot into the ground and forcefully shifting direction (this is known as “cutting” in sports).
* When something or someone hits your knee on its outer side, such as from a football tackle.
* Squatting or lifting heavy objects.
* Landing awkwardly on your knee after a jump.
* Hyperextending (overstretching) your knee. This is common in skiing.
* Repeated pressure and stress to your knee, which causes your MCL to lose its elasticity (like a worn-out rubber band).

## **Diagnosis and Tests**

In most cases, a healthcare provider can tell if you have a torn MCL by doing a physical exam on your knee. If your provider thinks you may have an MCL tear, they'll bend your knee and apply pressure on it to see if your knee is loose. Your provider may have you undergo imaging tests to make sure you don’t have any other injuries in your knee and to see how severe your MCL tear is.

### **TESTS**

Your healthcare provider may use one or more of the following tests to diagnose an MCL tear:

* **Physical exam**: Your provider will examine your knee to see if you have pain with palpation on the inside of your knee. They'll also apply pressure (stress) to your MCL to see if it’s loose, which often means your MCL is torn.
* **MRI**: An MRI (magnetic resonance imaging) uses a large magnet, radio waves and a computer to make detailed images of your organs and bones. An MRI is the imaging test of choice for MCL tears. It can help your provider see if you have any other soft tissue injuries in your knee.
* **Ultrasound**: Ultrasound uses sound waves to take pictures inside your body. An ultrasound can help your provider see how severe your MCL tear is and if you have any other injuries in your knee.
* **X-ray**: Your provider may take an X-ray of your knee to make sure you don’t have any broken bones or other injuries in your knee.

## **Management and Treatment**

Most people who have an MCL tear recover from non-surgical treatment. This is because your MCL has a good blood supply, which makes it easier for your tear to heal. Non-surgical treatment for an MCL tear can include:

* **Using the RICE (rest, ice, compression, elevation) method**: The RICE method involves resting your knee, icing your knee, wearing an elastic bandage around your knee (compression) and elevating your knee while you’re resting. The RICE method helps reduce pain and swelling.
* **Taking pain relievers**: Your healthcare provider may recommend taking pain relievers (non-steroidal anti-inflammatory medications, or NSAIDs) to help reduce pain and swelling in your knee.
* **Wearing a knee brace**: Your provider may have you wear a knee brace that prevents your knee from moving side to side so that your MCL can heal.
* **Using crutches**: Your provider may have you use crutches to walk so that you can limit the amount of weight you put on your affected knee.
* **Doing physical therapy**: Your provider will most likely have you do physical therapy exercises to improve your strength and range of motion in your knee. Exercises may involve strengthening your thigh muscles, cycling and doing resistance exercises. If you have an MCL tear and play a sport, your healthcare team will tailor your physical therapy to the types of movements you do for the sport that you play.

While non-surgical treatment is very effective in treating MCL tears, professional athletes may want to consider undergoing surgery to fix their tear due to the amount of stress and pressure they’ll have on their knee when they return to their sport. If you have an MCL tear and other knee injuries at the same time, you’ll likely have to undergo surgery to fix your injuries.

If you need to have surgery for your MCL tear, your surgeon will either reattach the torn part of your MCL or reconstruct and/or augment your MCL using a graft. An MCL graft can be constructed with a piece of tissue from elsewhere in your body, such as your hamstring tendons, or from a donor. Your surgeon will likely use small incisions (cuts) on your inner knee to perform your MCL surgery.

Recovery time from MCL surgery depends on a few factors, including:

* The severity of your MCL tear.
* The type of surgery you had.
* If you also had surgery on other parts of your knee.
* Your age and overall health.

MCL surgery recovery often involves physical therapy to increase your strength and the range of motion in your knee.

### **Can an MCL tear heal on its own?**

A grade 1 MCL tear (minor tear) can usually heal on its own with rest within one to three weeks. Grade 2 and grade 3 MCL tears, which are more severe, need proper treatment in order to heal, which can include resting, wearing a knee brace and doing physical therapy. If you injure your knee, contact your healthcare provider as soon as possible.

### **Do MCL tears require surgery?**

Most MCL tears heal well without surgery. However, if you have other knee injuries alongside an MCL tear, you will likely need to undergo surgery. Professional athletes may need to consider surgery to fix their MCL tear to prevent future MCL issues when they return to their sport.

## **MCL Tear Treatment: Drug Information and Their Side Effects**

## Common Medications Used for MCL Tear Treatment

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

* Examples: Ibuprofen (Advil, Motrin), Naproxen (Aleve), Aspirin
* Purpose: Reduce pain, inflammation, and swelling associated with the MCL injury.
* Side Effects:
  + Gastrointestinal irritation, ulcers, or bleeding
  + Kidney function impairment, especially with long-term use or in patients with kidney disease
  + Increased risk of cardiovascular events in susceptible individuals
* Precautions: Patients with heart disease, high blood pressure, kidney disease, or history of stomach ulcers should consult their healthcare provider before use and adhere strictly to recommended doses[1](https://www.mountsinai.org/health-library/selfcare-instructions/collateral-ligament-cl-injury-aftercare)[4](https://www.webmd.com/pain-management/knee-pain/mcl-injury-what-to-know)[5](https://hssh.health/blog/medial-collateral-ligament-mcl-sprain-symptoms-diagnosis-and-treatment/).

2. Acetaminophen (Paracetamol)

* Purpose: Pain relief without anti-inflammatory effects, often used if NSAIDs are contraindicated.
* Side Effects: Generally well tolerated but can cause liver damage if overdosed or combined with other acetaminophen-containing products.

3. Prescription Pain Relievers

* Occasionally prescribed for moderate to severe pain if NSAIDs are insufficient.
* Side Effects: Drowsiness, constipation, nausea, risk of dependence with opioids.

## Additional Treatment Measures (Non-Drug)

* Ice application to reduce swelling and pain.
* Rest and limited physical activity initially.
* Use of knee braces (hinged braces preferred) to protect the ligament and maintain stability.
* Crutches may be used temporarily to reduce weight-bearing if instability or pain is significant.
* Physical therapy to restore range of motion, strength, and stability

## **Procedures and Timelines**

## Non-Surgical Treatment

* Indications: Most Grade 1 (mild) and Grade 2 (moderate) MCL tears without other ligament injuries.
* Procedures:
  + RICE protocol: Rest, Ice, Compression (elastic bandage or brace), Elevation.
  + Use of a knee brace (often hinged) to protect and stabilize the knee.
  + Crutches may be used initially to reduce weight-bearing if pain or instability is significant.
  + Physical therapy focusing on gentle range of motion, strengthening, and gradual return to activity.
* Timeline:
  + Grade 1 tears usually heal within 1 to 3 weeks.
  + Grade 2 tears may take 3 to 6 weeks to heal.
  + Patients often return to normal activities gradually as symptoms improve.
* Outcome: Most isolated MCL injuries heal well without surgery due to good blood supply and healing potential.

## Surgical Treatment

* Indications:
  + Grade 3 (complete) tears, especially with significant instability.
  + MCL tears combined with other ligament injuries (e.g., ACL, PCL).
  + Persistent instability after conservative treatment.
  + High-level athletes requiring rapid and robust knee stability.
* Procedures:
  + Arthroscopic or minimally invasive surgery to reattach the torn ligament or reconstruct it using a graft.
  + Grafts may be autografts (patient’s own tissue, e.g., hamstring or patellar tendon) or allografts (donor tissue).
  + Small incisions on the inner knee are typical.
* Timeline:
  + Surgery is usually outpatient, with no hospital stay needed.
  + Postoperative physical therapy begins within weeks to restore motion and strength.
  + Full recovery and return to sports or demanding activities can take 8 to 12 weeks or longer depending on injury severity and rehabilitation progress.

## **MCL Tear: Genomic Data**

* A genome-wide association study involving 1,572 MCL injury cases and over 100,000 controls found two single nucleotide polymorphisms (SNPs)—rs80351309 and rs6083471—significantly associated with MCL injury risk at genome-wide significance (p < 5×10⁻⁸). These SNPs have moderate effects, with odds ratios of approximately 2.12 and 1.57, respectively
* The association of rs80351309 requires cautious interpretation due to moderate imputation accuracy and needs replication in further studies
* While much of the genetic research has focused on anterior cruciate ligament (ACL) injuries, genes related to collagen types (such as types I, III, V, XII, XIV, and XV) and matrix metalloproteinases, which influence ligament structure and repair, are also implicated in ligament injury susceptibility and may be relevant to MCL tears

**DIFFERENTIAL DIAGNOSIS**

* Crystal-induced inflammatory arthropathy
* Infection
* Osteoarthritis
* Overuse syndromes
* Patellar subluxation
* Patellar tendonitis
* Popliteal cyst
* Slipped capital femoral epiphysis
* Tibial apophysitis
* Trauma

## **MCL Tear Epidemiology**

The medial collateral ligament (MCL) is one of the most commonly injured knee ligaments, involved in at least 42% of ligamentous knee injuries, with isolated MCL injuries accounting for 29% of these cases

In the general U.S. population, the incidence of MCL injury is approximately 0.24 per 1,000 people annually, equating to about 74,000 injuries each year

The annual incidence reported ranges from 0.24 to 7.3 per 1,000 people, with a male-to-female ratio of approximately 2:1, indicating males are twice as likely to sustain MCL injuries

MCL injuries are particularly common in sports involving cutting maneuvers or direct valgus forces on the knee, such as soccer, skiing, ice hockey, wrestling, judo, and rugby

A ten-year observational study showed MCL injuries account for about 7.9% of all athletic knee injuries

In young athletic populations, such as collegiate athletes, the incidence rate is higher, with studies reporting around 7.27 per 1,000 person-years. Male athletes have a slightly higher incidence rate than females, though some differences may not be statistically significant when adjusted for exposure

Most MCL injuries are low grade (Grade 1 and 2), with Grade 1 sprains comprising about 73% of cases in athletic cohorts

MCL injuries often occur as isolated injuries but can also be combined with other ligament injuries, especially anterior cruciate ligament (ACL) tears

In skiing injuries, the MCL is involved in about 60% of knee injuries, highlighting the ligament's vulnerability in this sport

## **Outlook / Prognosis**

MCL tears usually heal well if they’re treated properly. Complications from MCL tears are rare. Most athletes who experience an MCL tear are able to return to their sport after their injury has healed.

The time it takes to fully recover from an MCL tear depends on how severe the tear is. A grade 1 (mild) MCL tear usually heals within one to three weeks. A grade 2 (moderate) MCL tear generally takes four to six weeks to heal with treatment. A grade 3 (severe) MCL tear can take six weeks or more to heal with treatment. If you undergo surgery to fix your MCL tear, it could take longer.

## **Prevention**

If you play certain sports such as football, soccer or skiing and/or had an MCL tear before, you are more likely to experience an MCL tear.

While not all MCL tears are preventable, there are steps you can take to lower your risk of tearing your MCL. Balance, strength and power exercises that focus on your thigh and hip muscles can help lower your risk of getting an MCL tear. In football linemen, braces have been shown to prevent MCL injuries.

## **Living With**

Be sure to follow your healthcare provider’s instructions for treatment, including those of your physical therapist. Commit to your physical therapy exercises and take your medications as prescribed by your provider. The more closely you follow your treatment plan, the sooner your MCL will heal.

### **When should I see my healthcare provider?**

If you injure your knee, see your healthcare provider as soon as possible. They’ll need to evaluate the injury to see how severe it is, reduce the swelling and determine a treatment plan.

### **What questions should I ask my doctor?**

If you have an MCL tear, it could be helpful to ask your healthcare provider the following questions:

## What kind of MCL tear do I have?

MCL tears are classified into three grades based on severity:

* Grade 1 (Mild): Minor sprain with some fibers torn but ligament intact. Little swelling or instability. You can usually walk with mild pain.
* Grade 2 (Moderate): Partial tear with increased laxity but still some ligament continuity. More pain and difficulty walking, some instability.
* Grade 3 (Severe): Complete tear with gross instability of the knee. Walking is difficult and painful. The knee feels unstable

MRI is the gold standard to confirm the grade and exact location of the tear

## 2. What are my treatment options?

* Grade 1 and 2 tears: Usually treated conservatively with rest, ice, compression, elevation (RICE), NSAIDs for pain, knee bracing, and physical therapy to restore strength and motion. Crutches may be used initially if walking is painful
* Grade 3 tears: May require surgery if there is significant instability, distal avulsion, or combined ligament injuries. Otherwise, some Grade 3 tears can be treated non-surgically with bracing and rehab

## 3. How long do you predict it will take me to recover?

* Grade 1: 1 to 3 weeks
* Grade 2: 4 to 6 weeks (up to 10 weeks in some cases)
* Grade 3: 6 weeks or more, possibly 8 to 12 weeks or longer if surgery is needed

Return to full activity depends on healing, rehab progress, and injury severity.

## 4. What medications should I take?

* NSAIDs (e.g., ibuprofen, naproxen) are commonly recommended to reduce pain and inflammation
* Acetaminophen can be used if NSAIDs are contraindicated.
* Prescription pain medications are rarely needed unless pain is severe.
* Always follow dosing instructions and consult your healthcare provider about medication safety.

## 5. Do I need to see a specialist?

* If you have a mild or moderate MCL tear, your primary care doctor or physical therapist can usually manage your care.
* See an orthopedic specialist if you have a severe tear, persistent instability, or if your symptoms worsen despite treatment

## 6. Should I see a sports medicine specialist?

* Yes, especially if you are an athlete or want to return to sports quickly and safely. Sports medicine specialists have expertise in ligament injuries and rehabilitation tailored to athletic demands

## 7. When can I return to my sport?

* Return depends on injury severity and rehab progress:
  + Grade 1: Often within 1 to 3 weeks
  + Grade 2: Around 6 to 10 weeks
  + Grade 3: 8 to 12 weeks or longer, especially if surgery was performed

Your doctor and physical therapist will guide you based on strength, stability, and absence of pain.

## 8. What are the pros and cons of surgery to repair my MCL tear?

Pros:

* Restores knee stability in severe or combined ligament injuries
* May prevent long-term joint instability and arthritis
* Enables earlier return to high-level sports in some cases

Cons:

* Longer recovery time compared to conservative treatment
* Risks of surgery: infection, stiffness, nerve injury
* Not always necessary for isolated MCL tears, which often heal well without surgery

## **De-Identified Doctor-Patient Conversation on MCL Tear**

Patient:

Doctor, I injured my knee during a soccer game. I felt a sharp pain on the inside of my knee and heard a popping sound. Now it’s swollen, and I feel some instability. What kind of injury do I have?

Doctor:

Based on your description, it sounds like you have a medial collateral ligament, or MCL, tear. The MCL is a ligament on the inner side of your knee that helps keep it stable. The popping sound and pain you felt are common symptoms, and the swelling and instability suggest the ligament has been stretched or torn.

Patient:

How do you figure out how bad the tear is?

Doctor:

I’ll examine your knee by gently pressing and applying pressure to the inside and outside of your knee to check for tenderness and looseness. We may also order imaging tests like an MRI, which can show us the extent of the tear and if there’s any other damage. Sometimes, X-rays or stress X-rays are done to rule out bone injuries or to see if the joint opens up more than normal, indicating a tear.

Patient:

What are my treatment options?

Doctor:

Most MCL tears, especially mild to moderate ones, heal well without surgery. Treatment usually involves rest, ice, compression, and elevation (RICE), along with anti-inflammatory medications like ibuprofen to reduce pain and swelling. You’ll likely wear a knee brace to protect the ligament and do physical therapy to regain strength and motion. Surgery is rarely needed unless the tear is severe or combined with other ligament injuries.

Patient:

How long will it take to recover?

Doctor:

Recovery depends on the severity. Mild tears usually heal in 1 to 3 weeks, moderate tears may take 4 to 6 weeks, and severe tears can take 8 to 12 weeks or more, especially if surgery is required. Physical therapy plays a big role in helping you get back to full activity.

Patient:

What medications should I take?

Doctor:

Over-the-counter NSAIDs like ibuprofen or naproxen are usually effective for pain and swelling. Acetaminophen is another option if you can’t take NSAIDs. We generally avoid prescribing stronger pain medications unless the pain is severe.

Patient:

Should I see a specialist or a sports medicine doctor?

Doctor:

If your injury is mild or moderate, your primary care doctor or physical therapist can manage it. But if your knee is very unstable, the pain doesn’t improve, or you want expert guidance for returning to sports, seeing an orthopedic or sports medicine specialist is a good idea.

Patient:

When can I get back to playing soccer?

Doctor:

For mild tears, you might return in a few weeks once your knee feels stable and strong. Moderate tears usually require 6 to 10 weeks before returning to sport. Severe tears or those needing surgery may take 3 months or longer. Your physical therapist will help guide your progress to ensure you’re ready.

Patient:

What are the pros and cons of surgery for an MCL tear?

Doctor:

Surgery can restore knee stability in severe or combined injuries and may help prevent long-term problems like arthritis. However, surgery involves risks like infection, stiffness, and a longer recovery time. Since most isolated MCL tears heal well without surgery, we typically reserve it for cases where conservative treatment fails or if there’s significant instability.

Patient:

Thank you, Doctor. That helps me understand what to expect.

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### **LCL tears**

**Definition and description**

A lateral collateral ligament (LCL) tear is a knee injury that causes pain, swelling and bruising. Your LCL is a band of tissue located on the outside of your knee (the side that faces away from your body). This tissue connects your lower leg bones to your thigh bone. It stops your knee from bending outward abnormally.

Athletes in sports like football, soccer and skiing are at higher risk for LCL tears, which can prevent you from competing. However, with time, treatment and rehabilitation, you should be able to play some sports again.

### **How does the knee usually work?**

Three bones make up your knee joint:

* Your thighbone (femur).
* Your kneecap (patella).
* Your shinbone (tibia).

Ligaments hold the bones together. There are two types:

* **Collateral ligaments:** These ligaments are on the sides of your knee. The medial (inside) ligament connects your femur and tibia. The lateral (outside) collateral ligament (your LCL) connects the femur and fibula. Thanks to these ligaments, you can move your knee sideways.
* **Cruciate ligaments:** Your cruciate ligaments are inside your knee joint. They cross each other (the anterior cruciate ligament is in the front and the posterior cruciate ligament is in the back) and they form an “X.” These ligaments control the way your knee moves back and forth.

Anyone who makes stop-and-go movements or does a lot of twisting or bending could also tear an LCL. For example, football players who get hit in the knee, basketball players who jump, and soccer players with quick direction changes are at a higher risk.

It’s unclear what percentage of individuals tear an LCL. However, your risk is higher if you have had a previous LCL tear. An LCL tear is rarely an isolated injury. You’re likely to have an ACL tear or other knee problem at the same time as an LCL tear.

## **Symptoms and Causes**

LCL tears typically happen when you’re playing a sport that involves:

* Bending.
* Hard contact.
* Quick changes of direction.
* Twisting.
* Jumping.
* Weaving.
* Stop-and-go movements.

The riskiest sports for LCL tears include:

* Football.
* Skiing.
* Soccer.

S**ymptoms of LCL tears**

The symptoms of an LCL tear include:

* Pain.
* Swelling.
* Tenderness.
* Bruising.
* An unstable feeling. Your knee might feel like it’s about to give out or buckle or lock up.

You might find that the sensation of being unstable on your feet continues after you’re walking again. While not unusual, it’s a good idea to tell your healthcare provider about it. Such instability can feel a little scary since you might fear injuring yourself again.

## **Diagnosis and Tests**

When you see your healthcare provider (which you should do as soon as possible), they’ll ask you questions about your injury and look at your knee. They’ll check for the following:

* Tenderness.
* Swelling.
* How your knee moves.
* How your leg moves.
* Other injuries.

Your healthcare provider might order tests, including:

* X-ray.
* MRI.
* Ultrasound.

Your healthcare provider will ask you several questions as they assess your knee injury. Questions might include:

* What are your symptoms?
* How long have you had these symptoms?
* How did you injure your knee?
* Can you put any weight on your leg?
* What medications do you take?

## **Management and Treatment**

Healthcare providers categorize knee injuries in three grades:

* **Grade 1:** Knee injuries are mild. Your LCL is not completely torn. You should heal with only at-home treatment, including the use of crutches. Your healthcare provider might also have you wear a hinged knee brace when you’re allowed to put some weight on your knee. You’ll likely feel better after about three to four weeks.
* **Grade 2:** Knee injuries are considered moderate. You have a partial tear in your LCL. For a grade 2 injury, you’ll need to use crutches and then a hinged knee brace. Recovery will take about eight to 12 weeks.
* **Grade 3:** Knee injuries are severe. Your LCL is separated or torn completely and may take eight to 12 weeks to heal. You’ll use a hinged brace for several months. Your healthcare provider might recommend surgery.

You might need surgery if your injury is severe. Typically, providers consider a knee injury to be severe if you tear the LCL and another part of your knee, including your:

* Anterior cruciate ligament (ACL).
* Meniscus.

You may also need to go to physiotherapy (physical therapy). Physiotherapy will help you:

* Strengthen your muscles.
* Increase your range of motion.
* Learn exercises you can do at home.

Severe injuries require open surgery. Your surgeon will:

* Stitch up your torn LCL.
* Reattach the LCL to your bones.
* Reconstruct your ligament using other tendons or ligaments.

Your healthcare provider might give you the go-ahead to return to your sports activities once you can walk without limping. First, you’ll have to go through what’s called functional progression. You’ll start with simple, gentle exercises and stretches, then move to moderate ones and eventually return to your normal activities. Be sure to check with your healthcare provider before starting a regimen of stretches and exercise.

Healing from an LCL tear can take time. It can be hard to be patient, but you can’t rush the process.

### **Home remedies**

Yes, there are some things you can do at home to help your injured LCL heal:

* Rest your knee.
* Apply ice. Put an ice pack or cold pack on your knee for about 10-20 minutes. Repeat this every one to two hours for the first three days. Make sure you have some sort of cloth between the ice and your skin.
* Compress your knee by wrapping it with an elastic bandage.
* Prop your knee up (elevate it) on a pillow to reduce swelling. Try to keep it above your heart.
* Take anti-inflammatory medications (NSAIDs) such as ibuprofen (Motrin® and Advil®) and naproxen (Aleve®).
* Limit how much weight you put on your leg.
* Use crutches and wear your brace as instructed.
* Perform very gentle stretches and range-of-motion exercises as instructed by your healthcare provider.

### **Recovery timeline**

Recovery time depends on the grade (severity) of your LCL tear.

* Grade 1 (mild): Three to four weeks.
* Grade 2 (moderate): Eights to 12 weeks.
* Grade 3 (severe): Eight to 12 weeks.

### **Do LCL tears heal on their own?**

With time and at-home treatments, your LCL tear might heal on its own. But, your healthcare provider can evaluate the severity of your injury to determine the best treatment plan. If you resume your activities without seeing your healthcare provider, you risk further injury.

## **LCL Tear Treatment: Drug Information and Their Side Effects**

## Common Medications Used

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

* Examples: Ibuprofen (Motrin®, Advil®), Naproxen (Aleve®)
* Purpose: Reduce pain, inflammation, and swelling associated with LCL tears.
* Side Effects:
  + Gastrointestinal irritation, ulcers, or bleeding
  + Kidney damage with long-term or high-dose use
  + Increased risk of cardiovascular events in susceptible individuals
* Precautions: Avoid if you have a history of stomach ulcers, kidney disease, or heart problems unless advised by your doctor.

2. Acetaminophen (Tylenol®)

* Purpose: Pain relief without anti-inflammatory effects, useful if NSAIDs are contraindicated.
* Side Effects: Generally well tolerated but can cause liver damage if overdosed or combined with other acetaminophen-containing products.

## Additional Treatment Measures (Non-Drug)

* Rest and limit weight-bearing on the injured leg; use crutches if necessary.
* Ice application for 10-15 minutes every 2-3 hours initially to reduce swelling.
* Compression with elastic bandages or knee braces to support the knee and reduce pain.
* Physical therapy to restore range of motion, strength, and stability.

## Surgery

* Usually reserved for severe LCL injuries or when other knee ligaments are also damaged.
* Surgery involves ligament repair or reconstruction and requires a longer recovery period.

## **LCL Tear: Procedures and Timelines**

## Non-Surgical Treatment

* Indications: Most mild to moderate (Grade 1 and 2) LCL tears without other ligament involvement.
* Procedures:
  + Initial management includes rest, ice, compression, elevation (RICE or POLICE protocol).
  + Use of a knee brace or lightweight cast that allows forward and backward motion but restricts side-to-side movement.
  + Crutches to limit weight-bearing if needed.
  + Physical therapy focuses on restoring range of motion, strengthening muscles around the knee, and improving stability.
* Timeline:
  + Recovery typically takes 4 to 10 weeks, depending on injury severity and adherence to rehab.
  + Patients progress through functional exercises starting from gentle movements to more demanding activities before returning to normal or sports activities.
* Outcome: Most isolated LCL injuries heal well with conservative treatment.

## Surgical Treatment

* Indications:
  + Severe (Grade 3) LCL tears, especially when combined with injuries to other knee ligaments (ACL, PCL, posterolateral corner).
  + Persistent instability after conservative treatment.
  + Complex knee trauma such as dislocations.
* Procedures:
  + Open surgery or arthroscopic reconstruction using tendon grafts (often semitendinosus autograft) to restore ligament stability.
  + Surgeons drill tunnels in the tibia and femur to anchor the graft, which is fixed with screws or staples.
* Timeline:
  + Surgery recovery may take around 4 months or longer before full weight-bearing and return to activities.
  + Postoperative rehab is critical and usually involves gradual increase in motion, strengthening, and functional training over several months.
* Outcome: Surgery aims to restore knee stability and prevent long-term joint problems.

**DIFFERENTIAL DIAGNOSIS**

* ACL and PCL tears are often confused with LCL injury due to shared nonspecific features like swelling, acute-onset pain, and knee instability. The anterior or posterior drawer tests should help differentiate the injuries.
* Lateral meniscus tears are often mistaken for an LCL tear due to their common nonspecific features, such as swelling, bucking, and lateral joint line pain. A positive McMurray test, which is not seen in LCL tears, can differentiate a lateral meniscus tear.
* Popliteal injury, specifically tendinopathy, commonly presents as posterolateral knee pain distal to lateral femoral epicondyle worsened by downhill walking. A positive Garrick test can help determine the source of popliteal pain. This test is performed by flexing the knee and externally rotating the tibia as the patient resists. Pain is absent in LCL injury with this maneuver.
* Bone contusion may present as LCL tears. Palpating the lateral joint line and stressing the knee can help detect the contusion. Varus stress will not affect lateral bone contusion pain.
* ITB syndrome presents with chronically developing pain at the lateral distal femoral epicondyle. Pain should not be reproducible via varus stresses.

A thorough clinical examination and appropriate imaging can help distinguish these conditions from LCL tears.

**EPIDEMIOLOGY**

**Frequency of LCL Injuries**

Due to this ligament's close association with the PLC and posterior (PCL) and anterior (ACL) cruciate ligaments, the LCL is injured in isolation in less than 2% of knee injury cases. However, this ligament is damaged alongside other structures in 7% to 16% of all knee ligamentous injuries. Studies show that isolated LCL injury is the second least common knee injury in high school athletes, with an incidence of 7.9%. PCL injuries are the least common at 2.4%.Contact sports cause 40% of PLC and LCL injuries. Other possible causes of LCL damage are non-sports-related trauma, such as motor vehicular crashes and falls.

**Risk Factors**

Although there have been few studies completed on isolated LCL injuries, reports show that the female gender, high-contact sports, and athletic activities requiring high-velocity pivoting and jumping increase the likelihood of injury. Soccer is the most likely to cause knee injury overall, but tennis and gymnastics are the most specific for isolated LCL injuries. A United States military study has shown that prior knee, ankle, or hip injury predisposes soldiers to increased lateral knee injury rates

## **Outlook / Prognosis**

Like most injuries, LCL tears can come with complications. Report any of the following to your healthcare provider:

* A feeling of instability in the knee joint.
* A pop, or feeling of collapse or “giving out” of the knee.
* Numbness, tingling or weakness in your knee or lower leg.
* Stiffness.
* If you notice crunching or grinding in the knee joint.

### **Can LCL tears come back after they heal?**

Yes, it’s possible to tear the same lateral collateral ligament again. In fact, you’re at a higher risk of an LCL tear if you’ve had one before. As a result, you might want to take extra precautions to reduce your risk, including stretching and wearing a knee brace.

## **Prevention**

Although you can’t prevent a knee injury like an LCL tear, there are some steps you can take to reduce your risk:

* Support your ligaments by wearing a knee brace when you’re playing sports.
* Make sure your knees are correctly aligned when you play sports. Ask your healthcare provider about how to keep your knee aligned during play.
* Stretch before practices or games.
* Do conditioning exercises to improve your strength and flexibility.

Take care of your knees. It might feel time-consuming to do extra exercises and stretches, but it’s worth it to keep your knees healthy.

**Living With**

For a while, you’ll have to use crutches or a knee brace. Your healthcare provider will tell you how long you need to wait before putting weight on your knee. You’ll be back to walking normally after your LCL tear heals.

Immediately go to your emergency department if you have symptoms of a blood clot in your lung (pulmonary embolism), such as:

* Trouble breathing.
* Sudden chest pain.
* Coughing up blood.

You should also immediately see a healthcare provider if you have the symptoms of any type of blood clot, including:

* Pain in your thigh, groin or knee.
* Swelling or redness in your groin or leg.

Also, see a healthcare provider at your emergency department right away if you have the following symptoms:

* Increased pain.
* Your foot changes color or becomes cool or pale.
* Numbness, tingling or weakness in your toes.
* Inability to move your toes.

Keep a careful eye on your symptoms. You might feel tempted to “wait and see” if the symptoms get better, but it’s better not to hesitate. Instead, inform your healthcare provider or go to the emergency department.

### **What questions should I ask my healthcare provider about LCL tears?**

Consider asking the following questions when you see your healthcare provider:

## What grade is my LCL tear?

* Grade 1 (Mild sprain): Ligament is stretched but intact; mild pain and tenderness; no joint laxity or instability.
* Grade 2 (Partial tear): Some ligament fibers torn; pain and swelling present; joint laxity with a firm endpoint (5-10 mm opening).
* Grade 3 (Complete tear): Ligament completely torn; significant pain and swelling; marked joint laxity and instability (more than 10 mm opening)

## 2. What’s the best treatment for me?

* Grade 1 and 2: Conservative treatment with rest, ice, compression, elevation (RICE), NSAIDs for pain, knee bracing, and physical therapy.
* Grade 3: Often requires surgical repair or reconstruction, especially if combined with other ligament injuries or if instability persists after conservative treatment

## 3. How long should I use crutches?

* Usually for 1 to 2 weeks, or until you can walk without significant pain or instability. Crutches help reduce weight-bearing and protect the knee during early healing

## 4. How long should I wear a brace?

* Typically, a knee brace is worn for 4 to 6 weeks, depending on injury severity. It protects the ligament and limits side-to-side movement while allowing controlled motion

## 5. How soon can I return to sports?

* Grade 1: 3 to 4 weeks after injury.
* Grade 2: 8 to 12 weeks.
* Grade 3: May require 3 to 6 months, especially if surgery is performed

Return depends on pain, swelling, strength, and stability recovery.

## 6. Do I need physical therapy?

* Yes. Physical therapy is essential to restore knee range of motion, strengthen muscles, improve stability, and prevent stiffness or re-injury

## 7. What dosage of NSAIDs should I take?

* Common NSAIDs like ibuprofen are often taken at 200-400 mg every 6 to 8 hours as needed, not exceeding 1200 mg per day over-the-counter without doctor supervision.
* Naproxen can be taken as 220 mg every 8 to 12 hours.
* Always follow your healthcare provider’s instructions and consider any personal health conditions

## 8. Do I need surgery?

* Surgery is usually reserved for Grade 3 tears, especially if combined with other ligament injuries or if there is persistent instability after conservative treatment.
* Most isolated Grade 1 and 2 tears heal well without surgery

## 9. What exercises or stretches are safe?

* Early gentle range of motion exercises to prevent stiffness.
* Quadriceps and hamstring strengthening exercises as pain allows.
* Avoid activities that cause lateral knee stress or instability until cleared by your therapist.
* Progress to balance and proprioception training before return to sports

## **De-Identified Doctor-Patient Conversation on LCL Tear**

Patient:

Doctor, I twisted my knee during a fall, and now I have pain and swelling on the outside of my knee. It also feels unstable sometimes. What could be wrong?

Doctor:

Based on your symptoms, you may have injured your lateral collateral ligament, or LCL. This ligament is on the outer side of your knee and helps keep it stable. Injuries to the LCL often cause pain, swelling, and a feeling that the knee might give way.

Patient:

How do you know how bad the injury is?

Doctor:

I will examine your knee, checking for tenderness and how much it moves sideways using specific tests like the varus stress test. We may also order an MRI to see the extent of the tear and check for other injuries, since LCL tears often happen alongside injuries to other knee ligaments.

Patient:

What are the treatment options?

Doctor:

For mild to moderate tears (Grade 1 or 2), we usually recommend rest, ice, compression, elevation, and wearing a knee brace to protect the ligament. Physical therapy will help you regain strength and stability. For severe tears (Grade 3), especially if other ligaments are involved or the knee is unstable, surgery might be necessary.

Patient:

How long will it take to heal?

Doctor:

Mild and moderate tears typically heal within 4 to 10 weeks with proper care. Severe tears requiring surgery may take several months to fully recover.

Patient: Should I use crutches and a brace? For how long?

Doctor:

You might need crutches for 1 to 2 weeks to avoid putting too much weight on your knee initially. A knee brace is usually worn for 4 to 6 weeks to protect the ligament while it heals.

Patient:

When can I return to sports?

Doctor:

Return to sports depends on your injury’s severity and recovery progress. Mild injuries may return in about a month, moderate injuries in 2 to 3 months, and severe injuries or post-surgery cases may require 4 months or more.

Patient:

Do I need physical therapy?

Doctor:

Yes, physical therapy is important to restore motion, strengthen muscles, and improve knee stability.

Patient:

What about medications?

Doctor:

Over-the-counter NSAIDs like ibuprofen can help reduce pain and swelling. Always follow dosing instructions and check with your doctor if you have other health conditions.

Patient:

When would surgery be necessary?

Doctor:

Surgery is usually reserved for complete tears with significant instability, especially if combined with other ligament injuries or if the knee remains unstable after conservative treatment.

Patient:

Thank you, Doctor. That helps me understand what to expect.

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**Degenerative disk disease**

**Definition**

Degenerative disk disease is a condition that occurs when your spinal disks begin to wear down.

Degenerative disk disease (sometimes spelled degenerative disc disease) isn’t actually a disease, but rather, it’s a condition that occurs when your spinal discs wear down. Spinal disks are rubbery cushions between your vertebrae (bones in your spinal column). They act as shock absorbers and help you move, bend and twist comfortably. Everyone’s spinal discs degenerate over time — it’s a natural part of aging.

When the cushions wear away, the bones can start to rub together. This contact can cause pain and other problems, like:

* **Adult scoliosis,** where your spine curves
* **Herniated disk,** also called a bulged, slipped or ruptured disk
* **Spinal stenosis,** when the space in your spinal canal narrows
* **Spondylolisthesis,** when vertebrae move in and out of place

**Types of degenerative disk disease**

Disk degeneration mostly affects your lower back (lumbar spine) or neck (cervical spine).

* **Lumbar degenerative disk disease.** Your lower back (lumbar spine) has five vertebrae. These are the largest bones in your back. Healthcare providers call them L1 to L5. Disks in your spine (spinal disks) separate each of these vertebrae. Approximately 90% of degenerative disk disease occurs in the lowest portions of your lumbar spine.
* **Cervical degenerative disk disease.** This type of degenerative disk disease occurs in the seven vertebrae of your neck (cervical spine). These vertebrae are each separated by a spinal disk. Your cervical spine is responsible for all kinds of movements, including looking up and down and turning your head from side to side. Degenerative disk disease in this area can make those movements painful.
* **Multilevel degenerative disk disease.** Multilevel degenerative disk disease is when degenerative disk disease affects more than one disk or level of your spine. So, areas of your lumbar spine and your cervical spine could be affected.

Almost everyone has some disk degeneration after age 40, even if they don’t develop symptoms. It can lead to back pain in about 5% of adults.

**Symptoms of degenerative disk disease**

The most common degenerative disk disease (degenerative disc disease) symptoms are neck pain and back pain. You may experience pain that:

* Comes and goes, lasting for weeks or months at a time
* Radiates down your lower back and buttocks
* Worsens with sitting, bending or lifting

**What does degenerative disk pain feel like?**

Degenerative disk pain:

* Can happen in your neck or lower back
* Can be mild, moderate or severe
* Can be sharp, aching or stiff
* May start and stop
* Can get worse after certain activities, like bending, twisting or lifting
* Can get worse over time

**Degenerative disk disease causes**

Spinal discs wear down as a natural part of aging. Especially after age 40, most people experience some disk degeneration. But not everyone experiences pain.

You might have pain if your spinal disks:

* **Dry out.** Your disks have a soft core that mostly contains water. As you get older, that core naturally loses some water. As a result, disks get thinner and don’t provide as much shock absorption as they used to.
* **Tear or crack.** Minor injuries can lead to small cracks in your spinal disks. These tears are often near nerves. Tears can initiate inflammation cascade, which involves nearby structures like nerves, which might be painful, even when they’re minor. If the outer wall of your spinal disk cracks open, your disk may bulge out of place, known as a herniated disk, which may compress a spinal nerve.

**Risk factors for degenerative disk disease**

Degenerative disk disease is most common in people age 40 and older. Some factors increase your risk of developing degenerative disk disease, including:

* Acute injuries, like falls
* Obesity
* Sex, with women being more likely to experience symptoms
* Smoking
* Working a physically demanding job

**Does degenerative disk disease increase my risk for other conditions?**

Degenerated disks can increase your risk of developing other spinal conditions. Common spine problems include:

* Osteoarthritis
* Scoliosis
* Spinal stenosis
* Spondylolisthesis
* Radiculopathy
* Spondylolysis

**Diagnosis and Tests**

To diagnose degenerative disk disease (degenerative disc disease), your healthcare provider may start by asking you about your symptoms. Questions may include:

* When did the pain start?
* Where do you feel pain?
* What activities cause the most pain?
* What activities decrease the pain?
* Did you have an injury or accident that led to pain?
* Do you have other symptoms, like tingling or numbness?
* How far can you walk?

Your healthcare provider may use imaging scans, like X-ray, CT or MRI to help with the diagnosis of degenerative disk disease. These tests can show your healthcare provider the state and alignment of your disks. Your provider may also conduct a physical exam to check your:

* **Nerve function.** Your provider may use a reflex hammer to check your reactions. Little or no reaction could mean you have damaged or compressed nerves.
* **Pain levels.** Your provider may touch or press on specific areas of your back to measure your pain levels.
* **Strength.** Muscle weakness or shrinking (atrophy) could mean you have nerve damage or degenerated discs.

**stages of degenerative disk disease**

Healthcare providers use the following four stages when diagnosing degenerative disk disease:

1. **Dysfunction.** Your spinal disks have started to degenerate, and you may be experiencing mild degenerative disk disease.
2. **Dehydration.** Your spinal disks have started to dry out, causing them to lose some of their height and flexibility. Your neck and back pain may worsen at this stage.
3. **Stabilization.** At this stage, your spine tries to stabilize itself, which can cause spinal stenosis and severe pain.
4. **Collapse.** Your spinal disks continue shrinking and the bones in your spine rub together. The damaged disks press against your nerves, causing severe pain.

**Management and Treatment**

Usually, your healthcare provider will recommend noninvasive degenerative disk disease treatment options first. Your treatment may include:

* **Physical therapy:** Participating in strengthening and stretching exercises with a trained physical therapist
* **Medications:** Taking nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, neuromodulation medication or steroids
* **Steroid injections:** Injecting medicine near your spinal nerves, disks or joints to reduce inflammation and pain
* **Radiofrequency neurotomy:** Using electric currents to burn sensory nerves and prevent pain signals from reaching your brain

**Degenerative disk disease self-care**

Some people find pain relief through at-home remedies. At-home treatments may decrease pain for a short time. But they’re not a long-term treatment for severely degenerated discs. You may try:

* **Physical activity.** Low-impact activity like walking or swimming can strengthen back muscles and relieve some pain.
* **Hot and cold therapy.** Alternating ice packs and heating pads every 10 to 15 minutes up to four times per day may reduce soreness and inflammation.
* **Stretching.** Gentle yoga and stretching throughout the day may improve posture and relieve tension.
* **Traction.** Traction may improve symptoms and relieve tension.

**Degenerative disk disease surgery**

Most people don’t need surgery for degenerative disk disease. But if you’ve tried multiple nonsurgical treatments and have persistent pain and/or weakness, surgery may be a good option.

Your surgeon may use one of a few types of spinal decompression surgery:

* **Diskectomy:** Removing part of a spinal disk to relieve pressure on your nerves
* **Foraminotomy:** Expanding the opening for your nerve roots by removing tissue and bone
* **Laminectomy:** Taking out a small portion of bone from your lower spine (lamina)
* **Osteophyte removal:** Removing bone spurs (osteophytes)
* **Spinal fusion:** Connecting two or more vertebrae to improve stability

**Medications for Degenerative Disc Disease**

1. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

* Examples: Ibuprofen, Naproxen, Diclofenac (Voltaren), Celecoxib (Celebrex)
* Purpose: Reduce inflammation and relieve pain associated with disc degeneration.
* Side Effects:
* Stomach irritation, ulcers, gastrointestinal bleeding
* Increased risk of heart attack or stroke (especially with long-term or high-dose use, particularly COX-2 inhibitors like celecoxib)
* Kidney damage with prolonged use
* Notes: Celecoxib may have fewer gastrointestinal side effects but still carries cardiovascular risks

2. Acetaminophen (Tylenol)

* Purpose: Pain relief without anti-inflammatory effects.
* Side Effects: Risk of liver damage if overdosed.

3. Muscle Relaxants

* Examples: Cyclobenzaprine, Methocarbamol
* Purpose: Relieve muscle spasms that often accompany chronic back pain.
* Side Effects: Drowsiness, dizziness, dry mouth, potential dependency

4. Neuropathic Agents

* Examples: Gabapentin (Neurontin), Pregabalin (Lyrica)
* Purpose: Treat nerve-related pain caused by nerve irritation or compression.
* Side Effects: Dizziness, fatigue, weight gain, swelling, mood changes

5. Antidepressants

* Examples: Tricyclic antidepressants (e.g., amitriptyline)
* Purpose: Block pain signals and improve sleep quality in chronic pain patients.
* Side Effects: Dry mouth, drowsiness, weight gain, constipation

6. Opioids (Narcotics)

* Examples: Codeine (Tylenol #3), Hydrocodone (Vicodin), Oxycodone (Percocet, Oxycontin)
* Purpose: Used for severe pain episodes on a short-term basis.
* Side Effects: Risk of addiction, tolerance, drowsiness, constipation, nausea, respiratory depression. Generally avoided for long-term use due to high addiction potential

7. Oral Steroids

* Examples: Medrol Dose Pack (methylprednisolone)
* Purpose: Short-term powerful anti-inflammatory treatment for severe flare-ups.
* Side Effects: Increased blood sugar, mood changes, stomach irritation, immune suppression. Use limited to 1-2 weeks due to risks

**Degenerative Disc Disease (DDD) Procedures and Timelines**

Common Surgical Procedures for DDD

1. Spinal Decompression Surgery
2. Purpose: Relieves pressure on spinal nerves caused by disc degeneration or bone overgrowth.
3. Types:
4. Laminectomy: Removal of part or all of the lamina (bony arch of vertebra) to free compressed nerves.
5. Foraminotomy: Enlarges the foramina (nerve root openings) to relieve nerve pressure.
6. Facetectomy: Removal of facet joints pressing on nerves.
7. Typically minimally invasive with high success rates (~90%) and good patient satisfaction.
8. Used when nerve compression causes pain, weakness, or neurological symptoms
9. Discectomy
10. Purpose: Removal of damaged or herniated disc material pressing on nerves.
11. Types:
12. Microdiscectomy: Minimally invasive removal of herniated disc fragments.
13. Open discectomy: Larger incision for direct access.
14. Artificial Disc Replacement (ADR): Removal of the entire degenerated disc and replacement with a prosthetic disc to maintain motion.
15. ADR is an alternative to fusion, aiming to preserve spinal mobility.
16. Recovery can take up to 6 months
17. Spinal Fusion Surgery
18. Purpose: Stabilizes the spine by fusing two or more vertebrae after disc removal or to prevent abnormal motion.
19. Types:
20. Anterior Lumbar Interbody Fusion (ALIF): Approach from the abdomen to fuse lower lumbar vertebrae.
21. Posterior Lumbar Interbody Fusion (PLIF): Approach from the back.
22. Anterior Cervical Discectomy and Fusion (ACDF): Common for cervical spine DDD.
23. Fusion eliminates motion at the fused segment to reduce pain but may increase stress on adjacent segments

Typical Timelines

* Preoperative Phase:
* Medical evaluation, imaging, and surgical planning.
* Patient education about procedure, risks, and recovery.
* Surgery Duration:
* Varies by procedure; minimally invasive discectomies may take 1-2 hours, fusion surgeries longer.
* Hospital Stay:
* Minimally invasive surgeries often require 1-3 days.
* More extensive fusion surgeries may require longer hospitalization.
* Initial Recovery (Weeks 1-6):
* Pain management, wound healing, limited activity.
* Use of braces may be recommended.
* Start gentle physical therapy focusing on mobility and pain relief.
* Rehabilitation Phase (3-6 months):
* Gradual increase in physical therapy intensity to restore strength and flexibility.
* Avoid heavy lifting, twisting, or high-impact activities until cleared.
* Long-Term Recovery:
* Fusion takes months to fully solidify (3-6 months or more).
* Artificial disc replacement recovery may be similar but aims to preserve motion.
* Return to normal activities and sports depends on healing and surgeon clearance.

Degenerative Disc Disease (DDD) staging is classified using several systems based on imaging findings, clinical symptoms, and functional impairment. Here is a summary of the most commonly used staging frameworks:

**Epidemiology of Degenerative Disc Disease (DDD)**

Prevalence by Age and Gender

Degenerative disc disease is highly prevalent and increases with age.

Studies show that over 70% of people under 50 years old have disc degeneration visible on imaging, rising to over 90% in those over 50 years old

By age 50, approximately 80% of people show disc degeneration on imaging, increasing to about 96% in people in their 80s

Women tend to have slightly higher prevalence rates than men in some studies, with disc degeneration seen in about 77% of women vs. 71% of men under 50 years

The most commonly affected intervertebral disc levels are:

Cervical spine: C5/6 (men 51.5%, women 46%)

Thoracic spine: T6/7 (men 32.4%, women 37.7%)

Lumbar spine: L4/5 (men 69.1%, women 75.8%)

In a large Medicare dataset (ages 65+), the prevalence of diagnosed disc degeneration was about 12.2% among enrollees, increasing with age and higher in females than males

The overall prevalence of spine degeneration diagnosis (including disc degeneration and other pathologies) was around 27.3%, rising from 24.2% in 2005 to 30.1% in 2017, reflecting aging populations and increased diagnosis

Age: The strongest risk factor; prevalence rises sharply with advancing age.

Obesity: Associated with higher prevalence of disc degeneration and other spine pathologies

Gender: Females generally have higher rates of diagnosed spine degeneration than males, except for some conditions like diffuse idiopathic skeletal hyperostosis (DISH)

Other factors: Genetic predisposition, mechanical stress, and lifestyle factors contribute to the development and progression of DDD.

An estimated 266 million people worldwide suffer from degenerative spine disease and low back pain annually, with prevalence varying by region

**Differential Diagnosis of Degenerative Disc Disease (DDD)**

* Diskitis: Infection of the intervertebral disc space causing severe back pain, fever, and systemic symptoms.
* Spinal Stenosis: Narrowing of the spinal canal leading to nerve compression and symptoms like neurogenic claudication and leg pain.
* Spondylolisthesis: Forward slippage of a vertebra that can cause back pain and nerve symptoms.
* Spondylolysis: Stress fracture of the pars interarticularis, often in younger patients or athletes.
* Fibromyalgia: A systemic pain syndrome with widespread musculoskeletal pain, fatigue, and tender points, often without structural spine abnormalities.
* Marfan Syndrome: A connective tissue disorder that can affect the spine and cause back pain due to structural abnormalities.
* Cauda Equina Syndrome: A surgical emergency characterized by bowel/bladder dysfunction, saddle anesthesia, and severe neurological deficits.
* Muscle Spasm: Often secondary to mechanical back pain but may mimic discogenic pain.
* Spinal Cord Tumor or Infection: Rare but serious causes of back pain requiring imaging and urgent treatment.
* Facet Joint Injury or Arthritis: Pain originating from degenerative changes in the facet joints rather than the discs.
* Sacroiliac Joint Dysfunction: A common source of mechanical low back pain that can be confused with discogenic pain.
* Radiculopathy and Plexopathy: Nerve root or nerve plexus compression causing radiating pain and neurological symptoms.
* Malignancy: Metastatic cancer involving the spine presenting with persistent back pain and systemic symptoms.
* Osteoporosis and Vertebral Compression Fractures: Can cause acute or chronic back pain with or without nerve involvement.

Red Flags Suggesting Alternative or Serious Diagnoses

* New onset bowel or bladder incontinence
* Saddle anesthesia
* Unexplained fever or weight loss
* History of cancer
* Significant trauma or osteoporosis
* Immunosuppression or intravenous drug use
* Severe or progressive neurological deficits

**Key Genetic Factors in Degenerative Disc Disease**

1. Collagen Genes (COL9A2, COL9A3, COL11A1)

* Collagen IX genes (*COL9A2* and *COL9A3*) encode important structural proteins in the intervertebral disc extracellular matrix, particularly in cartilage and the nucleus pulposus.
* A specific mutation (Gln326Trp, known as the Trp2 allele) in *COL9A2* has been associated with increased risk of DDD, especially in certain populations like Finnish and Southern Chinese, with an odds ratio of about 2.4 for disc degeneration in middle-aged individuals.
* Mutations in *COL11A1* and other collagen genes also contribute to disc matrix integrity and susceptibility to degeneration.

2. Vitamin D Receptor (VDR) Gene

* The *VDR* gene polymorphisms, especially the *TaqI* and *FokI* variants, are among the most consistently associated genetic markers for DDD.
* The *TaqI* polymorphism affects mRNA stability, potentially altering vitamin D signaling, which influences sulphate metabolism critical for proteoglycan synthesis in discs.
* The *FokI* polymorphism changes the protein structure of the receptor, affecting transcriptional activity and possibly disc health.
* Vitamin D receptor gene variants are linked to altered extracellular matrix composition and disc degeneration risk.

3. Aggrecan (AGC1) and Extracellular Matrix Genes

* Aggrecan is a major proteoglycan in the disc matrix, essential for water retention and disc resilience.
* Variations in the *AGC1* gene and other genes involved in extracellular matrix formation and repair influence disc degeneration susceptibility.

4. Matrix Metalloproteinases (MMPs) and ADAMTS Genes

* Genes such as *MMP3* and *ADAMTS5* encode enzymes involved in matrix degradation.
* Polymorphisms in these genes are associated with increased breakdown of disc matrix components, accelerating degeneration.

5. Heritability and Genetic Influence

* Twin studies estimate that genetic factors account for approximately 70-75% of the risk for developing DDD, underscoring a strong hereditary component.
* Genetic predisposition interacts with environmental and mechanical factors (like smoking, obesity, and repetitive stress) to influence disease onset and progression.

**Outlook / Prognosis**

Most people who have surgery for degenerative disk disease experience long-term pain relief. But even after surgery, you need to continue exercising and stretching to keep your back strong and healthy.

Many people use nonsurgical and at-home treatments to manage pain long term. If you have mild to moderate back pain, you’ll need to continue treatment to keep the pain at bay.

**Prevention**

You can prevent or slow the progression of spinal degeneration through lifestyle changes. Some of these include:

* Achieving and maintaining a weight that’s healthy for you
* Avoiding or quitting smoking
* Getting regular physical activity to increase strength and flexibility

**Common Questions**

**What should I avoid if I have degenerative disk disease?**

Things to avoid with degenerative disk disease include:

* **Smoking.** Smoking can worsen your pain and make treatment less effective.
* **Lifting heavy objects.** Heavy lifting stresses and strains the disks in your back, especially when you do it often.
* **Drinking alcohol.** Drinking too many beverages containing alcohol increases your risk of back pain.
* **Staying seated for long periods.** If you spend too much time sitting on the couch or at your desk, your back pain will increase. So, make sure to get up and move around once in a while.
* **High-impact physical activity.** Sports and other physical activities that involve jumping, running and other high-impact movements can be hard on your back. Instead, try low-impact physical activities like walking and swimming.

What’s the most likely cause of my degenerative disk disease?

The primary cause of degenerative disc disease is age-related wear and tear. As you age, the spinal discs naturally lose water content and elasticity, making them thinner and less able to cushion the vertebrae. This drying out and degeneration reduce their shock-absorbing ability, leading to pain and other symptoms. Other contributing factors include:

* Repetitive mechanical stress from daily activities or certain occupations
* Acute or repetitive spinal injuries (e.g., falls, lifting heavy objects improperly)
* Genetic predisposition (family history of spine problems)
* Obesity, smoking, and poor nutrition, which can accelerate disc degeneration
* Sedentary lifestyle or poor posture

Age is the strongest risk factor, but lifestyle and genetics also play important roles

How can I slow the progression of the disease?

You can slow the progression of DDD by:

* Maintaining a healthy weight to reduce spinal load
* Engaging in regular low-impact exercise (e.g., walking, swimming) to strengthen back muscles and improve flexibility
* Avoiding smoking, which speeds disc degeneration
* Using proper body mechanics when lifting or bending
* Staying hydrated and maintaining good nutrition to support disc health
* Managing chronic conditions like diabetes that may affect blood supply to discs
* Avoiding prolonged sitting or inactivity, which can worsen disc health

Early intervention with lifestyle changes and physical therapy can help preserve spine function and reduce symptoms

What nonsurgical treatments are most likely to relieve my pain?

Nonsurgical treatments that often relieve DDD pain include:

* Physical therapy: Tailored exercises to strengthen core and back muscles, improve posture, and increase flexibility
* Medications: NSAIDs (ibuprofen, naproxen) for inflammation and pain; acetaminophen for pain relief; muscle relaxants for spasms
* Heat and cold therapy: To reduce pain and inflammation
* Epidural steroid injections: For severe nerve-related pain
* Activity modification: Avoiding activities that worsen pain
* Lifestyle changes: Weight loss, smoking cessation, ergonomic adjustments

These treatments focus on symptom management and improving function without surgery

What will happen if I choose not to have surgery?

If you opt against surgery:

* Many people with DDD manage symptoms successfully with nonsurgical treatments and maintain a good quality of life.
* Symptoms may fluctuate; some experience periods of pain relief and others flare-ups.
* Without surgery, progression of degeneration may continue slowly, but severe neurological damage is uncommon.
* Persistent pain or worsening neurological symptoms (like numbness, weakness, or bladder/bowel dysfunction) may require reevaluation.
* Surgery is generally reserved for cases with severe pain unresponsive to conservative care or significant nerve compression.

Choosing nonsurgical management is often appropriate, especially in mild to moderate cases

How can I prevent pain from returning after surgery?

To prevent recurrent pain after surgery:

* Follow your surgeon’s postoperative instructions carefully, including wearing braces if prescribed.
* Engage in physical therapy to strengthen supporting muscles and improve spinal stability.
* Maintain a healthy weight to reduce spinal stress.
* Avoid smoking, which impairs healing and accelerates degeneration.
* Use proper body mechanics and avoid heavy lifting or high-impact activities until fully healed.
* Stay active with low-impact exercises to maintain spine health long-term.

Consistent lifestyle management and rehabilitation are key to sustaining surgical benefits and minimizing recurrence

**Degenerative Disk Disease: Doctor-Patient Conversation**

Patient:

Doctor, I’ve been having persistent lower back pain that sometimes radiates to my legs. I heard it might be degenerative disk disease. What exactly is that?

Doctor: Degenerative disk disease isn’t actually a disease but a condition that happens when the spinal disks—the cushions between the bones in your spine—start to wear down over time. This can happen naturally as we age, or from injuries and daily wear and tear. When these disks lose their cushioning ability, it can cause pain and stiffness in your back or neck

Patient:

What causes the pain? Why does it sometimes spread to my legs?

Doctor: The pain occurs because as the disks degenerate, they lose height and flexibility, which can cause the bones in your spine to rub together or press on nearby nerves. This nerve irritation can cause pain that radiates down your legs or arms, depending on the affected area

Patient:

How do you diagnose this condition?

Doctor: We start by discussing your symptoms and medical history, including when the pain started and what movements worsen it. Then, we perform a physical exam to check your spine and nerve function. Imaging tests like X-rays or MRI scans help us see the extent of disk degeneration and any nerve involvement

Patient:

What treatment options are available? Do I need surgery?

Doctor: Most patients begin with non-surgical treatments. These include lifestyle changes like weight loss and exercise, physical therapy, and medications such as anti-inflammatory drugs or pain relievers. Injections like steroid shots can also help reduce inflammation and pain. Surgery is usually reserved for severe cases where other treatments haven’t helped or if there’s significant nerve compression causing weakness or loss of function

Patient:

What kind of surgery might I need if it comes to that?

Doctor: Surgical options include discectomy, where part of the damaged disk is removed; spinal fusion, which stabilizes the spine by joining vertebrae; decompression surgery to relieve nerve pressure; or artificial disk replacement in some cases. Our goal is to tailor the treatment to your specific condition and symptoms

Patient:

Will I be able to return to my normal activities?

Doctor: Many patients improve significantly with treatment and can return to their daily activities with less pain. Physical therapy and regular exercise are key to maintaining spine health. Surgery recovery varies but can also lead to good outcomes. We’ll work together to create a plan that fits your needs and lifestyle

Patient:

Is this condition going to get worse over time?

Doctor: Degeneration is a natural part of aging, but symptoms don’t always worsen. Some people have disk degeneration without pain. However, if symptoms do progress, we’ll adjust your treatment accordingly. Regular follow-ups help us monitor your condition and manage symptoms effectively

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**Complex regional pain syndrome (CRPS)**

**Definition**

Complex regional pain syndrome (CRPS) is a condition that causes pain, changes in skin color and other symptoms in a certain part of your body — usually in your extremities. Your extremities include your arm, leg, hand or foot.

The symptoms of CRPS can greatly impact the function of your affected limb, sleep, daily activities and your mental health.

Experts believe that CRPS occurs as a result of dysfunction in your central or peripheral nervous systems. Your central nervous system consists of your brain and spinal cord. Your peripheral nervous system relays information from your brain and spinal cord to your organs, arms, legs, fingers and toes. The abnormal functioning results in an overreaction to pain signals that your nervous system can’t shut off.

There are two subtypes of CRPS:

* **Type I**: This type occurs without nerve damage. It happens after an illness or injury that didn’t directly damage a nerve. Type I was formerly known as reflex sympathetic dystrophy.
* **Type II**: This type occurs after known nerve damage. It was formerly known as causalgia.

CRPS can also either be acute (short-term) or chronic (lasting longer than six months). It’s usually treatable.

CRPS more commonly affects adults than children. The peak onset is around 40 years of age. CRPS affects females more often than males.

About 66% to 80% of cases occur in people of European ancestry.

CRPS is relatively rare. It affects about 200,000 people every year in the United States.

**Symptoms of CRPS**

How severe and how long symptoms of complex regional pain syndrome (CRPS) last varies from person to person.

Symptoms of CRPS typically start within four to six weeks after an injury, fracture or surgery, but they can develop without a known cause.

The most common and prominent symptom of CRPS is pain. The pain is constant or intermittent and is a burning, stinging or tearing sensation. It’s often deep inside your affected limb.

Sensory changes are also common in the affected area and may include:

* Increased sensitivity to painful stimuli (a pinch may feel more painful than usual).
* Feeling pain from stimuli that are usually not painful (such as just touching your skin).
* Numbness.

Other symptoms of CRPS in the affected area include:

* **Skin swelling**: Swelling may come and go or remain constant.
* **Decreased function in your affected limb**: You may experience a decreased ability to move your affected limb and/or increased stiffness. You may also have difficulty placing pressure on your affected limb or joint.
* **Changes in skin temperature**: The skin on your extremity may feel warmer or cooler compared to the opposite one.
* **Changes in skin color**: Your skin may appear blotchy, pale, purple/bruised or red.
* **Changes in skin texture**: Your skin may become shiny and thin or excessively sweaty.
* **Changes in nail and hair growth**: You may have rapid hair or nail growth or no growth.

Since the symptoms of CRPS usually improve over time, it’s easiest for healthcare providers to diagnose it in the early stages. It’s important to see a provider soon after you experience symptoms of CRPS.

**What causes CRPS?**

Researchers aren’t sure why some people develop CRPS while others with similar injuries don’t. They think it’s due to an inflammatory or immune reaction in both your peripheral and central nervous systems.

In more than 90% of cases, CRPS results from nerve trauma or injury to the affected limb that damages the thinnest sensory and autonomic nerve fibers. These small fibers transmit pain, itch and temperature sensations. They also control the small blood vessels and the overall health of surrounding cells.

The most common injury associated with developing CRPS is a bone fracture, especially a wrist fracture. A displaced or splintered bone or pressure from a tight cast can damage nerves.

Other common injuries that can lead to CRPS include:

* **Surgery**: A surgical incision, stitches or scarring can cause nerve injury.
* **Sprains or strains**: When connective tissues are damaged, it can result in excessive movement of a joint, which over-stretches nearby nerves.
* **Burns, bruises or cuts**: These are all noticeable signs of injuries that may also have damaged underlying nerves.

CRPS can also develop without an obvious injury or due to periods of prolonged immobilization.

Certain factors that may increase your risk of developing CRPS include:

* **Poor nerve health**: Conditions such as diabetes can leave your nerves less resilient and able to repair themselves. It may be difficult for people with peripheral neuropathy to regrow their nerve cells from an injury that wouldn’t otherwise cause problems. Smoking and previous chemotherapy can also make it difficult for your nerves to regenerate.
* **Immune system issues**: Your immune system plays a large role in inflammation. Some people with CRPS have elevated levels of inflammatory chemicals called cytokines that contribute to certain symptoms of CRPS. CRPS is also more common in people with other inflammatory and autoimmune diseases, such as asthma.
* **Genetics**: Your genes can affect your ability to recover from an injury. Researchers have discovered family clusters of CRPS. Although this is rare, it suggests that there may be a genetic link to CRPS.

**Diagnosis and Tests**

Since CRPS is rare and healthcare providers don’t totally understand it, it’s often misdiagnosed.

There’s no specific test to diagnose CRPS. Healthcare providers mainly diagnose it through a careful medical history, physical examination and review of your symptoms. Your provider will ask you if you’ve had a recent injury or surgery.

They will look for:

* A change in the appearance, temperature and texture of your skin in the affected area.
* A higher-than-expected amount of pain from an injury.
* Any other disease or conditions that could cause your pain, changes in your skin or other symptoms.

They may order imaging tests, such as an ultrasound or magnetic resonance imaging (MRI), to look for underlying nerve damage. But it’s not always possible to find the nerve damage.

Your provider may also order other tests to rule out conditions that cause similar symptoms. For example, electromyography (EMG) may reveal other causes of neuropathy, which may result in some similar pain scenarios.

**Management and Treatment**

The goal of treatment is to decrease your pain and other symptoms, restore function to the affected limb and maintain the quality of your life.

It’s important to start treatment early in the course of CRPS. This is because CRPS can cause the affected limb to stiffen over time. In addition, the pain usually worsens without treatment and movement becomes more and more difficult.

It’s best to see healthcare providers who have experience in treating CRPS, if possible. Treatment requires a combination of carefully managed approaches, including:

* Physical therapy and occupational therapy.
* Lifestyle changes.
* Psychosocial and behavioral therapy.
* Medications.
* Alternative therapies for pain management.

For young children with CRPS, psychosocial and rehabilitation therapies are the mainstay treatment. Healthcare providers typically only suggest pain-reducing medical procedures for older adolescents who have symptoms that aren’t responding to other therapies.

**Physical therapy and occupational therapy**

Physical therapy is one of the most important methods of treatment for CRPS.

A physical therapist can help improve blood flow to your affected limb as well as increase your flexibility, strength, muscle tone and function with certain exercises. An occupational therapist can teach you new ways to accomplish everyday tasks.

Other aspects of physical therapy for CRPS include:

* **Graded motor imagery**: This is a set of treatments that help reduce pain and improve the ability to move the affected part of your body. When one of your limbs is painful, it can become difficult to touch, move or use. Your brain also has a memory or “map” of different body parts and how these feel, move and function in daily activities. If you don’t touch, move or use the affected limb, this map starts to change and can begin to disappear. However, you can change this map or re-established it with graded motor imagery.
* **Mirror therapy**: This treatment technique is one of the exercises of graded motor imagery. It involves looking at the reverse image of your non-painful limb in a mirror. The reflection in the mirror then appears as the affected limb. This can “trick” your brain into thinking that the painful limb now feels and moves as normal.
* **Desensitization**: This technique involves touching the affected area with materials of different textures and weights and placing the affected limb into water of warmer and cooler temperatures. By exposing the affected area/limb to different sensations slowly over time, your brain adjusts to the sensations and pain begins to lessen.

**Lifestyle changes**

Removing certain barriers that can prevent your nerves from healing can help increase the chance of recovery and the speed of recovery, including:

* **Quitting smoking**: Smoking greatly interferes with nerve regeneration.
* **Managing existing health conditions**: Poor management of diabetes and other conditions that can affect circulation and nerves can make it difficult for your nerves to heal.

Other simple steps you can take at home to help your symptoms include:

* Keeping your affected limb elevated when resting or sleeping can help excess fluid return to your heart.
* Exercising every day is critical to improving circulation to the damaged nerves. Talk to your provider or a physical therapist about an exercise plan that’s appropriate for you.
* Wearing compression stockings or sleeves may help limit swelling, particularly when standing. Ask your provider if this is an option for you.

**Psychosocial and behavioral therapy**

Having CRPS is associated with worsening anxiety, depression and stress, which can increase pain. Psychotherapy can help. Psychotherapy, also called talk therapy, is a term for a variety of treatment techniques that aim to help a person identify and change unhealthy emotions, thoughts and behaviors.

If possible, it’s best to see a pain management clinical psychologist with training in treating CRPS. During psychotherapy, you talk to the psychologist to learn ways to better cope with factors that contribute to your pain and other symptoms.

**Medications**

No medications are specifically approved for CRPS in the U.S. However, your healthcare provider may recommend certain medications to manage your symptoms.

Medications that have pain-reducing effects include:

* Nonsteroidal anti-inflammatory drugs (NSAIDs), such as acetaminophen, ibuprofen and naproxen.
* Topical analgesic creams and patches, such as lidocaine.
* Certain antidepressants, such as amitriptyline and duloxetine.
* Anti-seizure drugs, such as gabapentin, pregabalin and topiramate.
* Bisphosphonates, such as alendronate.
* Botulinum toxin (Botox) injections.

The choice of medication(s) to begin with varies from person to person. Your healthcare provider will consider certain factors, including:

* Your age.
* Other existing health conditions.
* Any current medications you’re taking.
* The potential for medication side effects or interactions with the current medications you’re taking.

**Alternative therapies for pain management**

Alternative therapies for pain management may include:

* Biofeedback.
* Acupuncture.
* Hypnosis.
* Reiki.
* Chiropractic.

If your CRPS hasn’t responded well to the therapies mentioned above or you have severe pain or ongoing CRPS, your provider may recommend the following more invasive treatments:

* **Trigger point/tender point injections**: You may have trigger/tender points in the muscles in your shoulder girdle when CRPS is limited to your upper limb. Injection of each trigger/tender point with local anesthetics with or without glucocorticoids can help treat this type of CRPS in the early stage.
* **Sympathetic nerve blocks**: These blocks can provide significant pain relief for some people. The lumbar sympathetic block involves injecting an anesthetic next to your spine in your lower back. This directly blocks the sympathetic chain that transmits the pain signal from your lower limbs to your spinal cord and brain. For upper limb CRPS pain, the block is called stellate ganglion block, which involves injecting an anesthetic on the side of your neck.
* **Spinal cord stimulation**: This treatment involves surgically implanting a pulse generator device under your skin in your abdomen or buttock and wires (electrodes) near your spinal cord. The device, which is similar to a pacemaker, sends low-level electrical currents to your spinal cord. Electrical pulses interfere with and reduce the pain signal being sent to your brain.
* **Dorsal root ganglia stimulation**: This treatment is similar to spinal cord stimulation except that the smaller wires are implanted right on the dorsal root ganglion, which is a cluster of sensory neurons at the junction where each segmental nerve exits your spinal cord. The dorsal root ganglion is a relay station of the pain signal being sent from the peripheral nervous system (your limbs) to the central nervous system (your spinal cord and brain). The stimulation could be a more targeted and efficient (requiring less stimulation) therapy, as it concentrates on these small relay stations.
* **Peripheral nerve stimulation**: This treatment places a stimulating wire near a major nerve in your limb that covers the painful area. It works by interfering with the pain signal conducted through the targeted nerve.
* **IV ketamine infusion**: This treatment uses an IV infusion of a low dose of ketamine for 3 to 5 days. Ketamine works by blocking a particular molecule (NMDA receptor) in your nervous system that can wind up and worsen your pain.
* **Intrathecal drug pumps**: This treatment involves using an implanted catheter to send pain-relieving drugs, such as ziconotide (Prialt®), right into your spinal fluid.

**medications used to treat Complex Regional Pain Syndrome (CRPS) along with their common side effects:**

1. Antidepressants

* Tricyclic Antidepressants (TCAs):
* Examples: Amitriptyline, Nortriptyline, Duloxetine, Venlafaxine
* Purpose: Modulate neurotransmitters to reduce neuropathic pain and improve sleep.
* Side Effects:
* Dry mouth
* Blurred vision
* Constipation
* Heart palpitations
* Difficulty urinating
* Drowsiness or sedation
* Withdrawal symptoms if stopped abruptly (dose should be tapered)
* Notes: Nortriptyline generally has fewer side effects than amitriptyline.
* Selective Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):
* Examples: Duloxetine, Venlafaxine
* Side Effects: Nausea, dizziness, dry mouth, fatigue.

2. Anticonvulsants

* Examples: Gabapentin, Pregabalin, Carbamazepine, Phenytoin, Topiramate, Levetiracetam
* Purpose: Used to treat neuropathic pain by stabilizing nerve activity.
* Side Effects:
* Dizziness
* Fatigue
* Weight gain (especially pregabalin)
* Swelling
* Cognitive impairment (e.g., difficulty concentrating)
* Nausea

3. Pain Relievers

* Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):
* Examples: Ibuprofen, Naproxen, Aspirin
* Purpose: Reduce mild pain and inflammation.
* Side Effects: Stomach upset, ulcers, gastrointestinal bleeding with prolonged use.
* Opioids:
* Examples: Morphine, Codeine, Hydrocodone, Oxycodone
* Purpose: Used for severe pain, though often less effective in CRPS.
* Side Effects:
* Nausea and vomiting
* Constipation
* Dry mouth
* Drowsiness
* Cognitive slowing
* Risk of dependence and addiction (rare but possible)
* Long-term use may cause hormonal imbalances (e.g., impotence, menstrual irregularities)

4. Corticosteroids

* Examples: Prednisone, Methylprednisolone
* Purpose: Reduce inflammation, especially in the acute phase of CRPS.
* Side Effects (especially with prolonged use):
* Increased blood sugar
* Mood changes
* Weight gain
* Immune suppression
* Osteoporosis

5. Bisphosphonates

* Examples: Alendronate, Pamidronate, Clodronate
* Purpose: Inhibit bone resorption and may reduce CRPS-related bone pain and improve joint mobility.
* Side Effects:
* Gastrointestinal upset
* Rarely, osteonecrosis of the jaw
* Flu-like symptoms with intravenous forms

6. Sympathetic Nervous System Modulators

* Alpha-adrenergic antagonists:
* Examples: Phentolamine, Phenoxybenzamine, Clonidine, Reserpine, Prazosin
* Purpose: Modulate sympathetic nerve activity to reduce pain.
* Side Effects:
* Low blood pressure (hypotension)
* Dizziness
* Fatigue
* Dry mouth

7. Sodium Channel Blockers

* Examples: Intravenous Lidocaine, Mexiletine, Oxcarbazepine, Carbamazepine
* Purpose: Block nerve sodium channels to reduce neuropathic pain.
* Side Effects:
* Dizziness
* Nausea
* Cardiac arrhythmias (rare, especially with systemic use)
* Fatigue

8. Other Treatments (Non-Drug)

* Physical therapy, psychotherapy, sympathetic nerve blocks, spinal cord stimulation, intrathecal drug pumps, and ketamine infusions are also used but are beyond drug side effects.

**Complex Regional Pain Syndrome (CRPS) Procedures and Their Timelines**

1. Early Diagnosis and Multimodal Treatment Initiation

* Timeline: Within weeks of symptom onset (ideally within 1-3 months)
* Description: Early diagnosis and prompt initiation of treatment are critical to prevent progression and chronic disability. Treatment is usually multimodal, combining physical therapy, medications, and psychological support.

2. Physical and Occupational Therapy

* Timeline: Starts as soon as possible after diagnosis, ongoing for months to years
* Description:
* Focuses on maintaining limb mobility, strength, and function.
* Techniques include graded motor imagery, desensitization, and functional exercises.
* Prevents stiffness, muscle wasting, and improves blood flow.
* Essential throughout the course of CRPS to improve outcomes.
* Expected Progress: Gradual improvement in pain and function over weeks to months; some patients require long-term therapy.

3. Medications

* Timeline: Initiated early and adjusted over weeks to months
* Description:
* Pain relievers (NSAIDs, opioids in selected cases), corticosteroids (especially in acute phase), bisphosphonates, antidepressants, anticonvulsants, and sympathetic nervous system modulators.
* Intravenous ketamine infusions may be used in refractory cases.
* Expected Progress: Pain relief may begin within days to weeks; some medications require several weeks to reach full effect.

4. Sympathetic Nerve Blocks

* Timeline: Considered after initial therapies if pain persists; may be repeated over weeks/months
* Description:
* Local anesthetic injections targeting sympathetic nerves to reduce pain.
* Can provide temporary relief and improve function.
* Expected Progress: Immediate but often temporary pain relief; repeated blocks may be necessary.

5. Intravenous Ketamine Infusions

* Timeline: Used in refractory cases, typically over several days to weeks
* Description:
* Low-dose ketamine infusions can reduce severe neuropathic pain by modulating NMDA receptors.
* Expected Progress: Pain relief may last weeks to months post-infusion; requires close monitoring.

6. Psychological Therapies

* Timeline: Initiated early and continued as needed
* Description:
* Cognitive-behavioral therapy (CBT), relaxation techniques, and support to manage anxiety, depression, and PTSD associated with CRPS.
* Expected Progress: Improves coping skills and quality of life; benefits accumulate over months.

7. Advanced Interventions (for refractory cases)

* Spinal Cord Stimulation (SCS):
* Timeline: Considered after failure of conservative treatments, typically months into disease course.
* Description: Implantation of a device that delivers electrical impulses to the spinal cord to modulate pain signals.
* Expected Progress: Pain relief often occurs within days after implantation; long-term management required.
* Intrathecal Drug Pumps:
* Timeline: For severe, refractory pain after other treatments fail.
* Description: Pumps deliver medication directly into the spinal fluid.
* Expected Progress: Pain relief may be significant; requires surgical implantation and maintenance.

8. Self-Management and Education

* Timeline: Continuous throughout treatment
* Description:
* Patient education on condition, pacing activities, pain management techniques, and lifestyle adaptations.
* Encouraged to maintain activity and avoid immobilization to prevent worsening.
* Expected Progress: Empowers patients to manage symptoms and improve function long-term.

**CRPS Staging**

Stage I: Acute Stage (Up to 3 Months)

* Symptoms:
* Severe burning or aching pain disproportionate to the initial injury
* Increased sensitivity to touch (allodynia)
* Swelling and redness
* Fluctuating skin temperature (warm or hot)
* Increased sweating (hyperhidrosis)
* Muscle stiffness and weakness
* Faster-than-normal nail and hair growth
* Skin changes: shiny, thin, and warm
* Pathophysiology: Inflammatory changes predominate with vasodilation and increased blood flow.

Stage II: Dystrophic Stage (3 to 6 Months, up to 12 Months in some descriptions)

* Symptoms:
* Persistent swelling, often more constant and less fluctuating
* Increased stiffness and joint contractures
* Skin becomes cool or cold with mottled or bluish discoloration
* Brittle, cracked nails
* Muscle wasting (atrophy) begins
* Loss of skin wrinkles
* Continued pain and hypersensitivity
* Pathophysiology: Vasoconstriction and decreased blood flow lead to trophic changes.

Stage III: Atrophic Stage (After 6 Months to 1 Year and Beyond)

* Symptoms:
* Skin becomes pale, dry, tight, and shiny
* Severe muscle and tendon atrophy
* Joint contractures and limited range of motion
* Decreased pain in some cases but persistent disability
* Possible irreversible tissue changes
* Pathophysiology: Chronic changes with fibrosis, atrophy, and possible permanent damage.

Additional Classifications

* Type I CRPS: Occurs without confirmed major nerve injury (previously called reflex sympathetic dystrophy).
* Type II CRPS: Occurs with confirmed nerve injury (previously called causalgia).
* Warm vs. Cold CRPS:
* *Warm CRPS* is associated with the acute inflammatory phase and better prognosis.
* *Cold CRPS* is associated with chronic stages, poorer prognosis, and more severe symptoms.

**Outlook / Prognosis**

Each person’s experience with CRPS is different. CRPS usually improves over time and eventually goes away (goes into remission) in most people.

Severe or prolonged cases, which are rare, can greatly affect your life. In some people, CRPS gets worse and even spreads to other areas of their body. Experiencing increased psychological distress during the injury that led to CRPS may affect its severity and prognosis.

CRPS recurs (happens again) in about 10% to 30% of people. Most recurrences are due to unknown reasons.

The most important goals are to relieve pain and restore movement and strength in the affected limb. By achieving pain relief, you increase the odds of improving its function and your quality of life. Carefully selected treatment plans allow some people with CRPS to successfully manage their pain and lead active lives.

**Prevention**

Since researchers don’t know the exact cause of CRPS, there’s no conclusive way to prevent it. Some studies have revealed that taking vitamin C before a future surgery might prevent CRPS.

**When should I see my healthcare provider?**

Because of the complexity of this condition and the fact that it’s often misdiagnosed, seek out a pain management specialist or a specialty pain center with knowledge of CRPS if:

* You think you have symptoms of CRPS.
* Your symptoms are getting worse.
* Your condition hasn’t responded to other treatment methods

**Epidemiology**

Frequency

A population-based study by Sandroni et al showed an incidence of approximately 5.5 per 100,000 person-years at risk and a prevalence of about 21 per 100,000 for CRPS type I.The same study showed an incidence of 0.8 per 100,000 and a prevalence of about 4 per 100,000 for CRPS type II.Therefore, the incidence of CRPS type I is higher than that of CRPS type II.The reported incidence of CRPS type I is 1-2% after various fractures, while that of CRPS type II approximates 1-5% after peripheral nerve injury. The incidence of CRPS is 12% after a brain injuryand 5% after a myocardial infarction.

A study from the Netherlands showed a total incidence of CRPS of approximately four times higher than the incidence rate observed in the Sandroni study, which was performed in Olmsted County, Minn.The estimated overall incidence rate of CRPS was 26.2 per 100,000 person years, with females affected at least three times more often than males. The highest incidence occurred in females aged 61-70 years. The upper extremity was affected more frequently than the lower extremity, and a fracture was the most common precipitating event (44%).

Mortality/Morbidity

Despite treatment, many patients are left with varying degrees of chronic pain, trophic changes, and disability.

**Differential Diagnosis of CRPS**

1. Neurological Conditions

* Peripheral neuropathies: Small-fiber or large-fiber sensorimotor neuropathies can mimic CRPS symptoms such as pain, numbness, and autonomic changes.
* Nerve impingement syndromes: Examples include carpal tunnel syndrome or radiculopathy causing localized pain and sensory disturbances.
* Spinal cord pathologies: Trauma, tumors, transverse myelitis, or stroke affecting sensory or autonomic pathways.
* Central sensitization syndromes: Fibromyalgia or conversion disorders may present with widespread pain and sensory abnormalities.

2. Musculoskeletal Disorders

* Arthritis: Rheumatoid arthritis, gout, or pseudogout causing joint pain, swelling, and stiffness.
* Tenosynovitis: Inflammation of tendon sheaths causing localized pain and swelling.
* Fractures or undiagnosed injuries: Occult fractures or bone injuries can cause persistent pain and swelling.

3. Vascular and Infectious Conditions

* Cellulitis: Infection of the skin and soft tissues presenting with redness, swelling, warmth, and pain.
* Deep Vein Thrombosis (DVT): Causes limb swelling, pain, and warmth, sometimes confused with CRPS.
* Arterial insufficiency or ischemia: Can cause pain, color changes, and temperature abnormalities.
* Vasculitis: Inflammation of blood vessels leading to pain, swelling, and skin changes.
* Erythromelalgia: Episodic burning pain and redness of extremities due to vascular dysfunction.

4. Other Conditions

* Raynaud’s Disease: Episodic color changes and pain in extremities triggered by cold or stress.
* Compartment Syndrome: Increased pressure in muscle compartments causing pain and swelling.
* Charcot Foot: Neuropathic arthropathy causing joint destruction and deformity, often in diabetic patients.
* Lymphedema or venous obstruction: Causes swelling and skin changes.
* Self-harm or malingering: Factitious disorders or non-organic causes of pain.
* Malignancy: Tumors involving bone or soft tissue causing pain and swelling.

**QUESTION AND ANSWERS SET**

**Is CRPS considered a disability?**

In the United States, the Social Security Administration recognizes CRPS as a potential cause of disability depending on its severity and impact on your life. Consult government officials for more information on the Social Security Administration’s eligibility requirements.

**Is CRPS a mental illness?**

No, CRPS isn’t a mental health condition. It’s a neurological condition. CRPS can, however, cause or worsen anxiety, depression and stress. It can sometimes lead to post-traumatic stress disorder (PTSD).

What is Complex Regional Pain Syndrome (CRPS)?

CRPS is a chronic neurological condition causing severe, prolonged pain usually in an arm or leg, often after injury or surgery.

2. What causes CRPS?

CRPS often follows trauma, surgery, or nerve injury, but the exact cause involves abnormal inflammatory and nervous system responses.

3. What are the main symptoms of CRPS?

Symptoms include burning pain, swelling, skin color and temperature changes, sweating abnormalities, stiffness, and decreased mobility.

4. How is CRPS diagnosed?

Diagnosis is clinical, based on history and symptoms, supported by tests to rule out other conditions; no single definitive test exists.

5. What are the types of CRPS?

Type I occurs without confirmed nerve injury; Type II involves confirmed nerve damage.

6. Can CRPS be prevented?

Early treatment of injuries and careful management of pain may reduce CRPS risk; vitamin C supplementation after fractures has shown some preventive effect.

7. What treatments are available for CRPS?

Treatment includes physical and occupational therapy, medications (pain relievers, antidepressants, anticonvulsants), nerve blocks, and in severe cases, implant therapies.

8. How important is physical therapy?

Physical therapy is crucial to maintain limb function, improve blood flow, reduce pain, and prevent stiffness.

9. What medications help with CRPS pain?

NSAIDs, corticosteroids, anticonvulsants (e.g., gabapentin), antidepressants, and sometimes opioids or ketamine infusions are used.

10. Are nerve blocks effective?

Sympathetic nerve blocks can provide temporary pain relief and improve function in some patients.

11. What is graded motor imagery?

A therapy involving gradual, controlled exposure to painful movements to retrain the brain and reduce pain sensitivity.

12. Can CRPS symptoms improve over time?

With early and appropriate treatment, many patients improve, but some may experience chronic symptoms.

13. When is surgery or implant therapy considered?

For patients with refractory pain after all conservative treatments fail, options like spinal cord stimulators or intrathecal pumps may be used.

14. How does CRPS affect daily life?

CRPS can cause significant disability, impacting mobility, sleep, mood, and ability to perform daily tasks.

15. **What psychological support is helpful?**

Counseling, cognitive-behavioral therapy, and stress management help cope with chronic pain and associated depression or anxiety.

16. **How long does CRPS last?**

Duration varies widely; some recover within months, others have symptoms for years or lifelong.

17. **Can CRPS spread to other limbs?**

In some cases, symptoms may spread beyond the initial affected area.

18. **What are the risks of delayed diagnosis?**

Delayed treatment can lead to worsening pain, stiffness, muscle wasting, and poorer outcomes.

19. **Are there any lifestyle changes that help?**

Maintaining activity, avoiding immobilization, good nutrition, and smoking cessation support recovery.

20**. Where can I find specialists for CRPS?**

Pain clinics, neurologists, rehabilitation specialists, and multidisciplinary centers experienced in CRPS offer the best care.

**Genomic DATA**

1. Genetic Variants (SNPs) Associated with CRPS-1

* A study using exome sequencing identified four rare non-synonymous single nucleotide polymorphisms (SNPs) significantly more frequent in chronic CRPS-1 patients than in the general population:
* rs41289586 in ANO10
* rs28360457 in P2RX7
* rs1126930 in PRKAG1
* rs80308281 in SLC12A9
* These genes are expressed in macrophages, suggesting an immune or inflammatory component in CRPS pathogenesis.
* Males were more likely than females to carry these rare alleles, despite CRPS being more common in females, indicating possible sex-specific genetic influences

2. Gene Expression Profiling

* Genome-wide expression profiling in CRPS patients revealed differential expression of 80 genes compared to controls.
* Notably upregulated genes include:
* MMP9 (Matrix Metalloproteinase 9): Implicated in tissue remodeling and inflammation, showing a 4-fold increase in CRPS patients.
* HLA-A29.1, ANPEP, HDC, G-CSF3R, STAT3: Involved in immune response and inflammation.
* These findings support the role of immune and inflammatory pathways in CRPS development and pain progression

3. Human Leukocyte Antigen (HLA) Associations

* Certain HLA alleles, such as HLA-DR13, have been found at higher frequency in CRPS patients compared to controls, suggesting genetic susceptibility linked to immune system genes

4. Genetic Predisposition Estimates

* Research suggests that genetic susceptibility may account for about one-third of CRPS cases, highlighting a significant hereditary component alongside environmental triggers like trauma

**Complex Regional Pain Syndrome (CRPS): Doctor-Patient Conversation**

Patient:

Doctor, I’ve been having severe, burning pain in my arm since my injury a few months ago. The skin looks different, sometimes swollen and discolored. Could this be something serious?

Doctor:

Based on what you’re describing, it’s possible you have Complex Regional Pain Syndrome, or CRPS. It’s a neurological condition that causes intense, often burning pain along with changes in skin color, temperature, and swelling, usually in an arm or leg after an injury.

Patient:

Why does it happen? Is it permanent?

Doctor:

CRPS happens because your nerves become overly sensitive and send exaggerated pain signals, even after the injury has healed. The exact cause isn’t fully understood, but it involves abnormal nerve and immune system responses. The good news is that CRPS usually improves over time and can even go into remission, especially with early treatment.

Patient:

What kind of treatments are available? Will medications help?

Doctor:

There’s no single medication specifically approved for CRPS, but we use a combination of treatments to manage your symptoms. This can include pain-relieving drugs like anticonvulsants or antidepressants, physical therapy to keep your limb moving, and psychological support to help cope with the stress and anxiety that often come with chronic pain. In some cases, nerve blocks or other specialized procedures may be recommended.

Patient:

I’ve heard the pain can be unbearable. How do I manage day-to-day?

Doctor:

It can be very challenging. Along with medications, gentle exercises and therapies can help maintain function and reduce pain. Psychotherapy or talk therapy is also important because anxiety and depression can worsen pain. We will work as a team to support you physically and emotionally.

Patient:

Is there hope for recovery?

Doctor:

Absolutely. Many patients see significant improvement, especially when treatment starts early. While CRPS can be severe, with the right care and support, many people regain function and experience relief.

Patient:

What should I watch out for or avoid?

Doctor:

Avoid anything that might worsen your symptoms, such as cold exposure or unnecessary immobilization. Keep moving gently, follow your therapy plan, and communicate any changes in your symptoms. Early intervention is key.

REFERENCES

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**Amputation**

**Definition**

Amputation is surgery to remove all or part of a body appendage, usually a limb or extremity (an arm, leg, hand or foot). You might need surgery to amputate a body part if it’s too sick or injured to save and it endangers other parts. You might also need surgery if you lose a body part in a traumatic accident. When limb loss is unavoidable, amputation surgeons ensure that it’s clean and safe for the rest of you.

Common types include:

* Arm amputation.
* Hand amputation.
* Finger amputation.
* Leg amputation.
* Foot amputation.
* Toe amputation.

Less commonly, amputation can also mean removing a part of your face, like an ear, nose or tongue. A mastectomy is amputation of a breast. You can also have your testicles or penis removed (amputated).

**Why is amputation done?**

Devastating injuries and diseases are the usual causes of surgical amputation. In many cases, the body part has lost its ability to function as it should. Nerves no longer return sensation from the part or allow you to move it at will. Or blood vessels no longer nourish the tissues. Loss of sensation can cause injuries that you don’t notice, leading to infections. Loss of blood flow will eventually cause the tissues to die.

The surgery is usually a preventive measure. It helps preserve the health of the rest of your body. Tissue death, infections and cancer can easily spread from the sick part to the rest. A part that’s wounded beyond repair becomes a hazard if you can’t control it or protect it well enough. Removing the part also gives you the option to replace it with a more functional and aesthetic-looking prosthetic part.

**common causes of amputation**

Common conditions that may lead to surgical amputation include:

* Complications of peripheral artery disease (PAD), which causes a loss of blood flow.
* Complications of diabetes, which causes nerve damage and loss of sensation.
* Nonhealing and/or infected foot and toe ulcers (often related to diabetes or PAD).
* Gangrene, tissue death from loss of blood flow, which can spread.
* Stage three frostbite that leads to irreversible tissue death.
* Life-threatening infections in your bones, joints or other tissues.
* Cancerous tumors that surgeons are unable to safely remove from your body part.
* Severe injuries, including severing, crushing and burn injuries.

**Procedure Details**

**What happens before amputation surgery?**

If it’s not an emergency, you’ll go through a few steps of preparation before surgery:

**Assessment**

Your healthcare team will carefully assess the extent of your disease or injury. In some cases, they might be able to attempt to save your limb using advanced surgical techniques. This is called limb salvage surgery. If this is an option for you, your provider will discuss the risks and benefits with you. If not, they’ll use your assessment to plan your surgery.

**Counseling**

Amputation is more than the surgery itself. It’s a psychological and physical journey that will have lifelong repercussions. Likewise, your healthcare team will include more than surgeons. You may meet with a variety of therapists to prepare you for surgery and plan for your recovery. If you’re interested in a prosthetic limb, you’ll meet with a prosthetist to discuss your options.

**What happens during the procedure?**

During surgery, your surgeon will remove all diseased and damaged tissues. They’ll work to preserve as much healthy tissue as possible. They may need to repair individual nerves or blood vessels through microsurgery. They may also need to file or smooth the end of your bone, and they’ll often stitch your muscle to your bone to reinforce it. They’ll leave enough soft tissue at the end of the stump to close it.

You may have discussed plans for a certain type of prosthesis with your surgeon. In some cases, they might perform extra steps in your surgery to prepare you for that prosthesis. Examples include:

**Target muscle reinnervation**

This option for upper limb amputees can make it easier to control a myoelectric arm or hand. After amputating, your surgeon redirects the severed nerves that controlled your amputated limb to a new “target muscle” somewhere else on your body — often in your shoulder or chest. This allows you to operate your prosthesis more intuitively by activating this other muscle.

**Osseointegration**

Osseointegration means integrating your prosthesis with your bone (*osseo-*). Your surgeon implants a metal anchor into your bone that extends from the end of your limb. Your prosthesis can attach directly to it. This makes the prosthesis easier to attach and remove. It also helps to prevent some of the skin complications that a traditional prosthesis socket can sometimes cause.

**Rotation plasty**

Rotation plasty is a rare procedure that involves amputating part or all of your upper leg and reattaching your healthy lower leg as your upper leg. Your surgeon rotates your lower leg so that your ankle bends the right way to replace your knee. This allows you to use a below-the-knee prosthesis with your shortened leg, instead of needing an above-the-knee prosthesis.

**What happens after surgery?**

You’ll spend a few days to weeks recovering in the hospital after surgery. You’ll have oxygen through a mask, fluids through an IV and pain control as needed. You may have a urinary catheter and bedpan, so you don’t have to get up to go to the bathroom. Your healthcare team will carefully monitor your wound healing. Within a few days, a physical therapist will begin guiding you in small daily exercises to prevent stiffness.

You’ll continue your rehabilitation either at home or in a rehabilitation facility for people with limb loss. During this time, you’ll work with a variety of specialists to learn how to live with your changed body.

Your rehabilitation will likely include:

* **Physical therapy**. You’ll need to move regularly to prevent your tissues from stiffening. You’ll also need to learn to use your body in new ways, relying on different muscles than you used to.
* **Occupational therapy**. An occupational therapist helps you learn to adapt your practical life to your new body. They’ll teach you new ways to accomplish routine tasks at home and at work.
* **Psychotherapy**. Amputation is a profound psychological event. It will take time to adjust and to process through the full range of feelings it can evoke. It’s a good idea to have a mental health professional to talk to during this time. Your mental health is important to your overall recovery.
* **Prosthesis fitting and training**. If you plan to use a prosthetic limb, you’ll begin the fitting process after you’ve recovered. You’ll then spend several months learning how to use it.

**Risks / Benefits**

**What are the advantages of amputation?**

Surgical amputation is almost always a life-saving or life-preserving procedure. Occasionally, it’s a choice between removing a damaged and dysfunctional limb or salvaging it and living with it as-is. This might mean living with chronic pain, a constant safety hazard or a limb that you can’t use. Alternatively, removing and replacing it with a more functional prosthesis might improve your quality of life.

**What are the possible risks of amputation surgery?**

Any major surgery carries some risk of complications. These can occur during or after surgery. Those who need amputation surgery may be more at risk of complications than others. This is because they’re often already in poor health. Pre-existing conditions like cardiovascular disease, trauma, cancer and infections can contribute to the risk of sudden respiratory failure, [heart failure](https://my.clevelandclinic.org/health/diseases/21686-acute-heart-failure) or kidney failure.

Pre-existing conditions can also make it difficult for your body to recover well. With reduced resources for healing, wounds may be slow to close or may reopen, and you may have excessive swelling or bleeding. Your stressed immune system may be too weak to fight infections like pneumonia, which can happen with extended bed rest. Bed rest and cardiovascular disease also make blood clots more likely.

**Recovery and Outlook**

Recovery times can vary. In general, it takes two to three months for your surgical wounds to heal and your swelling to go down. Once your residual limb has settled into its final size and shape, you can begin fitting for a prosthesis. You’ll begin physical therapy as soon as possible after surgery. You’ll likely continue with it for at least six months. Training to use a prosthetic limb can take even longer.

**How painful is amputation?**

If you experience it consciously, limb amputation is one of the most painful assaults your body can endure. Fortunately, you won’t feel it during surgery, and you’ll have strong pain control after surgery. While you’ll probably experience some postoperative pain, your healthcare team will do their best to help you manage it. However, limb loss can lead to other, longer-lasting pain syndromes, including:

* **Residual limb pain**. Pain in your residual limb or “stump” can have a variety of causes. Nerve damage from surgery can cause recurring nerve pain. Using a prosthesis can irritate the skin on your stump in various ways. You should address these issues with your prosthetist.
* **Phantom limb pain**. Many amputees experience periodic sensations, such as pain, that seem to come from their amputated limb. This happens because the severed nerves continue to transmit signals to your brain. Address phantom limb pain with your provider.
* **Psychological pain**.Understandably, limb loss can cause significant psychological distress, especially when it’s unexpected. It can feel overwhelming and can raise your risk of clinical depression and PTSD. You’ll need professional support to process the psychological pain.

**What does it feel like to lose a limb?**

To lose a limb is to lose an essential part of yourself that you’ve taken for granted all your life. It disrupts the way your body works to accomplish the most basic tasks and challenges your mobility and independence. It also changes the way it feels to live in your body, how it looks and your own self-image. This can be devastating to your confidence in yourself and in your ability to live a satisfying life.

It’s natural to grieve for this loss, and to struggle with shock, anger, fear or despair. You may feel daunted by the challenges ahead and the long, hard rehabilitation process. Your healthcare providers and fellow amputees know this territory well. They won’t expect you to resolve these feelings right away. Instead, your feelings will be your companions as you begin to move forward, one step at a time.

**When To Call the Doctor**

During your recovery, reach out to your healthcare team whenever you have concerns or complications. Your team is there to counsel you and help troubleshoot issues as they arise. Contact your:

* **Surgeon** if your wound doesn’t seem to be healing or seems to be getting worse, or if you develop new symptoms, like a fever.
* **Physical therapist** if you have stiffness or challenges with movement, or if you have musculoskeletal pain from using one side of your body more than the other.
* **Mental health professional** if you need mental and emotional support in the form of therapy or medications.
* **Prosthetist** if your new prosthetic limb irritates your stump or doesn’t fit correctly.

The following are medical terms for certain amputation types.

**Upper extremity**

* **Transcarpal.** An amputation of a finger or a portion of the hand.
* **Wrist disarticulation.** An amputation through the wrist.
* **Transradial.** An amputation below the elbow.
* **Elbow disarticulation.** Amputation through the elbow or at elbow level.
* **Transhumeral.** Amputation above the elbow.
* **Shoulder disarticulation.** Amputation at the shoulder.

**Lower extremity**

* **Toe amputation.** Removal of one or more toes.
* **Midfoot amputation.** Removal of the toes and half of the foot, with the heel and ankle joint remaining. Also called a transmetatarsal amputation (TMA).
* **Transtibial amputation.** Also known as a below-knee amputation.
* **Knee disarticulation.** Also known as a through-knee amputation.
* **Transfemoral amputation.** An amputation above the knee.
* **Hip disarticulation.** An amputation in the area of the hip joint.
* **Hemipelvectomy.** An amputation of the entire leg and portion of the pelvis to the sacrum.

**Why is amputation sometimes necessary?**

The largest percentage of amputations are related to chronic disease that impairs blood flow and affects bone tissue. However, there are additional amputation causes.

**Amputations related to blood flow conditions**

Chronic disease and infection can lead to interrupted blood flow that jeopardizes a limb. When this is the case, a doctor may recommend amputation to preserve as much of the limb as possible.

Chronic conditions are a leading cause of lower extremity amputations. The American Academy of Physical Medicine and Rehabilitation (AAPMR) estimates that 93.4 percent of all lower extremity amputations are related to vascular disease. This includes conditions such as diabetes and peripheral artery disease.

The most common lower extremity amputations related to blood flow conditions are:

* toe (33.2 percent)
* transtibial (28.2 percent)
* transfemoral (26.1 percent)
* foot amputations (10.6 percent)

Amputations due to chronic disease are associated with 5-year mortality rates that are higher than some cancer types. This is because the need for amputation in many instances can indicate a person’s medical condition or overall health is worsening. Enhancing a person’s healthcare and overall health are excellent goals after amputation.

**Cancer-related amputations**

Cancer-related amputation accounts for 0.8 percent of total amputations. This is often due to bone cancer or cancer that has metastasized to the bone. However, cancer is the most common amputation cause for those between the ages of 10 and 20.

**Traumatic amputations**

Injuries and trauma can lead to amputations. An estimated 5.8 percent of lower limb amputations are related to trauma. This can include injuries from car accidents and workplace-related accidents.

The Bureau of Labor Statistics estimates that 6,200 work-related amputations happened in the United States in 2018. More than 58 percent of these involved using some type of machinery, particularly metal and woodworking machinery.

**Amputation statistics**

Although you’ve already read some statistics related to amputation, here are a few more to consider from the Amputee Coalition, a nonprofit organization for amputees. They illustrate that if you or a loved one requires an amputation, you are not alone.

In the United States:

* An estimated 2.1 million people are living with limb loss.
* More than 507 people lose a limb each day.
* An estimated 3.6 million people are projected to be living with limb loss by 2050.
* The most common age range for amputations is 45 to 64 (46 percent of Americans). The second most common range is 65 to 84 (36 percent of Americans).
* Men experience limb loss in significantly higher numbers than women — 69 percent of amputees are men, while 31 percent are women.
* Upper limb amputations are less common than lower limb ones (35 percent upper limbs versus 65 percent lower limbs).

Those with diabetes are 8 to 24 times more likely to undergo a lower limb amputation than those who do not have diabetes, according to the AAPMR.

There are also significant racial disparities related to amputations. The Amputee Coalition says African Americans are four times as likely as white Americans to have an amputation. Experts are not sure why African Americans might have a higher risk, but this is likely due to social conditions rather than biological factors.

**How amputations affect the body**

Because amputation removes a portion of the body that was naturally present, it’s easy to wonder how this affects your overall health. There are undeniably effects that can occur due to amputation. It’s important to work with your doctor and physical therapist to minimize these effects whenever possible.

Examples include:

* changes in your center of gravity and balance
* increased risk of arthritis in your remaining limb (if applicable) because it often has to increase its workload
* back pain due to changes in the body’s positioning for lower limb amputees

Often, the effects of an amputation are related to where it is and your overall health.

**Amputation complications**

Amputations are surgical procedures that have risks involved. Also, if the amputation was the result of trauma or infection, you may have other medical conditions to recover from as well. This can complicate recovery after amputation.

According to the AAPMR, some of the most common amputation complications include:

* infection
* pinched nerve
* phantom limb sensation and pain (feeling as if the limb is still there, even if it isn’t)
* residual limb pain

Another complication is joint contracture. This is when the remaining muscles, tendons, and other tissues tighten so much that you can’t move the remaining joint.

**Amputation healing time and recovery tips**

Amputation healing times can vary by the event that caused the amputation and the amputation site.

For example, amputations due to chronic conditions such as diabetes or peripheral artery disease may take longer to heal. Blood flow and wound healing are already impaired by these conditions, which may extend recovery times.

It likely takes less time to recover from a toe amputation than a leg amputation. A surgeon should help you determine your expected recovery period.

Some tips to help the recovery process:

* Follow wound care instructions carefully. Most surgical incision sites should be kept clean and dry. Notify your doctor if you experience significant drainage or infection signs.
* Take medications such as antibiotics as prescribed. This can help prevent surgical site infections.
* Participate in physical therapy as you are able to keep muscles strong and tendons and other tissues mobile.

It can take time to regain function after an amputation. Some individuals undergoing leg amputations reported it took as many as 6 months to regain their functional independence.

**Where do amputated limbs go?**

If you are wondering where amputated limbs go, you aren’t alone. Especially if you’re about to undergo an amputation, it’s fairly common to ask questions about how and where these limbs are disposed of.

Four potential destinations for your limb after the procedure. The limb could be:

* sent to a biohazard crematoria where it is destroyed
* donated to a medical college for use in dissection
* sent to a pathologist for testing, such as for cancer cells or infection
* returned to you if you have a proven religious need to retain the limb

If you are unsure where your limb is going, you can ask your surgeon.

**REFERENCES**

[Amputation: What It Is, Types, Risks & Recovery](https://my.clevelandclinic.org/health/procedures/21599-amputation)

**Carpal tunnel syndrome**

**Definition and description**

Carpal tunnel syndrome is a health condition that causes symptoms like pain, numbness, tingling and weakness in your hand and wrist.

The carpal tunnel is a space in your wrist bones. It’s like a tunnel road through a mountainside, but instead of making room in the rock for cars, it’s a passageway in your bones that lets tendons, ligaments and nerves pass through it to reach your hand.

Carpal tunnel syndrome happens when something irritates or puts extra pressure on the median nerve that runs through your carpal tunnel. The median nerve helps you move your forearm and gives feeling to most of your fingers and hands. If it’s damaged or pressed against the walls of your carpal tunnel, it can send extra or incorrect feelings to your hand and wrist.

Visit a healthcare provider if you’re experiencing pain, numbness or tingling in your hands and wrists. Carpal tunnel syndrome usually responds well to treatment, but it can permanently damage your median nerve if it’s not treated soon enough.

Carpal tunnel syndrome is extremely common. Experts estimate that around 3 out of every 1,000 people in the U.S. experience carpal tunnel syndrome each year.

**Signs and symptoms of carpal tunnel syndrome**

The most common carpal tunnel symptoms include:

* Numbness in your wrist, hand or fingers (especially your fingertips)
* Pain in your wrist, hand or fingers
* Tingling
* Trouble using your hands to hold or control objects (like holding your phone, gripping the steering wheel, holding a pen or typing on a keyboard, for example)

Carpal tunnel syndrome usually develops slowly. You might only experience minor symptoms at first that may get worse over time.

People usually first notice symptoms at night — pain or tingling may wake you up. Over time, the symptoms may start affecting you during the day, especially if you do the same kind of motion a lot at work like typing, writing or using tools.

**What does carpal tunnel syndrome feel like?**

Carpal tunnel syndrome can make your wrists, hands and fingers feel uncomfortable. It may feel like pinpricks or like your fingers or hands “fell asleep.” You may also feel numbness that makes you want to shake your hands like you’re flinging water off them.

Carpal tunnel syndrome pain usually feels like it’s coming from inside your hand or wrist — not a skin-level pain like a cut. The pain may feel like a sharp, burning stab or a constant ache.

Some people with carpal tunnel syndrome feel like their hands and grip are weaker than normal. It might feel like you can’t get a solid hold on a mug or pen, even if you’re concentrating on it.

Your hands and fingers may feel clumsy or less able to perform precise motions, like buttoning a shirt or aiming a key into a lock.

**What causes carpal tunnel syndrome?**

Extra pressure on your median nerve causes carpal tunnel syndrome. The carpal tunnel has space for all the parts that pass through it, but if one part of your wrist is swollen or damaged, it can press on other tissue around it, including your median nerve.

Anything that causes swelling or irritation in your wrist can cause carpal tunnel syndrome:

* Repetitive strain injuries
* Arthritis
* Sprains
* Wrist fractures (broken wrist bones)
* Ganglion cysts

**Risk factors**

Anyone can develop carpal tunnel syndrome, but some people are more likely to, including:

* People who do repetitive motions with their hands and wrists for work (swinging a hammer, for example)
* People who use power tools that vibrate (like drills or jackhammers)
* Pregnant women
* Women
* Adults over the age of 40
* People whose biological relatives have carpal tunnel syndrome (it can be hereditary, or passed through generations in families)

Having certain health conditions can increase your carpal tunnel syndrome risk, including:

* Rheumatoid arthritis
* Gout
* Hypothyroidism
* Diabetes
* Obesity
* Amyloidosis

**Complications**

If a healthcare provider doesn’t diagnose and treat carpal tunnel syndrome as soon as possible, the irritation in your wrist can cause permanent damage. Specifically, the extra pressure can damage your median nerve, which may make it hard or impossible to feel, move or use your hand.

Visit a healthcare provider as soon as you notice carpal tunnel symptoms or any changes in how you can feel or use your hand and wrist.

**Diagnosis and Tests**

A healthcare provider will diagnose carpal tunnel syndrome with a physical exam and some tests. They’ll examine your wrist, hand and fingers and ask about your symptoms. Tell your provider when you first noticed symptoms and if any activities or time of day make them better or worse.

**Carpal tunnel tests**

Your provider will use a combination of physical and imaging tests to diagnose carpal tunnel syndrome, including:

* Tinel’s sign
* Phalen’s test
* Wrist X-rays
* Electromyography (EMG)
* Ultrasound
* Magnetic resonance imaging (MRI)

**Management and Treatment**

Providers treat carpal tunnel syndrome with nonsurgical (conservative) treatments first. You may need carpal tunnel surgery if conservative treatments don’t relieve your symptoms.

**Non Surgical carpal tunnel treatments**

The most common carpal tunnel treatments include modifying your daily routine, supporting and strengthening your wrist and taking medication:

* **Wearing a splint (especially at night):** A splint will hold your wrist in a neutral position to take pressure off your median nerve.
* **Physical therapy:** A physical therapist can help you strengthen muscles around your wrist and increase your flexibility.
* **Changing your posture or working environment:** An occupational therapist can suggest ways to modify how you do everyday tasks to move safely and more comfortably. You might need to change how you sit or stand, how you position your keyboard or make other posture tweaks.
* **Over-the-counter medications:** Your provider might suggest over-the-counter NSAIDs or acetaminophen to reduce inflammation and relieve pain. Don’t take these medicines for more than 10 days in a row without talking to your provider.
* **Corticosteroids:** Corticosteroids are prescription anti-inflammatory medications. Your provider may give you cortisone shots in your affected carpal tunnel.

**Carpal tunnel syndrome surgery**

If conservative treatments don’t work, your provider will suggest carpal tunnel surgery. Your surgeon will perform a carpal tunnel release to create more space inside your wrist. They’ll make an incision (cut) in the ligament that connects your wrist to your palm (your transverse carpal ligament). This reduces tension on your carpal tunnel and gives your tendons and nerves more space.

Carpal tunnel release surgery is usually an outpatient procedure, which means you can go home the same day. Your surgeon will tell you what the expect and will give you recovery instructions.

**How soon after treatment will I feel better?**

You should start feeling better as soon as you start carpal tunnel treatment. It might take a few weeks (or longer) for nonsurgical treatments to reduce the pressure on your median nerve, but your symptoms should start improving gradually.

Carpal tunnel surgery should improve your symptoms as soon as your wrist heals. It usually takes a month or two to recover.

drug treatments for Carpal Tunnel Syndrome (CTS) along with their common side effects based on current medical references:

**Carpal Tunnel Syndrome Treatment Drugs and Their Side Effects**

1. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

* Examples: Ibuprofen (Advil, Motrin), Naproxen (Aleve)
* Purpose: Reduce inflammation and relieve mild pain associated with CTS.
* Effectiveness: May provide short-term pain relief but do not improve nerve compression or long-term symptoms significantly.
* Common Side Effects:
* Stomach upset, nausea
* Gastrointestinal ulcers or bleeding with prolonged use
* Kidney impairment (rare)
* Increased risk of cardiovascular events with long-term use.

2. Corticosteroids

* Oral Corticosteroids:
* Examples: Prednisolone
* Purpose: Reduce inflammation and swelling to relieve nerve pressure.
* Effectiveness: More effective than NSAIDs and diuretics; symptoms often return after stopping medication.
* Side Effects:
* Increased blood sugar
* Insomnia
* Weight gain and fluid retention
* Mood changes
* Immunosuppression with prolonged use.
* Local Corticosteroid Injections:
* Examples: Methylprednisolone acetate, Triamcinolone
* Purpose: Directly reduce inflammation in the carpal tunnel to relieve symptoms.
* Effectiveness: About 70% initial response rate; relief may last months but symptoms often recur within 1-2 years.
* Side Effects:
* Injection site pain or discomfort
* Tendon or nerve injury if overused
* Rare risk of infection or local tissue atrophy.

3. Diuretics

* Examples: Bendrofluazide, Trichlormethiazide
* Purpose: Reduce fluid retention in the carpal tunnel to decrease pressure.
* Effectiveness: Limited evidence; some improvement in nerve conduction but inconsistent symptom relief.
* Side Effects:
* Electrolyte imbalances (low potassium or sodium)
* Increased urination
* Dizziness or dehydration.

4. Vitamin B6 (Pyridoxine)

* Purpose: Historically used to support nerve health.
* Effectiveness: Studies show no significant benefit for CTS symptoms; risk of toxicity with high doses.
* Side Effects:
* Nerve toxicity at high doses causing numbness or tingling.

5. Neuropathic Pain Medications (Off-label use)

* Examples: Gabapentin, Pregabalin
* Purpose: Manage neuropathic pain symptoms in CTS.
* Effectiveness: Used off-label; evidence is limited but may help in some cases.
* Side Effects:
* Dizziness
* Fatigue
* Weight gain
* Swelling.

**CTS Stages**

1. Mild Stage

* Symptoms: Intermittent tingling, numbness, or mild discomfort in the thumb, index, middle, and radial half of the ring finger. Symptoms often occur during activities like typing or at night.
* Signs: No muscle weakness or atrophy; symptoms may improve with shaking the hand.
* Function: Minimal interference with daily activities.
* Diagnostic Findings: Normal or mildly slowed nerve conduction studies; median nerve swelling may be minimal on ultrasound.
* Management: Conservative treatments such as wrist splinting, activity modification, and NSAIDs.

2. Moderate Stage

* Symptoms: Persistent numbness, tingling, and pain throughout the day and night. Burning or shooting pain may be present.
* Signs: Mild weakness of thumb muscles (thenar eminence), possible early muscle wasting.
* Function: Difficulty with fine motor tasks, reduced grip strength, and occasional dropping of objects.
* Diagnostic Findings: Abnormal nerve conduction studies showing slowed median nerve conduction velocity; increased median nerve cross-sectional area on ultrasound.
* Management: Continued conservative care; corticosteroid injections may be considered; surgery may be discussed if symptoms persist.

3. Severe Stage

* Symptoms: Constant numbness and pain, often severe and disabling.
* Signs: Marked the nerve muscle atrophy and weakness, clumsiness, and loss of pinch and grip strength.
* Function: Significant impairment in hand function and daily activities.
* Diagnostic Findings: Severely abnormal or absent nerve conduction; marked median nerve enlargement and structural changes on imaging.
* Management: Surgical decompression (carpal tunnel release) is typically recommended.

Additional Notes on Staging

* Clinical and Sonographic Scoring:   
  A combined scoring system including symptom severity, functional deficits, provocative tests, and ultrasound measurements of median nerve cross-sectional area (CSA) can classify CTS severity more precisely. For example:
* CSA <12.1 mm²: Mild or negative
* CSA 12.1–15.36 mm²: Moderate
* CSA >15.36 mm²: Severe
* Progression:   
  Symptoms often start mild and intermittent, progressing to persistent and disabling without treatment.

**Common Procedures for Carpal Tunnel Syndrome (CTS)**

1. Conservative Treatments (Initial Management)

* Wrist Splinting: Wearing a splint, especially at night, to keep the wrist in a neutral position and reduce pressure on the median nerve.
* Medications: NSAIDs or corticosteroid injections to reduce inflammation and pain.
* Activity Modification and Physical Therapy: Avoiding aggravating activities and exercises to improve wrist mobility.

*These treatments are usually tried first, especially in mild to moderate CTS.*

2. Carpal Tunnel Release Surgery

When conservative treatments fail or symptoms are severe, surgery is recommended to relieve pressure on the median nerve by cutting the transverse carpal ligament.

Types of Surgery:

* Open Carpal Tunnel Release (OCTR):
* Surgeon makes an incision in the palm to directly visualize and cut the ligament.
* Traditional and widely used technique.
* Endoscopic Carpal Tunnel Release (ECTR):
* Surgeon uses a small camera inserted through a small incision to guide cutting of the ligament.
* May result in less pain and faster recovery initially.
* Ultrasound-Guided Carpal Tunnel Release:
* Uses ultrasound imaging to guide the surgeon in cutting the ligament through a small incision.

Surgery Procedure Details

* Usually performed under local anesthesia with sedation or general anesthesia.
* Surgery typically takes 10 to 20 minutes.
* Usually out patient; patients go home the same day.
* The surgeon closes the incision(s) with sutures or stitches.

Recovery Timeline

| Timeframe | What to Expect and Recommended Care |
| --- | --- |
| First 1-2 Days | Hand bandaged; keep elevated to reduce swelling; finger movement encouraged to prevent stiffness; pain and swelling common. |
| First 1-2 Weeks | Stitches removed around 10-14 days; continue finger exercises; avoid heavy lifting or gripping; swelling and discomfort gradually decrease. |
| 2-6 Weeks | Gradual return to normal hand and wrist use; physical therapy may be recommended; swelling and pain continue to improve. |
| 6-12 Weeks | Most patients regain significant strength and mobility; swelling usually resolves; return to most daily activities, including work, depending on job demands. |
| 3-6 Months | Full recovery expected; most symptoms resolved; return to full activities including sports or heavy manual labor. |

**Diagnostic Considerations**

These include the following:

* Focal CNS pathology (multiple sclerosis, tumor, stroke)
* Proximal median nerve mononeuropathy (eg, pronator teres syndrome)
* Polyneuropathies
* Raynaud syndrome
* Degenerative arthritis in the hand and wrist

**Differential Diagnoses**

* Acute Compartment Syndrome
* Cervical Disc Disease
* Cervical Myofascial Pain
* Cervical Spondylosis
* Diabetic Neuropathy
* Ischemic Monomelic Neuropathy
* Leprosy
* Lyme Disease
* Mononeuritis Multiplex
* Multiple Sclerosis
* Neoplastic Brachial Plexopathy
* Overuse Injury
* Physical Medicine and Rehabilitation for Epicondylitis
* Physical Medicine and Rehabilitation for Lateral Epicondylitis
* Physical Medicine and Rehabilitation for Myofascial Pain
* Posttraumatic Syringomyelia
* Radiation-Induced Brachial Plexopathy
* Surgery for Reflex Sympathetic Dystrophy (Complex Regional Pain Syndrome Type 1)
* Thoracic Outlet Syndrome
* Traumatic Brachial Plexopathy

**Epidemiology**

Frequency

*United States*

The incidence of carpal tunnel syndrome is 1-3 cases per 1000 subjects per year; prevalence is approximately 50 cases per 1000 subjects in the general population. Incidence may rise as high as 150 cases per 1000 subjects per year, with prevalence rates greater than 500 cases per 1000 subjects in certain high-risk groups.

*International*

A paucity of population-based studies of carpal tunnel syndrome (CTS) exists; however, the incidence and prevalence in developed countries seems similar to the United States (eg, incidence in the Netherlands is approximately 2.5 cases per 1000 subjects per year; prevalence in the United Kingdom is 70-160 cases per 1000 subjects).CTS is almost unheard of in some developing countries (eg, among nonwhite South Africans).

Mortality/Morbidity

Carpal tunnel syndrome is not fatal, but it can lead to complete, irreversible median nerve damage, with consequent severe loss of hand function, if left untreated.

Race

Whites are probably at highest risk of developing carpal tunnel syndrome (CTS). The syndrome appears to be very rare in some racial groups (e.g., non white South Africans).In North America, white US Navy personnel have CTS at a rate 2-3 times that of black personnel.

Sex

The female-to-male ratio for carpal tunnel syndrome is 3-10:1.

**Outlook / Prognosis**

You should expect to tweak some of your daily activities and try a few nonsurgical treatments to support your wrists and reduce inflammation inside your carpal tunnel. Your healthcare provider will suggest treatments that relieve carpal tunnel syndrome symptoms and prevent median nerve damage.

It might take a few tries to find treatments that work for you, but most people are able to find carpal tunnel relief. Your provider will suggest surgery if conservative treatments aren’t working or if you have severe carpal tunnel syndrome.

**Prevention**

It can be hard to prevent carpal tunnel syndrome, especially if a health condition or activity you can’t avoid causes it. You might be able to reduce your risk by protecting your wrists. Protective steps include:

* Stretch your wrists and hands before and after intense physical activitiesWear proper protective equipment for all work or activities.
* Take frequent rest breaks when working with your hands.
* Use proper technique and maintain good posture when working with tools or typing on a keyboard.

**Living With**

It’s possible for carpal tunnel syndrome to get better on its own — especially if you rest or avoid repetitive motions with your wrists for a while. But it’s much more likely that carpal tunnel syndrome won’t heal unless a healthcare provider diagnoses and treats it.

It’s not worth risking permanent damage to your median nerve. See a healthcare provider as soon as you notice any tingling, pain or numbness in your wrists, hands or fingers.

**QUESTION AND ANSWERS SET**

Do I have carpal tunnel syndrome or another wrist issue?

* CTS typically causes symptoms like numbness, tingling, burning, or pain in the thumb, index, middle, and part of the ring finger, often worsening at night and sometimes waking you up.
* You may feel weakness or clumsiness in your hand, dropping objects, or difficulty with fine movements.
* Symptoms usually develop gradually and may be triggered or worsened by repetitive hand/wrist motions (e.g., typing, tool use).
* Other wrist issues (arthritis, tendonitis, nerve compression elsewhere) can mimic CTS but often involve different symptom patterns or areas.
* Diagnosis is made by a healthcare provider through history, physical exam (e.g., Tinel’s and Phalen’s tests), and sometimes nerve conduction studies or ultrasound.
* If your symptoms match the typical CTS pattern (median nerve distribution, worse at night), CTS is likely; otherwise, further evaluation is needed

2. What’s causing the carpal tunnel syndrome?

* CTS is caused by compression of the median nerve as it passes through the carpal tunnel, a narrow passage in the wrist formed by bones and ligaments.
* Causes of compression include:
* Repetitive wrist movements or prolonged flexion/extension
* Wrist swelling or inflammation (e.g., from injury, arthritis, pregnancy)
* Anatomical variations or wrist fractures
* Health conditions like diabetes, hypothyroidism, or obesity
* Fluid retention or systemic diseases
* This compression leads to nerve irritation, causing the characteristic symptoms

3. Which treatments will I need?

* Early/mild CTS:
* Wrist splinting, especially at night, to keep the wrist neutral and reduce pressure
* Activity modification and ergonomic adjustments
* NSAIDs or corticosteroid injections to reduce inflammation and pain
* Physical therapy and nerve gliding exercises may help
* Moderate to severe CTS or persistent symptoms:
* Surgical decompression (carpal tunnel release) is often recommended if conservative treatments fail or if there is muscle weakness or atrophy

4. Will I need surgery?

* Surgery is usually considered if:
* Symptoms persist or worsen despite conservative treatment over weeks to months
* You have significant muscle weakness, atrophy, or nerve conduction study showing severe compression
* Surgery involves cutting the transverse carpal ligament to relieve pressure on the median nerve and is generally very effective.
* Many patients improve with nonsurgical care, but surgery provides definitive relief for moderate to severe cases

5. Which kind of splint should I buy, and how often should I wear it?

* Type of splint:
* A neutral wrist splint or brace that holds the wrist straight (not bent) is recommended.
* It should be comfortable and allow finger movement.
* When to wear:
* Primarily at night, since symptoms often worsen during sleep due to wrist flexion.
* Can also be worn during activities that provoke symptoms (typing, tool use).
* Wearing it consistently during symptom flare-ups helps reduce nerve compression and relieve symptoms

**What is the best way to fix carpal tunnel syndrome?**

There’s no one answer that applies to everyone. Which treatments will work best for you depends on what’s causing irritation in your carpal tunnel, as well as the carpal tunnel syndrome’s severity.

Most people can manage carpal tunnel syndrome with conservative treatments. But surgery is sometimes the best option. There’s no one right or wrong answer when it comes to your health. A healthcare provider will help you understand which treatments are right for you and why.

**How do I know if I’m getting carpal tunnel syndrome?**

Everyone experiences carpal tunnel syndrome differently. You might first notice symptoms at night, like wrist pain or tingling that are intense enough to wake you up. You may also notice that your wrists start showing signs of carpal tunnel the longer you use them, like at the end of a long day of working with tools.

Only a healthcare provider can confirm that you have carpal tunnel syndrome or another wrist issue. Even if you don’t have carpal tunnel syndrome, they’ll help you understand what’s causing the symptoms and how you can treat them.

REFERENCES

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### **Repetitive strain injury**

**Definition**

A repetitive strain injury is damage to your muscles, tendons or nerves caused by repetitive motions and constant use. They’re also sometimes called repetitive stress injuries.

Repetitive strain injuries are very common and usually affect your:

* Fingers and thumbs.
* Wrists.
* Elbows.
* Arms.
* Shoulders.
* Knees.

As their name suggests, repetitive strain injuries are caused by doing the same motion or activity repeatedly until it starts to hurt your body. Any motion or movement — from typing on a computer at work to practicing an instrument — can cause a repetitive strain injury if you do it too often.

Most repetitive stress injuries can be treated at home.

### Anyone can get a repetitive strain injury. Some of the most common people affected include:

* Workers with physically demanding jobs.
* Athletes.
* Musicians.
* People who sit at a desk or use a computer often.

Repetitive strain injuries are very common. They lead to many conditions, including:

* Tendinitis.
* Carpal tunnel syndrome.
* Tennis elbow.
* Trigger finger and trigger thumb.
* Osgood-Schlatter disease.
* Back strains and sprains.
* Shin splints.

### **How does a repetitive strain injury affect my body?**

The most obvious way a repetitive strain injury will affect you is the pain, discomfort and other symptoms you feel.

Because these injuries build up over time, that slow repeated damaged can also lead to other conditions, including:

* Stress fractures.
* Ganglion cysts.
* Nerve compression syndromes.
* Herniated disks.
* Bursitis.
* Dupuytren’s contracture.

## **Symptoms and Causes**

Symptoms of a repetitive strain injury include:

* Pain.
* Swelling.
* Tingling.
* Numbness.
* Stiffness.
* Weakness.
* Sensitivity to cold or heat.

### **What causes repetitive strain injuries?**

Any motion or activity that you frequently repeat can cause a repeated strain injury. They happen after your body experiences the same kind of stress and strain over time. Common causes include:

* Working out too hard without warming up and cooling down.
* Sports or other activities that require you to use the same motion repeatedly.
* Poor posture when sitting or standing.
* Working with a tool that vibrates.
* Working in the cold.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a repetitive strain injury with a physical exam. They’ll ask you when you noticed your symptoms and if any activity in your daily routine makes them worse.

Depending on what’s causing your symptoms — and where in your body you’re experiencing pain — your provider might need a few imaging tests to diagnose a condition caused by repetitive strain, including:

* X-rays.
* Magnetic resonance imaging (MRI).
* A CT (computed tomography) scan.
* An ultrasound.

## **Management and Treatment**

How repetitive strain injuries are treated depends on what’s causing them, and how severe your symptoms are. The best treatment is to modify or reduce the activity that caused your injury to prevent further damage. The damage to your body usually isn’t permanent and will heal over time.

You should be able to treat your symptoms at home by following R.I.C.E.:

* **Rest**: Avoid the activity that caused your injury. Don’t overuse the injured part of your body while it heals.
* **Ice**: Apply a cold compress to your injury 15 minutes at a time, a few times a day.
* **Compression**: Wrap your injury in an elastic bandage to help reduce swelling.
* **Elevation**: Keep the injury above the level of your heart as often as you can.

Over-the-counter NSAIDs like aspirin or ibuprofen can reduce pain and inflammation. Talk to your provider before taking NSAIDs for longer than 10 days.

Your provider might also refer you to a physical therapist to help with your posture, strength and flexibility. You might also work with an occupational therapist who can help tailor your recovery to get you ready to return to work (if that’s what caused your injury).

If your injury causes enough damage inside your body, you might need surgery to repair it, but this is rare.

### **How soon after treatment will I feel better?**

You should feel better gradually as you treat your symptoms and take a break from the activity that caused your injury. How long it takes will depend on which type of injury you experienced and what kind of activity caused it. Talk to your provider for a specific timeline.

## **Repetitive Strain Injuries (RSI) Treatment Drugs and Side Effects**

## 1. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

* Examples: Ibuprofen, Naproxen, Aspirin
* Purpose: Reduce inflammation and relieve pain in affected muscles, tendons, and joints.
* Usage: Often first-line treatment, available over-the-counter, recommended for short-term use (a few weeks).
* Common Side Effects:
  + Gastrointestinal upset, ulcers, or bleeding (especially with prolonged use)
  + Kidney impairment with long-term or high-dose use
  + Increased cardiovascular risk with some NSAIDs

## 2. Corticosteroid Injections

* Purpose: Targeted reduction of inflammation around affected tendons or joints, especially useful in tendinitis, de Quervain's tenosynovitis, and trigger finger.
* Usage: Administered by healthcare providers; limited to fewer than three injections per year to avoid tendon weakening.
* Common Side Effects:
  + Local pain or discomfort at injection site
  + Tendon weakening or rupture with repeated injections
  + Possible skin discoloration or infection (rare)

## 3. Muscle Relaxants

* Purpose: Relieve muscle spasms associated with RSI.
* Common Side Effects:
  + Drowsiness
  + Dizziness
  + Dry mouth

## 4. Topical Pain Relief Agents

* Examples: Capsaicin cream, lidocaine patches, NSAID gels
* Purpose: Provide localized pain relief with minimal systemic side effects.
* Common Side Effects:
  + Skin irritation or rash
  + Burning sensation (especially with capsaicin)

## 5. Antidepressants (in some cases)

* Purpose: Used off-label to manage chronic pain and improve sleep in persistent RSI.
* Common Side Effects:
  + Dry mouth
  + Drowsiness
  + Weight changes
  + Mood alterations

## 6. Other Pain Relievers

* Paracetamol (Acetaminophen): Often used for mild pain relief; generally safe but risk of liver toxicity at high doses.
* Opioids: Rarely used due to risk of dependence and side effects; reserved for severe pain unresponsive to other treatments.

## **Repetitive Strain Injury (RSI) Procedures and Timelines**

## 1. Initial Self-Care and Activity Modification

* Timeline: Immediate and ongoing
* Description:
  + Rest or reduce the repetitive activity causing symptoms to prevent further damage.
  + Follow R.I.C.E. (Rest, Ice, Compression, Elevation) for acute symptoms.
  + Modify work or leisure activities ergonomically to reduce strain.
* Expected Outcome: Symptoms often improve within weeks to months if aggravating activities are controlled.

## 2. Physical Therapy and Rehabilitation

* Timeline: Starts within days to weeks after diagnosis; continues for several weeks to months
* Description:
  + Tailored exercises to restore movement, strengthen muscles, and improve posture.
  + Manual therapies, stretching, nerve gliding exercises, and ergonomic advice.
  + Modalities such as TENS (transcutaneous electrical nerve stimulation) or ultrasound therapy may be used.
* Expected Outcome: Gradual reduction in pain and improved function over 6–12 weeks; some cases require longer rehabilitation.

## 3. Medications and Injections

* Timeline: Used as needed alongside physical therapy; corticosteroid injections considered after failure of conservative measures
* Description:
  + NSAIDs and muscle relaxants for pain and inflammation.
  + Corticosteroid injections for localized inflammation (e.g., tendinitis).
* Expected Outcome: Symptom relief varies; injections may provide temporary improvement lasting weeks to months.

## 4. Splinting or Bracing

* Timeline: Used during flare-ups or aggravating activities; duration depends on symptom severity
* Description:
  + Supports and immobilizes affected area to reduce strain and allow healing.
* Expected Outcome: Helps control symptoms and prevent worsening during recovery.

## 5. Surgery (Rare Cases)

* Timeline: Considered after months of failed conservative treatment (usually 3–6 months or more)
* Description:
  + Surgical release or repair for specific conditions caused by RSI, e.g., carpal tunnel release for median nerve compression.
* Expected Outcome: Surgery can provide definitive relief for nerve compression syndromes but is rarely needed for most RSIs.

## 6. Long-Term Management and Prevention

* Timeline: Lifelong, especially if work or activities continue to pose risk
* Description:
  + Ergonomic adjustments, regular breaks, stretching, and strengthening exercises to prevent recurrence.
  + Lifestyle modifications such as maintaining general fitness and avoiding smoking.
* Expected Outcome: Reduces risk of recurrence and chronic symptoms.

## Typical Recovery Timelines

| Phase | Duration | Key Activities and Outcomes |
| --- | --- | --- |
| Acute Symptom Management | Days to 2 weeks | Rest, ice, NSAIDs, activity modification |
| Physical Therapy & Rehab | 6 to 12 weeks | Strengthening, stretching, ergonomic training |
| Symptom Improvement Phase | 3 to 6 months | Gradual pain reduction, return to normal function |
| Surgery Consideration | After 3–6 months if needed | For refractory cases with nerve compression |
| Long-Term Prevention | Ongoing | Ergonomics, regular exercise, lifestyle changes |

## **Repetitive Strain Injury (RSI) Staging**

## Four-Stage Classification of RSI (Soft Tissue Response to Injury)

| Stage | Description |
| --- | --- |
| 1 | Initial Injury/Inflammation: Mild inflammation without pathological tissue changes; symptoms may be intermittent aching or discomfort. |
| 2 | Pathological Changes: Development of tissue alterations such as tendinosis (degeneration without inflammation). Symptoms become more frequent. |
| 3 | Structural Failure: Partial or complete rupture of soft tissues (e.g., tendon tears). Symptoms are more severe and persistent. |
| 4 | Chronic Changes: Additional changes such as bony calcification develop, often associated with chronic pain and functional impairment. |

## Three-Stage Clinical Course of RSI

| Stage | Symptoms and Signs |
| --- | --- |
| Stage 1 | Early/Subtle Symptoms: Intermittent discomfort, mild aching or tingling, often ignored or mistaken for fatigue. Early intervention is critical here. |
| Stage 2 | Moderate Symptoms: Frequent pain, weakness, swelling, and reduced function. Symptoms interfere with daily activities and may persist at rest. |
| Stage 3 | Chronic/Severe Symptoms: Persistent pain even at rest, significant weakness, muscle wasting, and possible irreversible tissue damage. Disability may occur. |

## Occupational Health Staging (CCOHS)

| Stage | Description |
| --- | --- |
| Early Stage | Aching, fatigue, and discomfort during or after repetitive activities; symptoms improve with rest. |
| Late Stage | Persistent aching, fatigue, and weakness even at rest; sleep disturbance and inability to perform light duties. |

## **Epidemiology of Repetitive Strain Injuries (RSI)**

## Prevalence in the United States

In 2021, 9.0% of U.S. adults aged 18 and over reported having repetitive strain injuries in the past 3 months

Prevalence varies by age group:

Ages 35–49: about 10.3%

Ages 50–64: about 11.6%

Ages 18–34: about 7.3%

Ages 65 and over: about 7.0%

Men and women report similar overall rates (~9%), but women are more likely to experience activity limitations and seek medical care for RSI

Prevalence also varies by race/ethnicity: White non-Hispanic adults have higher reported rates (~9.5%) compared to Asian (7.5%) and Hispanic adults (~7.3%)

Among those with RSI, 44.2% reported limiting their usual activities for at least 24 hours due to symptoms

About 51.4% of those who limited activities consulted a medical professional, with higher consultation rates among women and Black non-Hispanic adults

RSI is a leading cause of occupational illness and disability, especially affecting the upper limbs (wrist, hand, shoulder, elbow)

Work-related RSI incidence in specific cohorts ranges from about 5.5% annually, with higher rates in women (7.2%) compared to men (4.3%).

Risk factors include repetitive tasks, high physical exertion, job insecurity, and psychological demands

The most commonly affected body parts in work-related RSI are the wrist/hand (36.8%), shoulder/upper arm (20%), and elbow/lower arm (14.8%)

In Canada (2000/01), about 10.1% of adults aged 20 or older reported an RSI serious enough to limit normal activities in the past year

Prevalence has been increasing steadily since the 1980s and 1990s.

RSI is the most common and costly occupational health problem in the U.S., costing over $20 billion annually in workers’ compensation

Nearly two-thirds of reported occupational illnesses involve repetitive trauma to the upper body

## **Differential Diagnosis of Repetitive Strain Injury (RSI)**

## 1. Nerve Compression Syndromes

* Carpal Tunnel Syndrome (CTS): Median nerve compression at the wrist causing numbness, tingling, and pain in the thumb, index, middle, and ring fingers.
* Cubital Tunnel Syndrome: Ulnar nerve compression at the elbow causing numbness and weakness in the ring and little fingers.
* Ulnar Tunnel Syndrome (Guyon Canal Syndrome): Ulnar nerve compression at the wrist.
* Thoracic Outlet Syndrome: Compression of nerves or blood vessels between the neck and shoulder causing arm pain and numbness.

## 2. Tendinopathies and Tendon Sheath Inflammation

* Tendinitis/Tendinosis: Inflammation or degeneration of tendons causing localized pain and tenderness.
* Tenosynovitis: Inflammation of the tendon sheath, often causing swelling and pain.
* Trigger Finger/Thumb (Stenosing Tenosynovitis): Pain and locking of fingers due to tendon sheath narrowing.

## 3. Bursitis

* Inflammation of bursae (fluid-filled sacs near joints), commonly affecting the shoulder, elbow, or knee, causing localized pain and swelling.

## 4. Musculoskeletal Disorders

* Osteoarthritis or Joint Degeneration: Causes joint pain and stiffness, often with swelling and reduced range of motion.
* Frozen Shoulder Syndrome: Stiffness and pain in the shoulder joint limiting movement.
* Tennis Elbow (Lateral Epicondylitis): Overuse injury causing pain on the outer elbow.

## 5. Other Conditions

* Cervical Radiculopathy: Nerve root compression in the neck causing radiating arm pain and sensory changes.
* Fibromyalgia: Widespread musculoskeletal pain with fatigue and tender points, often without objective findings.
* Complex Regional Pain Syndrome (CRPS): Chronic pain condition with autonomic and sensory abnormalities following injury.
* Stress Fractures or Bone Injuries: Can cause localized pain and swelling mimicking RSI.
* Inflammatory or Autoimmune Diseases: Rheumatoid arthritis or other systemic conditions causing joint and soft tissue inflammation.

## **Genomic Data Related to Repetitive Strain Injury (RSI)**

## 1. Genetic Variants Affecting Tendon and Ligament Integrity

* Collagen Genes (e.g., COL5A1, COL1A1):  
  Variations in collagen-encoding genes affect the strength and resilience of tendons and ligaments.
  + *COL5A1* gene polymorphisms have been linked to increased risk of tendon injuries such as rotator cuff tears, tennis elbow (lateral epicondylitis), and Achilles tendon ruptures.
  + *COL1A1* gene variants influence collagen type I synthesis, affecting tendon biomechanical properties and injury susceptibility.
* These genetic differences may predispose individuals to RSI by weakening connective tissue, making them more vulnerable to damage from repetitive stress.

## 2. Genes Regulating Inflammatory Response

* Variations in genes like *IL-1β* that control pro-inflammatory cytokine production can modify the inflammatory response after repetitive injury.
* Altered inflammation regulation may contribute to chronic tendinopathies and delayed healing seen in RSI.

## 3. Genetic Predisposition to Bone Fragility and Stress Fractures

* Rare variants in genes such as *SERPINF1* have been implicated in bone fragility syndromes that can present as stress fractures, sometimes mistaken for RSI-related injuries.
* Although not common, these genetic factors highlight the importance of considering underlying hereditary conditions in patients with recurrent or unusual injury patterns.

## 4. Multifactorial Nature of RSI

* RSI development is influenced by an interplay of genetic predisposition, biomechanical factors, occupational exposures, and psychosocial stressors.
* Genetic factors may explain why some individuals develop RSI despite similar exposures and why others do not.

## **Outlook / Prognosis**

You should expect to make a full recovery from a repetitive stress injury. They’re usually temporary and shouldn’t have long-term impacts on your health or ability to do activities you love.

If your job or activity at school caused your repetitive strain injury, you might need to miss some work or classes. Check with your provider before resuming any physical activity, especially if that’s what caused your original injury.

Talk to your provider about any accommodations you might qualify for while you heal if your injury was caused at work.

## **Prevention**

The best way to avoid a repetitive strain injury is to avoid overusing your body.

During sports or other physical activities:

* Wear the right protective equipment.
* Don’t “play through it” if you feel pain during or after physical activity.
* Give your body time to rest and recover after intense activity.
* Stretch and warm up before playing sports or working out.
* Cool down and stretch after physical activity.

Improving your posture will help avoid extra stress on your body.

Federal laws and guidelines require employers to accommodate their employees’ needs to prevent repetitive strain injuries.

### **When should I see my healthcare provider?**

Visit your provider if your symptoms are making it hard for you to do your day-to-day activities (including your job). They’ll help you understand what’s injured, what’s causing it and how you can modify your routine to help your body heal.

Stopping the damage from repetitive strain as soon as possible will help speed up your recovery.

Go to the emergency room if you notice any of the following:

* Extreme pain.
* Swelling that’s getting worse.
* Discoloration.
* You can’t move a part of your body that you usually can.

**QUESTION AND ANSWERS SET**

## What is Repetitive Strain Injury (RSI)?

RSI is a condition characterized by pain and discomfort in muscles, tendons, nerves, and joints caused by repetitive movements or sustained awkward postures.

## 2. What are the common symptoms of RSI?

Symptoms include sharp or aching pain, tenderness, stiffness, swelling, tingling, numbness, weakness, and sensitivity to temperature changes in affected areas.

## 3. Which body parts are most commonly affected by RSI?

The neck, shoulders, elbows, forearms, wrists, and hands are most commonly affected.

## 4. What causes RSI?

RSI is caused primarily by repetitive mechanical overuse, poor posture, inadequate breaks, excessive force, and sometimes psychosocial factors like stress.

## 5. How does RSI develop over time?

Symptoms usually start gradually, worsen with continued repetitive activity, and may improve with rest or change in activity.

## 6. Can RSI affect people who don’t do manual labor?

Yes, RSI can occur in office workers, musicians, athletes, and anyone performing repetitive tasks, including typing or using a mouse.

## 7. How is RSI diagnosed?

Diagnosis is mainly clinical, based on history and physical exam. Imaging or nerve studies may be used to rule out other conditions.

## 8. What are common conditions related to or caused by RSI?

Carpal tunnel syndrome, tennis elbow, tendinitis, bursitis, and nerve entrapment syndromes.

## 9. What is the first line of treatment for RSI?

Rest and reduce or modify the activity causing the strain.

## 10. What role does ergonomics play in managing RSI?

Ergonomic adjustments to workstations and tools help reduce strain and prevent recurrence.

## 11. Are medications effective for RSI?

NSAIDs, muscle relaxants, and corticosteroid injections can reduce pain and inflammation but do not cure RSI.

## 12. How important is physical therapy?

Physical therapy helps restore biomechanics, strengthen muscles, improve posture, and reduce symptoms.

## 13. Can stress or poor sleep worsen RSI?

Yes, psychosocial factors like stress and poor sleep can increase muscle tension and pain perception.

## 14. Is RSI permanent?

Most cases improve with appropriate treatment and activity modification, but some can become chronic and disabling.

## 15. When is surgery considered for RSI?

Surgery is a last resort, typically for severe cases like nerve compression syndromes unresponsive to conservative care.

## 16. How long does it take to recover from RSI?

Recovery varies but often takes weeks to months; early intervention improves outcomes.

## 17. Can RSI symptoms come and go?

Yes, symptoms often fluctuate, worsening with activity and improving with rest.

## 18. What lifestyle changes help prevent RSI?

Regular breaks, ergonomic work setups, stress management, exercise, and maintaining good posture.

## 19. Can RSI affect mental health?

Chronic pain and disability from RSI can lead to anxiety, depression, and reduced quality of life.

## 20. Where can I get help if I suspect RSI?

Consult your primary healthcare provider, occupational health specialist, or physiotherapist for diagnosis and management.

## **De-Identified Doctor-Patient Conversation on Repetitive Strain Injury (RSI)**

Patient:

Doctor, I’ve been having persistent pain and stiffness in my wrists and forearms after doing a lot of typing at work. It sometimes feels numb and weak. Could this be a repetitive strain injury?

Doctor:

Yes, your symptoms are consistent with repetitive strain injury, or RSI. This happens when you perform repetitive movements over time, causing strain and inflammation in muscles, tendons, and nerves, especially in the arms, wrists, and hands.

Patient:

How do you diagnose RSI?

Doctor:

We start by discussing your symptoms and examining the affected area. I’ll ask about your work habits and activities that worsen your symptoms. Sometimes, we may order tests like nerve conduction studies or imaging to rule out other conditions such as carpal tunnel syndrome.

Patient:

What treatments are available?

Doctor:

The main treatment is to reduce or modify the repetitive activities causing the strain. Resting the affected area is important, but it’s also best to keep moving gently to avoid stiffness. Physical therapy can help you improve posture, stretch, and strengthen muscles. Therapies like TENS (electrical nerve stimulation) or ultrasound may help manage pain.

Patient:

Are there medications that can help?

Doctor:

Over-the-counter painkillers like paracetamol or anti-inflammatory drugs (NSAIDs) can reduce pain. In some cases, if pain is severe and persistent, steroid injections around the tendons may be considered to reduce inflammation.

Patient:

When would surgery be necessary?

Doctor:

Surgery is rarely needed for RSI itself but may be considered if you develop conditions like carpal tunnel syndrome that don’t improve with other treatments.

Patient:

How can I prevent RSI from getting worse or recurring?

Doctor:

Ergonomic adjustments at your workstation are key — proper chair height, keyboard and mouse positioning, and taking regular breaks to stretch and rest. Maintaining good posture and using relaxation techniques can also help. If your workplace has occupational health services, they can assess your setup and suggest improvements.

Patient:

What if I keep having symptoms despite treatment?

Doctor:

If symptoms persist, we may reassess your diagnosis and treatment plan. Sometimes, a multidisciplinary approach involving physiotherapists, occupational therapists, and possibly psychologists can provide better management.

Patient:

Thank you, Doctor. That helps me understand what to do next.

REFERENCES

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[Repetitive Strain Injury (RSI): Causes, Symptoms & Treatment](https://my.clevelandclinic.org/health/diseases/17424-repetitive-strain-injury)

### **Synovial chondromatosis**

**Definition and description**

Synovial chondromatosis is a rare condition where noncancerous (benign) tumors affect joints like your knee. The tumors develop in your synovium, the thin layer of tissue that lines your joints. Synovial chondromatosis can cause severe joint damage and osteoarthritis. If you already have arthritis, the condition can make the problem worse.

You may better understand this condition by defining the parts of each word:

* **Synovial** refers to your synovium, a thin layer of tissue that lines your joints. Your synovium makes synovial fluid, a lubricant that helps joints move and glide. Your joints, bones and synovium tissue are all part of your musculoskeletal system.
* **Chondro (or chondral)** refers to cartilage. This type of connective tissue cushions bones inside of your joints and keeps them from rubbing together.
* **Matosis (or mitosis)** refers to cell changes that occur within tissue.

### **Other names for synovial chondromatosis**

You may also hear these terms:

* **Reichel’s syndrome:** German surgeon Friedrich Reichel first described this condition in 1900.
* **Reichel-Jones-Henderson syndrome:** In the early 1900s, American orthopaedic surgeons Hugh Jones and Melvin Henderson advanced the medical study and understanding of the condition first identified by Dr. Reichel.
* **Synovial chondroma:** The suffix “-oma” is the medical term for tumors, regardless of whether they’re cancerous (malignant) or not.
* **Synovial osteochondromatosis:** “Osteo” means bone. For this condition, it refers to the ossification (hardening) of the tumor into a bone-like substance.

### **What parts of the body does synovial chondromatosis affect?**

Synovial chondromatosis is a rare type of benign bone tumor that grows outside the bone. Most people have multiple nodules or tumors in a single joint. The most common place for nodules to form is your knee. Nodules may also affect your elbow, hip or shoulder. In rare instances, the condition affects smaller joints in your ankle, wrist or jaw.

Synovial chondromatosis is rare, affecting approximately 1 in 100,000 people. It mostly occurs in men who are between 30 and 50 years old.

### **Types of synovial chondromatosis**

There are two types of synovial chondromatosis:

* **Primary synovial chondromatosis** occurs for unknown reasons. It can lead to osteoarthritis.
* **Secondary synovial chondromatosis** is the most common type. It occurs when you already have joint damage from conditions like arthritis, osteonecrosis (avascular necrosis) or osteochondritis dissecans.

### **What causes synovial chondromatosis?**

When you have synovial chondromatosis, the synovium grows differently than it should. The tissue forms nodules (abnormal growths) of cartilage that may be as small as a grain of rice or as large as a marble. Some people have dozens of nodules of varying sizes.

These growths break off from your synovium tissue and enter your joint space. Synovial fluid in your joint surrounds the nodules, leading to calcification (hardening). In some instances, the nodules turn into a bone-like substance (ossify). As these hardened nodules move around, they damage the cartilage that protects your joint. You develop painful osteoarthritis when the damaged cartilage wears away, exposing your joint surface. If you have the secondary type, existing joint damage worsens.

### **Symptoms of synovial chondromatosis**

Synovial chondromatosis causes symptoms similar to osteoarthritis. Joint pain and inflammation are the most common complaints. The pain may worsen when you move your joint.

You may also have:

* Bumps (nodules) that you can feel underneath your skin.
* Decreased range of motion in your affected joint.
* Fluid (edema) in your joint.
* Grinding, creaking or popping sounds or sensations when you move your joint (crepitus).
* Swollen, tender joints.

### **Where do symptoms of synovial chondromatosis occur?**

Depending on the affected body part, you may have:

* Ankle pain.
* Elbow pain.
* Hip pain.
* Jaw pain.
* Knee pain.
* Shoulder pain.
* Wrist pain.

## **Diagnosis and Tests**

For diagnosis and treatment, you may see an orthopaedist. This medical doctor specializes in the treatment of musculoskeletal problems. Your healthcare provider will perform a physical examination and evaluate your symptoms.

An X-ray usually detects loose nodules, but smaller ones might not show up. If an X-ray doesn’t find any nodules, you may receive a CT scan or an MRI to get a more detailed image of your joint.

These imaging tests aid the diagnosis. They also can show signs of osteoarthritis and fluid in your joint.

## **Management and Treatment**

For secondary synovial chondromatosis, your healthcare provider may recommend holding off on major treatment. Nonsteroidal anti-inflammatory drugs (NSAIDs) and pain relievers can ease symptoms. You’ll get regular imaging tests to monitor your joint. You may need surgery to treat severe joint damage.

**Surgical treatments for synovial chondromatosis**

Surgery involves removing the tumors in addition to part or all of your affected synovium tissue (a synovectomy). After surgery, you may do physical therapy to regain range of motion and strengthen the joint.

The surgery is typically an arthroscopic procedure. Arthroscopy incisions are smaller and cause less pain and scarring than the larger incisions used in an open procedure. Depending on the location of the nodule, you may get knee arthroscopy, shoulder arthroscopy or arthroscopy on a different joint.

During an arthroscopic procedure, your healthcare provider:

* Make several small incisions in your skin.
* Inserts a tiny camera device (arthroscope) into one opening.
* Inserts surgical instruments into the other openings.
* Views a video screen to perform the procedure and remove the growths.
* Removes the camera and instruments.
* Closes the incisions with dissolvable stitches or a bandage.

### **Complications of synovial chondromatosis**

The condition increases your risk of joint damage. In rare instances, a free-floating nodule may grow overly large. It may take up the entire joint space or invade nearby tissues. The joint may appear misshapen. You may lose the ability to fully use that joint.

## **Treatment Drug Information and Their Side Effects**

## Drug Treatments for Symptom Relief

## 1. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

* Purpose:  
  Used to reduce joint pain and inflammation associated with synovial chondromatosis.
* Common Drugs: Ibuprofen, Naproxen, Aspirin
* Side Effects:
  + Gastrointestinal upset, ulcers, bleeding
  + Kidney impairment (rare with short-term use)
  + Increased cardiovascular risk with long-term use

## 2. Pain Relievers (Analgesics)

* Purpose:  
  Used to manage joint pain when inflammation is not prominent or NSAIDs are contraindicated.
* Common Drugs: Acetaminophen (Paracetamol)
* Side Effects:
  + Liver toxicity in overdose or prolonged high doses

## Role of Drug Therapy

* Drug therapy is supportive and symptomatic.
* NSAIDs and analgesics help manage pain and inflammation but do not treat the underlying cause or remove loose bodies.
* Regular imaging (X-rays, MRI, CT) is used to monitor disease progression during conservative management or postoperatively.

## Definitive Treatment: Surgery

* Loose Body Removal: Surgical extraction of cartilaginous bodies from the joint.
* Synovectomy: Partial or complete removal of the affected synovium to reduce recurrence.
* Approaches:
  + Arthroscopic Surgery: Minimally invasive, smaller incisions, faster recovery, low complication rates.
  + Open Surgery: Used for extensive disease or when arthroscopy is not feasible.
* Postoperative Care: Physical therapy to restore joint range of motion and strength.

## **Synovial Chondromatosis Procedures and Timelines**

* + Arthroscopic surgery: Minimally invasive, using small incisions and a camera to remove loose bodies and synovium.
  + Open surgery (arthrotomy): Larger incisions for direct visualization and removal, used for extensive disease or difficult-to-access joints.

## 2. Arthroscopic Surgery

* Advantages:
  + Smaller incisions
  + Less postoperative pain
  + Faster recovery and rehabilitation
  + Earlier improvement in joint range of motion
  + Lower morbidity
* Typical Timeline:
  + Surgery duration: Usually 1–2 hours depending on joint and extent of disease
  + Hospital stay: Often outpatient or 1 day
  + Rehabilitation: Begins within days, with gradual return to activities over weeks to months
  + Follow-up: Regular visits to monitor for recurrence
* Recurrence Rate: Up to 20% in some series, requiring close follow-up.

## 3. Open Surgery (Arthrotomy)

* Indications:
  + Extensive disease with many loose bodies
  + Difficult joint access
  + Recurrence after arthroscopy
* Procedure:
  + One or two large incisions to fully expose the joint
  + Thorough removal of loose bodies and synovectomy
* Typical Timeline:
  + Surgery duration: 1–3 hours
  + Hospital stay: 1–3 days depending on complexity
  + Rehabilitation: Longer than arthroscopy, often several weeks to months
  + Follow-up: Regular monitoring for recurrence
* Outcomes: Similar long-term results to arthroscopy but with longer recovery and higher morbidity.

## 4. Postoperative Rehabilitation

* Physical therapy to restore joint mobility, strength, and function starts soon after surgery.
* Recovery timelines vary by joint involved (e.g., knee vs. hip) and surgery type but generally:
  + Weeks 1–2: Pain and swelling management, gentle range of motion exercises
  + Weeks 3–6: Progressive strengthening and functional activities
  + 3–6 months: Return to most daily activities and sports, depending on joint and patient factors

## 5. Follow-Up and Recurrence Monitoring

* Recurrence rates vary widely (0–60%), so long-term follow-up with periodic imaging is recommended.
* Early detection of recurrence allows timely intervention.
* In rare cases, malignant transformation has been reported, underscoring the need for vigilance

**DIFFERENTIAL DIAGNOSIS**

* Crystal deposition disease (tendinosis Calcarea)
* Osteocartilaginous loose bodies
* Osteochondritis dissecans
* Neurotrophic arthritis
* Rheumatoid arthritis
* Degenerative arthritis
* Tuberculous arthritis
* Osteochondral fractures
* Soft tissue tumors

Other benign synovial disorders include synovial hemangioma, lipoma arborescens, and pigmented villonodular synovitis (PVNS).

Differential diagnosis should also consider the possibility of a malignant lesion. Interosseous low-grade chondrosarcoma that extends into a joint and synovial cell sarcoma can be considered if the lesions involve bone adjacent to a joint. MRI findings help differentiate possible malignancies. Marrow invasion is not usual with synovial chondromatosis. It is more likely to be present with malignant lesions.

For both the clinician and the pathologist, it can be challenging to distinguish synovial chondromatosis from chondrosarcoma. The classic indicators of malignancy, such as bony invasion, permeation, and destructive growth across joints, develop late in the disease course. Recurrence (especially multiple episodes of recurrence) is a significant sign that warrants consideration of malignant transformation. However, the number of lesions, the size, or the rate of change do not correlate with malignancy

**STAGING**

**Stage I:** An active, inflammatory intrasynovial process without loose bodies. It could be asymptomatic or present with localized joint pain and swelling.

**Stage II:**  Active synovial proliferation with transitional loose bodies (between synovium and hyaline cartilage from pedunculated to free loose bodies). Patients present with mechanical symptoms and decreased range of motion.

**Stage III:** A quiescent stage of the disease with no ongoing metaplasia. Several loose bodies with minimal synovial disease and inflammation. Patients tend to be asymptomatic in this stage as well.

**EPIDEMIOLOGY**

Men are reported to be affected with synovial chondromatosis up to four times more commonly than women. The knee is the most common joint affected. Typically affects diarthrodial, weight-bearing joints of individuals 30-60 years of age. The following joints are affected in descending order of frequency: knee (70%), hip (20%), shoulder, elbow, ankle, and wrist.As a general observation, the larger the joint and the more weight it bears, the greater potential for synovial chondromatosis development. It has also been reported to affect the temporomandibular joint, the intervertebral facet joints, and a variety of tenosynovial locations.

A rare occurrence is an extra-articular presentation of synovial-chondral lesions. This occurs in synovial lined bursal tissue or tenosynovium, where the typical chondral loose bodies form. These are referred to as tenosynovial chondromatosis or bursal chondromatosis. Synovial chondromatosis occurs most commonly in the fifth decade of life; it is rarely present before age 20 and is very rare in children. Reference to both the primary form (no evidence of concurrent joint pathology) and secondary form (occurring in the setting of joint degeneration) is made in the literature. The secondary form occurs more commonly and usually in older individuals. However, both primary and secondary forms are uncommon. Even though the exact incidence is unknown, it has been reported as 1.8 per million individuals per year in England.With a 10% incidence of being bilateral.

## **Outlook / Prognosis**

For close to 1 in 4 people who undergo surgical treatment, the nodules grow back. Your healthcare provider will order imaging tests and monitor the joint for signs of recurrence.

The condition also increases your risk for joint damage and arthritis. Your healthcare provider will continue to check you for signs of these issues.

## **Prevention**

Experts aren’t sure why some people develop synovial chondromatosis. There isn’t anything you can do to prevent the condition.

### **When should I call the doctor?**

Call your healthcare provider if you experience:

* Decreased range of motion in a joint.
* Severe joint pain and swelling.
* Unusual popping or grinding sounds or sensations in joints.

### **QUESTION AND ANSWERS SET**

### **Can synovial chondromatosis become cancerous?**

It’s extremely rare for a benign bone tumor to become cancerous. However, there have been a few reported instances of the condition turning into chondrosarcoma, a type of bone cancer.

## What caused the synovial chondromatosis?

The exact cause of synovial chondromatosis is unknown. It may occur spontaneously (primary form) or secondary to joint conditions like osteoarthritis, rheumatoid arthritis, or trauma. Some evidence suggests that trauma or synovial irritation/inflammation may contribute. The condition is not inherited

## 2. What’s the best treatment?

The best treatment is surgical removal of the loose bodies combined with partial or full synovectomy (removal of the affected synovium). This can be done arthroscopically (minimally invasive) or via open surgery depending on disease extent. Surgery helps reduce symptoms and prevent joint damage.

## 3. Do I need surgery?

If you have symptoms like joint pain, swelling, limited motion, or loose bodies visible on imaging, surgery is usually recommended to relieve symptoms and prevent progression. In mild or asymptomatic cases, observation may be considered, but surgery is the mainstay for symptomatic disease

## 4. Do I have osteoarthritis? If not, how can I prevent it?

Synovial chondromatosis can cause secondary osteoarthritis by damaging the joint cartilage with loose bodies. If you do not currently have osteoarthritis, preventing it involves timely treatment of synovial chondromatosis to avoid cartilage damage. Maintaining joint health through weight management, avoiding joint overuse, and following rehabilitation after surgery can help

## 5. Should I look for signs of tumor recurrence or complications?

Yes. Synovial chondromatosis can recur in about 25% of cases, especially if synovectomy is incomplete. Rarely, malignant transformation to chondrosarcoma has been reported. Watch for worsening pain, swelling, decreased joint function, or new masses. Regular follow-up with imaging is important to detect recurrence or complications early

## **Genomic Data**

* FN1 and ACVR2A Gene Rearrangements:  
  The most common and recurrent genetic abnormality in SC involves rearrangements and fusions between the *FN1* (fibronectin 1) and *ACVR2A* (activin A receptor type 2A) genes. Studies show that about 67% of SC cases harbor rearrangements in *FN1* and/or *ACVR2A*, with *FN1-ACVR2A* fusion confirmed in approximately 56% of cases
* Other Gene Fusions:  
  A novel *FN1-NFATc2* gene fusion has been reported in some cases, indicating genetic heterogeneity. Additionally, *KMT2A-BCOR* gene fusion was identified in a case of malignant transformation (synovial chondrosarcoma), but *BCOR* alterations appear rare overall[1](https://pmc.ncbi.nlm.nih.gov/articles/PMC7147082/).
* Chromosomal Abnormalities:  
  Occasional abnormalities involving chromosome 6 have been observed cytogenetically in SC, but these are less well characterized
* Gli1 Gene Mutation:  
  In temporomandibular joint synovial chondromatosis, a homozygous mutation in the *Gli1* gene (rs2228226 G>C) has been identified in case reports, suggesting possible site-specific genetic variations

## **De-Identified Doctor-Patient Conversation on Synovial Chondromatosis**

Patient:

Doctor, I’ve been having joint pain and swelling, and sometimes my knee feels stiff and catches when I move it. What could be causing this?

Doctor:

Your symptoms could be due to a condition called synovial chondromatosis. It’s a rare, benign disorder where the lining of your joint—the synovium—produces small cartilaginous nodules. These nodules can break off and become loose bodies inside the joint, causing pain, swelling, stiffness, and sometimes mechanical symptoms like catching or locking.

Patient:

How do you diagnose synovial chondromatosis?

Doctor:

We start with a physical examination and review your symptoms. An X-ray can sometimes show these loose bodies if they have calcified, but smaller nodules might not be visible. If X-rays don’t give us enough information, we use more detailed imaging like MRI or CT scans to see the joint structures and any loose bodies clearly.

Patient:

What treatment options are available?

Doctor:

Treatment depends on how severe your symptoms are. If symptoms are mild, we might monitor the condition and manage pain with anti-inflammatory medications like NSAIDs. For more severe cases, surgery is usually recommended to remove the loose bodies and often part or all of the affected synovium—a procedure called synovectomy. This is commonly done arthroscopically, which uses small incisions and usually results in less pain and faster recovery.

Patient:

What can I expect after surgery?

Doctor:

After surgery, you’ll likely do physical therapy to regain your joint’s range of motion and strength. Most patients recover well and experience relief from symptoms. However, synovial chondromatosis can recur, so regular follow-up is important.

Patient:

Are there any complications if I don’t get treatment?

Doctor:

If left untreated, the loose bodies can cause joint damage over time, leading to secondary osteoarthritis, joint deformity, and chronic pain or disability.

Patient:

Is this condition common? What causes it?

Doctor:

It’s quite rare and mostly affects adults between 30 and 50 years old. The exact cause is unknown, but it may be related to irritation or inflammation of the synovium. Sometimes it can occur secondary to other joint problems like osteoarthritis.

Patient:

Thank you, Doctor. That helps me understand what’s going on and what to expect.

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[Synovial Chondromatosis - StatPearls - NCBI Bookshelf](https://www.ncbi.nlm.nih.gov/books/NBK470463/#article-29814.s9)

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**Lower Limb Length Discrepancy**

**Definition and description**

A limb length discrepancy is a difference between the lengths of the arms or legs. This article focuses exclusively on differences in leg length.

Some children are born with legs of different lengths. Sometimes this discrepancy is associated with other congenital malformations. In other cases, an illness or injury may cause a discrepancy in the lower limb lengths to develop over time.

Treatment for a discrepancy depends upon the severity. In many cases, a minor difference in leg length can be well tolerated or evened out by wearing a small lift in one shoe. A child with a more significant difference, however, may benefit from surgery to make their legs the same length. This can be done a number of ways but is most often accomplished through a procedure that slows or stops growth in the longer leg.

## Description

More than 50% of people have a subtle difference in their leg lengths. These mild variations usually do not cause problems. However, for the small percentage of people with a leg length difference greater than 2 cm, the difference in length can affect their well-being and quality of life.

In most cases, the bones affected by a leg length discrepancy are the femur (thighbone) and tibia (shinbone).

Like the other long bones in the body, the femur and tibia do not grow from the center outward. Instead, growth occurs around the growth plates. Growth plates are areas of cartilage located between the widened part of the shaft of the bone (the metaphysis) and the end of the bone (the epiphysis).

## **Cause**

If illness or injury affect the growth plate, the bone may grow at a faster or slower rate than the bone on the opposite side.

### *Previous Trauma to a Bone in the Leg*

A broken leg bone can lead to a limb length discrepancy if it heals in a shortened position. This is more likely to happen if the bone was broken in several places. It is also more likely to happen if the skin and muscle tissue around the bone were severely injured and exposed, as occurs in an open fracture. Alternatively, a break in a child's bone through the growth plate can cause permanent damage, which may slow or stop growth in that area, resulting in a shorter leg.

In a child, a broken bone that does not involve the growth plate sometimes will grow faster for several years after healing, causing it to become longer than the bone on the opposite side. This type of overgrowth occurs most often in young children with femur fractures.

### *Bone Infection*

Bone infections that occur in growing children may cause a significant limb length discrepancy. This is especially true if the infection happens in infancy.

### *Bone Diseases (Dysplasias)*

Certain bone diseases may cause limb length discrepancy, such as:

* Neurofibromatosis
* Multiple hereditary exostoses
* Ollier disease

### *Other Causes*

Other causes of limb length discrepancy include:

* Neurologic conditions
* Conditions that cause inflammation of the joints during growth, such as juvenile arthritis

In some cases, the cause of limb length discrepancy is idiopathic, or unknown.

These conditions are usually present at birth, but the limb length difference may be too small to be detected early on. As the child grows, however, the discrepancy increases and becomes more noticeable. In underdevelopment, one of the two bones between the knee and the ankle is abnormally short. The child may also have related foot or knee problems.

Hemihypertrophy (one side too big) and hemiatrophy (one side too small) are rare conditions that cause limb length discrepancy. In patients with these conditions, the arm and leg on one side of the body are either longer or shorter than the arm and leg on the opposite side. There may also be a difference between the two sides of the face. In some cases, the exact cause of these conditions cannot be determined.

## **Symptoms and Signs**

The effects of limb length discrepancy vary from patient to patient, depending on the cause and size of the difference. While a slight difference in leg length may not cause any symptoms, a significant difference can cause a noticeable limp and make it difficult for a child to run and play. Sometimes the child will stand with one hip higher than the other or with one knee bent. Other children will toe walk on their shorter leg. Because these differences require the child to exert more effort to walk, they may tire easily.

Some studies suggest that patients with lower limb length discrepancies are more likely to experience low back pain and are more susceptible to injury. Other studies do not support this finding, however.

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## **Doctor Examination(DIAGNOSIS)**

Parents are usually the first to detect a lower limb length discrepancy when they notice a problem with the way their child walks. Discrepancies are also sometimes detected when a child undergoes a screening at school for curvature of the spine (scoliosis).

Your child's doctor will conduct a thorough physical examination and use tests to confirm or diagnose a discrepancy in length, as outlined below.

### *Physical Examination*

During the exam, your doctor will ask about your child's general health, medical history, and symptoms. They will then perform a careful examination, observing how your child sits, stands, and moves.

Gait analysis. During the examination, your doctor will closely observe your child's gait (the way they walk). Young children may compensate for a lower limb length discrepancy by flexing their knee or walking on their toes.

Measuring the discrepancy. In most cases, the doctor will measure the discrepancy when your child is standing barefoot. They will place a series of measured wooden blocks under the short leg until the hips are level, and thus determine the discrepancy. Sometimes, an X-ray is taken with the wooden blocks in place to assess whether the pelvis is truly level. This can also determine whether any spinal curvature responds to correction of the discrepancy with the wooden blocks.

### *Imaging Studies*

X-rays. An X-ray provides images of dense structures, such as bone. If your doctor needs a more precise measurement of the discrepancy, they may order X-rays of your child's legs.

Scanograms. This is a special type of X-ray that uses a series of three images (hips, knees, and ankles) and a ruler to measure the length of the bones in the legs. Your doctor may order a scanogram instead of, or in addition to, a traditional X-ray.

image of bone and soft tissue in the legs than X-rays; however, they create a greater exposure to radiation for your child. In some complex cases, your doctor may use a CT scan to measure the limb length discrepancy.

If your child is still growing, your doctor will likely repeat the physical examination and imaging studies every 6 to 12 months to see if the discrepancy has increased or remained the same.

## Treatment

Your doctor will consider several things when planning your child's treatment, including:

* The size of the lower limb length discrepancy
* Your child's age (and how much growth they have remaining)
* The cause of the discrepancy, if known
* Any underlying neurologic issues

### *Nonsurgical Treatment*

For patients with minor limb length discrepancies (less than 2 cm) and no angular deformity, treatment is usually nonsurgical. Because the risks of surgery may outweigh the benefits, surgical treatment to equalize small differences in leg length is not usually recommended.

For patients with an underlying neurologic disorder, it may actually be beneficial for their weaker leg to be slightly shorter than the stronger leg. This allows the child to better clear the weaker leg when they swing it through during walking.

Nonsurgical treatments may include:

Observation. If your child has not yet reached skeletal maturity, and the discrepancy is less than 2 cm, your child's doctor may recommend simple observation until your child's growth is complete. During this time, your child will be re-evaluated at regular intervals to determine whether the discrepancy is increasing or remaining the same.

Wearing a shoe lift. Your child's doctor may suggest a lift, fitted to the inside or outside of the shoe, to see if it improves your child's ability to walk and run. A shoe lift may also help with back pain caused by a smaller lower limb length discrepancy. Shoe lifts are inexpensive and can be removed easily if they are not effective.

### *Surgical Treatment*

In general, surgeries for lower limb length discrepancy are designed to do one of the following:

* Slow down or stop the growth of the longer limb
* Shorten the longer limb
* Lengthen the shorter limb

### *Epiphysiodesis*

In children who are still growing, epiphysiodesis can be used to slow down or stop growth at one or two growth plates in the longer leg. The advantage of this minor surgical procedure is that it does not require cutting the bone or prolonged limitation in weight bearing for the child. The child, however, must still be skeletally immature (growth plates open) so that their remaining growth in the normal leg can be used to equalize their leg lengths.

Epiphysiodesis is a relatively simple surgical procedure that can be performed in one of two ways:

* The surgeon may drill or scrape the growth plate to stop further growth. The limb length discrepancy will gradually lessen as the opposite leg continues to grow and catch up.
* The surgeon may place metal staples, or a metal plate with screws, around the sides of the growth plate to slow or stop growth. These metal implants are then removed once the shorter leg has caught up.

The procedure is performed through very small incisions in the knee area, using X-rays for guidance. Proper timing is critical. The goal is to reach equal leg length by the time growth normally ends — at age 14 for girls and 16 for boys, on average, though this often varies. Doctors make decisions about timing based on known averages, with the use of growth charts.

The decision on whether to perform this procedure on the femur, tibia, or both depends on the location of the discrepancy. This is assessed so that leg lengths can be equalized and the knee heights of each leg are nearly symmetric at maturity.

Disadvantages of epiphysiodesis include:

* The possibility of a slight over- or under-correction of the lower limb length discrepancy
* The patient's adult height will be slightly less than it normally would have been

### *Lower Limb Shortening*

In patients who have finished growing, the longer limb can sometimes be shortened to even out the leg lengths.

To do this, the doctor removes a section of bone from the middle of the longer limb, then inserts metal plates and screws or a rod to hold the bone in place while it heals.

Because a major shortening may weaken the muscles of the leg, limb shortening cannot be used for very large lower limb length discrepancies. In the femur, a maximum of 3 inches can be shortened. In the tibia, a maximum of 2 inches can be shortened.

### *Lower Limb Lengthening*

Because of their complexity, lower limb lengthening procedures are usually reserved for patients with very large discrepancies in length.

Lengthening can be performed either externally or internally.

External lengthening. In this procedure, the doctor cuts the bone of the shorter leg into two segments, then surgically applies an external fixator to the leg. The external fixator is a scaffold-like frame that sits outside the leg and is connected to the bone with wires, pins, or both.

The lengthening process begins approximately 5 to 10 days after surgery and is performed manually. The patient or a family member turns the dial on the fixator several times each day.

When the bones are gradually pulled apart (distracted), new bone will grow and fill in the space created. Muscles, skin, and other soft tissues will adapt as the limb slowly lengthens.

The bone may lengthen 1 mm per day, or approximately 1 inch per month.

Lengthening may be slower in a bone that was previously injured. It may also be slower if the leg was previously operated on. Bones in patients with potential blood vessel abnormalities, such as cigarette smokers, may also need to be lengthened more slowly.

The external fixator is worn until the bone is strong enough to support the patient safely. This usually takes about 3 months for each inch of growth. Factors such as age, health, smoking, and participation in rehabilitation can affect the amount of time needed.

External limb lengthening requires:

* Meticulous cleaning of the area around the pins and wires
* Diligent adjustment of the frame several times daily

Potential risks and complications of external lengthening include:

* Infection at the site of wires and pins
* Stiffness of the joints immediately above and below the bone being lengthened
* Slight over- or under-correction of the bone's length
* Failure of the bone to consolidate into strong new bone

Internal lengthening. In this procedure, the doctor cuts the bone in the shorter leg, then surgically implants an expandable metal rod in the bone. The rod is completely internal and lengthens gradually in response to the normal movements of the patient's limb, or to an external magnetic motor.

As the rod lengthens, the bones are gradually pulled apart, and new bone grows in the space created. The rod provides stability and alignment to the bone as it lengthens.

Because no external fixator is used in internal lengthening, there is less risk of infection — including the superficial infection that commonly occurs around pin sites.

Both internal and external lengthening take several months to complete. Both procedures require:

* Regular follow-up visits to the doctor's office
* Extensive rehabilitation, including physical therapy and home exercise

## **Genomic Data and Genetic Factors**

## Genetic and Congenital Causes of LLD

* Many cases of lower limb length discrepancy are congenital, meaning present at birth, often due to genetic syndromes or hereditary conditions affecting bone growth and development
* Specific congenital/genetic conditions associated with LLD include:
  + Fibular hemimelia: A longitudinal deficiency or absence of the fibula bone, leading to shortening of the leg
  + Congenital short femur: Severe shortening or absence of the femur bone
  + Hemiatrophy and Hemihypertrophy: Conditions where one side of the body grows smaller (hemiatrophy) or larger (hemihypertrophy) than the other, often linked to syndromes such as Russell-Silver syndrome and Beckwith-Wiedemann syndrome
  + Hereditary multiple exostoses (HME): A genetic disorder characterized by multiple benign bone tumors (exostoses) that disrupt normal bone growth, causing deformities and LLD
  + Ollier disease: A disorder with benign cartilage growths in bones, which can affect bone length
  + Neurofibromatosis type 1: Genetic condition causing tumors in the nervous system and bone deformities leading to LLD
  + Overgrowth syndromes: Such as Klippel-Trenaunay syndrome and Proteus syndrome, which cause asymmetric limb growth

## Genetic Mechanisms and Inheritance

* These conditions often involve mutations or genetic alterations affecting bone growth regulation, cartilage formation, and skeletal development.
* Some syndromes like HME follow autosomal dominant inheritance, meaning a single copy of the mutated gene can cause the disorder and associated limb length differences
* The exact genes involved vary by condition, e.g., mutations in the EXT1 and EXT2 genes in hereditary multiple exostoses.

## Acquired Causes with Genetic Predisposition

* While trauma, infections, and growth plate injuries cause many LLD cases, genetic susceptibility can influence the severity and healing response

## **Lower Limb Length Discrepancy (LLD) Epidemiology**

Prevalence:  
Anatomical leg length discrepancy is extremely common, affecting approximately 90% of the general population[1](https://pmc.ncbi.nlm.nih.gov/articles/PMC8687568/)[2](https://www.physio-pedia.com/Leg_Length_Discrepancy)[4](https://ecios.org/DOIx.php?id=10.4055%2Fcios20224)[7](https://www.jbjs.org/summary.php?id=347&native=1). Most individuals have some degree of difference in leg length, often very small and asymptomatic.

Magnitude of Discrepancy:

About 41% of people have a discrepancy of 0–4 mm.

Approximately 37% have discrepancies of 5–9 mm.

Around 20% have discrepancies greater than 9 mm, with about 15% between 10–14 mm, and 6.4% exceeding 14 mm

Discrepancies above 5 mm are associated with increased risk of osteoarthritis and low back pain

Anatomical LLD refers to actual bone length differences due to congenital or acquired causes such as fractures, infections, or growth disturbance

Functional LLD arises from biomechanical or muscular imbalances without true bone length difference

Discrepancies greater than 20 mm (2 cm) occur in up to two-thirds of some populations, especially in pediatric groups with congenital or acquired disorders

Use of corrective devices is less common; prevalence of people using corrective apparatus is about 1 per 1000 population, with an incidence of prescriptions around 2.16 per 100,000  
Males are affected nearly twice as often as females in some epidemiologic studies (male-to-female ratio ~1.95:1)

Athlete Population:  
LLD prevalence in athletes is reported around 40%, with most discrepancies under 10 mm and often asymptomatic

Clinical Impact:  
LLD greater than 5–6 mm correlates with increased low back pain and risk of hip and knee osteoarthritis. Discrepancies over 10 mm are linked to higher rates of joint replacement surgeries

## **De-Identified Doctor-Patient Conversation on Lower Limb Length Discrepancy (LLD)**

Patient:

Doctor, I’ve noticed that one of my legs seems shorter than the other, and sometimes I feel pain in my back and hips. Could this be a leg length discrepancy?

Doctor:

Yes, it’s possible. Leg length discrepancy, or LLD, means one leg is shorter than the other. This can cause uneven posture, gait problems, and sometimes pain in the lower back, hips, or knees as your body tries to compensate.

Patient:

How do you determine if I have LLD and how severe it is?

Doctor:

We start with a physical exam and measure your leg lengths. One common method is placing blocks under the shorter leg until your pelvis is level. Imaging tests like X-rays or full-length standing films can give precise measurements of the bone lengths. Differences less than about 1.5 to 2 cm are often not clinically significant.

Patient:

What causes leg length discrepancy?

Doctor:

There are several causes. Some people are born with it (congenital), others develop it due to injuries like fractures, infections, or growth plate problems during childhood. Sometimes it results from medical conditions affecting bone growth or after surgeries. There’s also functional LLD, where the bones are equal length but muscles or joints cause apparent shortening.

Patient:

What are my treatment options?

Doctor:

For small discrepancies under 2 cm, often no treatment is needed. If you have symptoms, shoe lifts or orthotic inserts can help balance your gait and reduce pain. Physical therapy can improve muscle strength and flexibility. For larger discrepancies, especially over 2 cm, surgical options like limb lengthening or growth modulation procedures may be considered.

Patient:

How long does treatment take?

Doctor:

Non-surgical treatments like shoe lifts and therapy can provide relief quickly. Surgical treatments involve a longer process—limb lengthening procedures can take several months including recovery and rehabilitation.

Patient:

Will this affect my daily activities or sports?

Doctor:

If untreated and significant, LLD can cause discomfort and limit activity. With proper management, most people can return to normal activities and sports. We tailor treatment to your specific needs and lifestyle.

Patient:

Should I see a specialist?

Doctor:

Yes, especially if you have noticeable symptoms or a discrepancy over 2 cm. An orthopedic specialist can evaluate you and recommend the best treatment.

Patient: Thank you, Doctor. That helps me understand what’s going on and what to do next.

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### **osteogenesis imperfecta**

**Definition and description**

Osteogenesis imperfecta (OI), also known as brittle bone disease, is a connective tissue disease that makes your bones fragile and easily broken, with little or no force. It causes your body to make less type I collagen than it needs, or to make improperly formed collagen. The name osteogenesis imperfecta means “imperfectly formed bone.”

Collagen is a protein that plays an important role in the structure and development of your bones, skin, muscles and tendons. This means people with brittle bone disease not only have many bone fractures in their lives; they can also have issues with their teeth, skin, spine, lungs and other parts of their bodies.

While the most common form of osteogenesis imperfecta usually causes mild symptoms, some forms can cause severe disabilities.

#### **Types of osteogenesis imperfecta**

Healthcare providers classify osteogenesis imperfecta into 19 types (type I through type XIX), depending on collagen formation and its effects on your body. Types I through IV are the most common.

People with type I (1) osteogenesis imperfecta have lower amounts of normal collagen than people without OI. People with types II (2), III (3) and IV (4) have improperly formed collagen and more severe symptoms.

##### **Type I**

This is the most common form of OI. It causes milder symptoms than other types. People with type I osteogenesis imperfecta get broken bones more easily than people without it, but most broken bones happen before puberty. It doesn’t cause bone deformity. It’s also called classic non-deforming osteogenesis imperfecta with blue sclerae.

##### **Type II**

Type II is the most serious form of osteogenesis imperfecta. It causes severe complications, like underdeveloped lungs (due to poor rib cage development), serious bone deformities and multiple broken bones before birth. Babies with type II osteogenesis imperfecta die at or shortly after birth. It’s also known as perinatally lethal osteogenesis imperfecta.

##### **Type III**

Type III osteogenesis imperfecta is the most severe form of OI that you can survive past birth. It causes severe bone deformities, making bones very fragile and easily breakable, and leading to physical disabilities. Babies often have broken bones at birth. It’s also called progressively deforming osteogenesis imperfecta.

##### **Type IV**

Type IV is more severe than type I but less severe than type III. People with Type IV have mild to moderate bone deformities, causing bones that are more fragile than people without OI, but not as easily broken as with type III OI. It’s also called common variable osteogenesis imperfecta with normal sclerae.

Osteogenesis imperfecta is rare. It affects around 1 in every 20,000 people worldwide.

## **Symptoms of osteogenesis imperfecta (brittle bone disease)**

Signs and symptoms of osteogenesis imperfecta can include:

* Brittle bones that break easily.
* Bone deformities.
* Bone pain.
* Blue or gray sclerae (the whites of your eyes).
* Bruising easily.
* Difficulty breathing.
* Hearing loss.
* Loose joints.
* Muscle weakness.
* Curved spine (kyphosis or scoliosis).
* Small stature.
* Triangular face shape.
* Weak, brittle or discolored teeth.
* Teeth that don’t align properly (malocclusion).
* Barrel-shaped rib cage.

### **What causes osteogenesis imperfecta?**

A genetic variation (mutation) causes osteogenesis imperfecta (brittle bone disease). Mutations in the *COL1A1* or *COL1A2* genes cause most cases. These two genes make type I collagen, which helps keep bones strong. A change in one of these two genes causes your body to either make less collagen than it needs or to make improperly formed collagen. More rare forms are caused by changes in other collagen genes.

Changes that cause OI may be sporadic (random) or you might inherit the gene from one or both biological parents. Some people are carriers for the gene variation that causes OI — and can pass it on to their children — but don’t have it themselves.

The four most common types of osteogenesis imperfecta are inherited in an autosomal dominant pattern. Other types are inherited in an autosomal recessive or X-linked pattern.

#### **Risk factors for osteogenesis imperfecta**

Anyone can be born with brittle bone disease. But you’re more likely to have OI if someone else in your biological family has it.

### **Complications of osteogenesis imperfecta**

Complications of osteogenesis imperfecta depend on the type and severity. They include:

* Heart disease, including heart failure.
* Frequent pneumonia.
* Respiratory issues, including respiratory failure.
* Issues that affect your nervous system.

## **Diagnosis and Tests**

Providers usually diagnose brittle bone disease in childhood with:

* Genetic testing.
* Bone density tests.

A pregnancy care provider might suspect osteogenesis imperfecta before birth based on ultrasound images. They can confirm the diagnosis during pregnancy with an amniocentesis (with genetic testing on the cells) or after the baby is born.

## **Management and Treatment**

Treatment for osteogenesis imperfecta can increase bone strength and help people with OI live more independently. Treatment may include:

* **Occupational therapy (OT).** OT can help you with skills to manage daily activities.
* **Physical therapy (PT).** Physical therapy can help you strengthen your bones and muscles with low-impact exercises.
* **Assistive devices.** Aids like walkers, canes or crutches can improve mobility.
* **Oral and dental care.** Regular dental checkups can help monitor and address tooth and jaw issues. You may need orthodontic care to correct certain issues.
* **Pulmonary care.** You may see a pulmonologist (a doctor who specializes in lung conditions) to help with breathing issues.
* **Medications.** Your provider may prescribe bisphosphonates to help strengthen bones.
* **Surgery.** A surgeon may place metal rods to correct curved or misshapen bones. The rods also help support your bones.
* **Braces, splints or casts.** Protective devices stabilize broken bones during healing or after surgery.

## **Diagnostic Considerations**

Because osteogenesis imperfecta (OI) can manifest itself in a wide variety of ways, differential diagnoses are best categorized into the following three stages of life:

* Antenatal/neonatal
* Preschool/childhood
* Adolescence/adulthood

In addition to the conditions listed in the differential diagnosis, other conditions that should be considered in the antenatal/neonatal stage include the following:

* Jeune dystrophy
* Camptomelic dysplasia
* Chondrodysplasia punctata
* Chondroectodermal dysplasia (Ellis–van Creveld syndrome)
* Nonaccidental injury

Hypophosphatasia may also be present. Patients may have blue sclerae, fractures, and wide fontanelles. This condition is characterized by low serum alkaline phosphatase levels and, in the severe recessive form, skin dimples overlying Bowdler spurs located symmetrically on the midshaft of the fibula, ulna, and radius.

Other conditions that should be considered in the preschool/childhood stage include the following:

* Pyknodysostosis
* Hajdu-Cheney syndrome
* Osteochondromatosis
* Nonaccidental injury

Other conditions that should be considered in the adolescence/adulthood stage include the following:

* Maffucci syndrome

For genetic conditions, patients present with fractures. For idiopathic juvenile osteoporosis, patients aged 8-13 years present with skeletal pain, atraumatic fracture, and reduced bone density. The condition remits by early adulthood.

It is of particular importance to differentiate between OI and child abuse (though it must be kept in mind that the two can also coexist). Mild OI is most likely to be confused with child abuse.The sclera and teeth are normal in many patients with OI. A family history is often not present. Keys to distinguishing OI from child abuse if no other stigmata of OI are present include the following points:

* The type of fracture is of diagnostic significance; although any type of long bone fracture can occur in OI, certain types are rare; metaphyseal corner fractures, which are common in child abuse, are rare in OI
* In children with OI, fractures may continue to occur while they are in protective custody; however, this scenario is hard to evaluate
* Child abuse can also be differentiated from OI on the basis of nonskeletal manifestations (eg, retinal hemorrhage, visceral intramural hematomas, intracranial bleeds of various ages, pancreatitis, and splenic trauma)

Collagen analysis is useful in difficult cases, but a negative result does not rule out OI.

## **Differential Diagnoses**

* Achondroplasia
* Genetics of Menkes Disease
* Glucocorticoid Therapy and Cushing Syndrome
* Homocystinuria/Homocysteinemia
* McCune-Albright Syndrome
* Osteopetrosis
* Osteoporosis
* Pediatric Acute Lymphoblastic Leukemia
* Rickets
* Scurvy (Vitamin C Deficiency)
* Thanatophoric Dysplasia
* Wilson Disease

## **Epidemiology**

The overall incidence of OI is approximately 1 case for every 20,000 live births; however, the mild form is underdiagnosed, and the actual prevalence may be higher. Prevalence appears to be similar worldwide, though an increased rate has been observed in two major tribal groups in Zimbabwe.

OI can present at any age, though the age when symptoms (ie, fractures) begin varies widely. Patients with mild forms may not have fractures until adulthood, or they may present with fractures in infancy. Patients with severe cases present with fractures in utero.

OI is equally common in males and females. It has been described in every human population in which skeletal dysplasias have been studied. The disease appears to have no predilection for a particular race.

## **Drug Information and Side Effects**

## Commonly Used Medications

1. Bisphosphonates (BPs)

* Examples: Pamidronate, Zoledronate, Alendronate, Risedronate
* Purpose: Increase bone mineral density, reduce fracture risk, and improve bone strength by inhibiting osteoclast-mediated bone resorption.
* Administration: Pamidronate is often given intravenously every 3-6 months in children; oral bisphosphonates like risedronate may be used in adolescents and adults.
* Side Effects:
  + Flu-like symptoms (fever, muscle aches) especially after first infusion
  + Hypocalcemia (low blood calcium), requiring calcium and vitamin D monitoring and supplementation
  + Gastrointestinal irritation (with oral forms)
  + Rarely, osteonecrosis of the jaw and atypical femoral fractures with long-term use
* Notes: Treatment is usually continued throughout childhood until growth completion.

2. Denosumab

* Purpose: A monoclonal antibody that inhibits osteoclast formation and function, reducing bone resorption.
* Side Effects: Hypocalcemia, infections, potential rebound bone loss after discontinuation.
* Status: Used experimentally or in cases refractory to bisphosphonates.

3. Synthetic Parathyroid Hormone (PTH) Analogues

* Purpose: Stimulate bone formation by activating osteoblasts.
* Side Effects: Hypercalcemia, leg cramps, dizziness.
* Use: Limited data in OI; more common in osteoporosis treatment.

4. Growth Hormone Therapy

* Purpose: Used in children to improve growth velocity and potentially bone density.
* Side Effects: Joint pain, insulin resistance, increased intracranial pressure (rare).

5. Calcitonin

* Occasionally used for bone pain relief but less common.

## Supportive Treatments

* Physical therapy: To improve muscle strength and mobility.
* Bracing and splints: To prevent deformities and provide support.
* Surgical interventions: For fracture fixation, correction of bone deformities, or scoliosis.

## **Procedures and Their Timelines**

## 1. Fracture Care

* What: Casting, splinting, or bracing to immobilize fractures and promote healing.
* Timeline: Bone healing in OI occurs at a similar rate to non-OI bones, typically 4 to 8 weeks depending on fracture location and severity.
* Considerations: Use of lightweight casts or removable orthoses to avoid additional fractures or osteopenia from prolonged immobilization

## 2. Physical Therapy

* What: Muscle strengthening, aerobic conditioning, and functional training to improve mobility and prevent fractures.
* Timeline: Ongoing throughout life; therapy programs are individualized and may be intensified after fractures or surgeries

## 3. Bracing and Assistive Devices

* What: Leg braces, wheelchairs, or custom orthotics to support weak muscles, align joints, and improve mobility.
* Timeline: Used as needed, often lifelong, to maintain function and reduce pain

## 4. Surgical Procedures

* Intramedullary Rodding:
  + What: Insertion of metal rods inside long bones (femur, tibia, humerus) to strengthen bones, prevent fractures, and correct deformities. Some rods are telescoping and grow with the child.
  + Timeline: Surgery is typically planned after multiple fractures or significant deformity; rods may last years but sometimes require revision or replacement. Recovery from surgery usually takes 6 to 12 weeks before weight-bearing resumes, followed by physical therapy
* Corrective Osteotomies:
  + What: Bone cuts to correct deformities, often combined with rodding.
  + Timeline: Performed alongside rodding; healing timeline similar to fracture care.
* Scoliosis Surgery:
  + What: Spinal fusion or instrumentation to correct scoliosis, common in moderate to severe OI.
  + Timeline: Recovery can take several months with intensive rehabilitation.
* Surgery for Basilar Invagination:
  + What: Neurosurgical procedure to relieve brainstem compression caused by skull base deformity.
  + Timeline: Complex surgery with variable recovery depending on severity.
* Hearing Loss Surgery:
  + What: Procedures like stapedectomy to improve conductive hearing loss.
  + Timeline: Recovery usually weeks; hearing improvement varies.
* Soft Tissue Surgery:
  + What: Procedures to release contractures, e.g., Achilles tendon lengthening.
  + Timeline: Recovery depends on procedure; physical therapy essential.

## 5. Medication Administration

* Bisphosphonates:
  + Administered cyclically (e.g., intravenous pamidronate every 3-6 months) to increase bone density.
  + Treatment duration may span several years during growth phases.
  + Effects on fracture rates and pain vary; ongoing monitoring required

## **Outlook / Prognosis**

Life expectancy for someone with the most common (and mildest) form of osteogenesis imperfecta can be the same as someone without it. But life expectancy varies greatly depending on the type. For instance:

* People with type I usually live a typical lifespan.
* People with type IV generally live into adulthood but may have a slightly shortened lifespan.
* Babies with type II die at or shortly after birth.

## **Prevention**

Because brittle bone disease is a genetic condition, you can’t prevent it. If you or your partner has OI or if you have a relative with the condition, you can talk to a genetic counselor. They can advise you about the risks of passing on the condition.

## **Living With**

If you or your child has osteogenesis imperfecta, you can help keep bones healthy by:

* Eating foods high in calcium and vitamin D.
* Participating in physical activities as recommended by your healthcare provider.
* Limiting alcohol and caffeine intake.
* Quitting smoking and avoiding secondhand smoke.
* Taking care of your mental health. Especially for children and teens, it might be helpful to talk to a social worker or counselor about mental health issues that can come with chronic illnesses.

### **When should I see my healthcare provider?**

If you notice you or your child gets broken bones easily — especially without significant injury — or has other symptoms of OI, talk to a healthcare provider. They can recommend additional testing if needed.

Go to the nearest emergency room if you or your child breaks a bone. Let them know if you have osteogenesis imperfecta.

### **Common Questions**

### **Can someone with osteogenesis imperfecta walk?**

Yes, people with mild forms of osteogenesis imperfecta can walk. Some people may use braces or crutches. Early treatments like physical and occupational therapy can help increase the chances that your child will be able to walk.

## What type of osteogenesis imperfecta do I/does my child have?

OI is classified into several types based mainly on severity, clinical features, and genetics:

* Type I (Mild): Most common and mildest form. Features include normal or near-normal stature, bone fragility with fractures, blue sclera (whites of eyes), possible hearing loss, and minimal bone deformity.
* Type II (Perinatal lethal): Most severe form, usually fatal shortly after birth due to respiratory failure. Characterized by multiple fractures and severe bone deformities detected prenatally.
* Type III (Severe, progressively deforming): Severe deformities, multiple fractures from birth, short stature, and often wheelchair-dependent.
* Type IV (Moderate severity): Between types I and III; moderate deformities, normal sclera, variable fracture frequency.
* Other types (V, VI, VII, VIII) are rarer and have variable features.

Your doctor can determine the type based on clinical exam, family history, genetic testing, and imaging.

## 2. What should I know about the life expectancy with OI?

* Mild forms (Type I): Normal or near-normal life expectancy with proper management.
* Severe forms (Type III and IV): Life expectancy may be reduced due to complications like fractures, respiratory issues, or deformities but many live into adulthood.
* Type II: Usually fatal in the perinatal period.

Advances in treatment have improved quality of life and survival for many patients.

## 3. How can I manage (or help my child manage) OI symptoms?

* Medical treatment: Bisphosphonates to increase bone density and reduce fractures.
* Physical therapy: To improve muscle strength, mobility, and prevent deformities.
* Surgical care: Corrective surgeries like intramedullary rodding to stabilize bones.
* Lifestyle: Avoid high-impact activities, ensure safe environments to reduce fracture risk.
* Nutrition: Adequate calcium and vitamin D intake.
* Regular monitoring: For hearing, dental issues, and respiratory health.

## 4. What should I do if I/my child breaks a bone?

* Seek prompt medical evaluation for proper diagnosis and treatment.
* Immobilize the limb with splints or casts as advised.
* Follow your healthcare provider’s instructions for pain management and rehabilitation.
* Notify your specialist managing OI to coordinate care and adjust treatments if needed.

## 5. What are the chances that I’ll have another child with osteogenesis imperfecta?

* OI is often inherited in an autosomal dominant pattern, meaning a 50% chance of passing the mutation if one parent is affected.
* Some cases arise from new (de novo) mutations with no family history.
* Genetic counseling and testing can provide personalized risk assessment for future pregnancies.

## **Osteogenesis Imperfecta (OI) Genomic Data**

## Genetic Basis of OI

* OI is primarily caused by mutations in genes involved in the synthesis and processing of type I collagen, the main structural protein in bone. The two most commonly affected genes are:
  + COL1A1 (collagen type I alpha 1 chain)
  + COL1A2 (collagen type I alpha 2 chain)
* Mutations in these genes account for the majority of OI cases, especially the classical autosomal dominant forms (Types I-IV). These mutations often lead to either reduced production or structurally abnormal collagen, resulting in fragile bones.

## Genetic Heterogeneity and Other Genes

* Beyond COL1A1 and COL1A2, at least 21 genes have been identified that cause various forms of OI, including recessive and rare types. These genes affect collagen modification, folding, bone mineralization, and osteoblast function. Examples include:
  + SERPINF1 (Type VI) — autosomal recessive, involved in bone mineralization
  + CRTAP, LEPRE1, PPIB (Types VII-IX) — involved in collagen post-translational modification
  + SERPINH1, FKBP10 (Types X and XI) — chaperones important for collagen folding
  + SP7 (Type XII) — transcription factor for osteoblast differentiation
  + BMP1 (Type XIII) — involved in collagen processing
  + WNT1 — involved in osteoblast proliferation and differentiation
  + CREB3L1 — ER-stress transducer affecting collagen gene regulation
* These non-COL1A1/2 mutations often cause autosomal recessive forms of OI, which can be more severe or have different clinical features.

## Mutation Types and Inheritance

* Most COL1A1 and COL1A2 mutations are heterozygous and inherited in an autosomal dominant manner. Each child of an affected individual has a 50% chance of inheriting the mutation.
* Recessive forms require mutations in both copies of the gene (homozygous or compound heterozygous).
* Mutations include missense, nonsense, splice-site, insertions/deletions, and gene rearrangements.

## **De-Identified Doctor-Patient Conversation on Osteogenesis Imperfecta (OI)**

Patient:

Doctor, my child has been diagnosed with osteogenesis imperfecta. Can you explain what this means?

Doctor:

Of course. Osteogenesis imperfecta, or OI, is a genetic condition that affects the bones, making them more fragile and prone to fractures. It’s sometimes called “brittle bone disease.” The severity can vary widely—from mild cases with few fractures to more severe forms with frequent breaks and bone deformities.

Patient:

What causes OI?

Doctor:

It’s caused by mutations in the genes responsible for producing type I collagen, a key protein that gives bones their strength. Most commonly, mutations occur in the COL1A1 or COL1A2 genes. These mutations lead to weaker or insufficient collagen, which makes bones fragile.

Patient:

How is OI treated?

Doctor:

Treatment focuses on preventing fractures, managing pain, and improving mobility. We often use medications called bisphosphonates to strengthen bones. Physical therapy is important to build muscle strength and improve movement. In some cases, surgery may be needed to correct bone deformities or insert rods to support long bones.

Patient:

What about my child’s daily life? Can they play sports or go to school normally?

Doctor:

Many children with OI can attend school and participate in activities, but it’s important to avoid high-impact sports that increase fracture risk. Activities like swimming and walking are usually encouraged. We tailor recommendations based on your child’s specific type and severity.

Patient:

What should I do if my child breaks a bone?

Doctor:

If your child has a fracture, seek medical care promptly. Treatment may involve casting or bracing. We’ll also coordinate ongoing care to monitor healing and adjust treatments to reduce future fracture risk.

Patient:

Is OI inherited? What are the chances of having another child with it?

Doctor:

OI is usually inherited in an autosomal dominant pattern, meaning if one parent has the mutation, there’s a 50% chance of passing it to each child. However, some cases result from new mutations with no family history. Genetic counseling can help assess your family’s specific risk.

Patient:

Will my child’s condition get worse over time?

Doctor:

It depends on the type of OI. Some forms are stable or improve with growth, while others may have ongoing fractures and deformities. With modern treatments, many people with OI live full lives with good quality of life.

Patient: Thank you, Doctor. This helps me understand what to expect and how to support my child.

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**TENDONITIS**

**DEFINITION AND DESCRIPTION**

Tendonitis (tendinitis) is the inflammation or irritation of a tendon that makes it swell. Tendons are strands of connective tissue between muscles and bones that help you move. This condition usually happens after a repetitive strain or overuse injury. It’s common in your shoulders, elbows and knees. If you have tendonitis, you’ll feel pain and soreness around your affected joint, usually near where the tendon attaches to the bone. Tendonitis can be either acute (short-term) or chronic (long-term).

#### **Types of tendonitis**

Types of tendonitis get their names after sports and the area of your body where injuries happen. Some of the most common types of tendonitis include:

* Tennis elbow.
* Golfer’s elbow.
* Pitcher’s shoulder.
* Swimmer’s shoulder.
* Runner’s knee (jumper’s knee).

Tendonitis is a relatively common condition. This is because people participate in occupations, activities or hobbies where they can easily overuse or injure their tendons.

## **Symptoms of tendonitis**

The most common symptoms of tendonitis include:

* Pain at the site of your tendon and the surrounding area. This pain can get worse when you move.
* Stiff joints or difficulty moving your joints.
* Hearing and feeling a cracking or popping sensation when you move.
* Swelling, often with skin discoloration (red to purple or darker than your natural skin tone).

The pain you feel with tendonitis may be gradual or sudden and severe, especially if you have calcium deposits. Calcium deposits are a buildup of calcium in your tissues that looks like firm white to yellow bumps on your skin. These bumps can cause itchy skin.

#### **Where on my body will I have symptoms of tendonitis?**

Tendinitis can occur in almost any area of your body where a tendon connects a bone to a muscle. The most common places are:

* Base of your thumb.
* Elbow, usually along the outer part of the forearm, when your palm is facing up, near where the tendon attaches to the outside part of the elbow.
* Shoulder.
* Hip.
* Knee, usually below the kneecap where your tendon attaches to your lower leg (tibia).
* Achilles tendon, which connects your calf muscles to your heel bone.

### **What causes tendonitis?**

Causes of tendonitis could include:

* Overuse or repetitive movements over time (like running or throwing).
* Strain from sudden movements.
* An injury.

In addition, tendonitis could be a side effect of a medication, including statins or drugs that lower cholesterol or fluoroquinolone antibiotics.

Certain underlying medical conditions can also cause tendonitis, such as:

* Diabetes.
* Rheumatoid arthritis.
* Gout/pseudogout.
* Osteoarthritis.
* An infection.

#### **Risk factors for tendonitis**

Anyone can get tendonitis. But it’s more common in those who do repetitive activities. Some of these activities include:

* Gardening/landscaping.
* Woodworking.
* Shoveling.
* Painting.
* Scrubbing.
* Playing sports like tennis, golf or baseball.

Other risk factors for tendonitis include:

* Poor posture.
* Presence of certain conditions that can weaken your muscles.
* Your age. After age 40, your tendons tolerate less stress, are less elastic and tear more easily.

### **Complications of tendonitis**

If left untreated, tendonitis could lead to:

* Chronic tendonitis (a constant, dull pain when you move).
* Difficulty or inability to move the affected part of your body.
* Torn tendons (tendon rupture).
* Muscle weakness.

## **Diagnosis and Tests**

A healthcare provider will diagnose tendonitis after a physical exam and testing. During the exam, your provider will take a complete medical history and ask you questions about your symptoms. They’ll order tests to confirm a diagnosis. Imaging tests help your provider see your tendons and could include:

* An X-ray.
* An MRI (magnetic resonance imaging).

## **Management and Treatment**

There are two steps to treat tendonitis. The first step includes:

* Icing the area the day of your injury.
* Avoiding activities that cause symptoms.
* Resting the injured area.
* Taking over-the-counter (OTC) anti-inflammatory medicines.

If tendonitis doesn’t improve in about three weeks, a healthcare provider will offer additional treatment that could include:

* **Corticosteroid injections:** Corticosteroids (often called “steroids”) work quickly to decrease the inflammation and pain in your tendon.
* **Physical therapy:** Physical therapy includes a range of motion exercises and splinting (thumb, forearm or hands). Physical therapy will focus on reducing inflammation, improving soft tissue mobility to the muscle (where that tendon originates from), and restoring movement, function and strength over time. With tendinitis-type injuries, a gradual loading of the tendon (eccentric loading), is essential to improving the condition and restoring function. Therapy may also be useful in screening other joints for mobility deficits that may have led to the development of tendonitis. A common example is looking at shoulder mobility when working with a person who has a tennis elbow.
* **Surgery:** This is rarely needed and is only for severe symptoms that don’t respond to other treatments.

#### **Side effects of the treatment**

Before you begin treatment, talk to your healthcare provider about possible side effects. You may experience:

* Pain at your injection site if you receive corticosteroid injections.
* Soreness after physical therapy.
* Bleeding or an infection after surgery.

Nonsteroidal anti-inflammatory drugs (NSAIDs) are effective in relieving tendinopathy pain, and may be administered topically or orally. However, because the vast majority of tendinopathies are not inflammatory, whether NSAIDs are more effective than other analgesics is unclear.

Corticosteroid injection may be considered for patients with tendonitis in whom conservative therapy with rest, immobilization, and anti-inflammatory agents has failed. The corticosteroid (eg, triamcinolone) is typically combined with a local anesthetic (eg, lidocaine) to provide prompt analgesia; in addition, pain relief confirms the diagnosis and accurate placement of the corticosteroid.

The efficacy of locally injected steroids is debated. A systematic review concluded that steroid injections provide short-term pain relief but may not have long-term efficacy.Response to injection therapy may vary with the anatomic site of tendinopathy.

Never use injections for Achilles tendonitis, because cases of Achilles tendon rupture have been reported following a single injection of corticosteroid. Avoid repetitive corticosteroid injections in any site, as well as injection directly into a tendon, because of the risk of tendon rupture. The use of ultrasound to direct these treatments improves accuracy and performance by facilitating visualization of the target and relevant adjacent structures.

In patients with calcific tendonitis of the shoulder, a systematic review concluded that ultrasound (US)-guided needling and lavage has a high success rate and low complication rate.In a randomized controlled study in 48 patients with calcific tendonitis of the rotator cuff that compared the combination of barbotage and US-guided corticosteroid injection in the subacromial bursa with subacromial bursa injection alone, both treatment groups demonstrated improvement at 1-year follow-up, but clinical and radiographic results were significantly better in the barbotage group.After US-guided treatment, recovery may be enhanced by use of a rehabilitation protocol that focuses on mobility, strength, and function.

A retrospective evaluation of double-needle US-guided percutaneous fragmentation and lavage (DNL) in 147 patients with rotator cuff calcific tendinitis found DNL to be safe and effective, with prompt relief of pain and function restoration.However, a systematic review of the efficacy of US-guided needle lavage in treating calcific tendinitis found a lack of high-quality evidence to determine the relative efficacy.

### Surgical therapy

Patients with symptoms resistant to conservative therapy may benefit from arthroscopic or open surgical treatment for tendon decompression and tenodesis. A Japanese study in 23 patients with chronic lateral epicondylitis who underwent arthroscopic surgery found that the procedure provided significant improvement in pain and functional recovery up to 3 months after surgery. However, the visual analog scale (VAS) for pain and satisfaction criteria during activity did not fall below 10 points until 6 months postoperatively.

A systematic review of surgical outcomes for the treatment of medial epicondylitis in 479 elbows included 13 studies of open approaches, two studies of arthroscopic approach, and one study with a percutaneous approach. Success rates were in the range of 63-100%, and the complication rate was low, at 4.3%. The rate of return to sports was 81-100%, and that of return to work was 66.7-100% (only one study reported a return-to-work rate lower than 90%). The evidence was insufficient to determine superiority among the three approaches.

Isolated gastrocnemius recession has been shown to provide significant and sustained pain relief for chronic Achilles tendinopathy. Good function can be expected for activities of daily living, however ankle plantarflexion power and endurance deficits were noted.

### Platelet-rich therapies

Platelet-rich therapies represent an experimental approach to treatment of tendinopathies and other musculoskeletal soft tissue injuries. In this technique, a quantity of the patient's blood is centrifuged and the active, platelet-rich fraction is extracted and applied to the injured tissue (eg, by injection). Platelet-rich plasma (PRP) has the potential to promote cell proliferation and differentiation, regulate angiogenesis, increase extracellular matrix synthesis, and modulate inflammation in degenerative tendons. In theory, the growth factors produced by platelets should enhance tissue healing.

Although platelet-rich therapies are gaining wider use, however, few level one studies exist demonstrating a clear benefit.

## Nonsteroidal anti-inflammatory drugs (NSAIDs)

These agents are used for the relief of mild to moderate pain. Although the effects of NSAIDs in the treatment of pain tend to be patient specific, ibuprofen usually is the drug of choice (DOC) for initial therapy. Other options include naproxen and indomethacin.

## [Ibuprofen (Motrin, Advil, Ibuprin, Nuprin)](https://reference.medscape.com/drug/advil-motrin-ibuprofen-343289)

Usually DOC for treatment of mild to moderate pain if no contraindications are present.

Inhibits inflammatory reactions and pain, probably by decreasing activity of the enzyme cyclooxygenase, which results in inhibition of prostaglandin synthesis.

## [Naproxen (Naprosyn, Aleve)](https://reference.medscape.com/drug/aleve-anaprox-naproxen-343296)

For relief of mild to moderate pain. Inhibits inflammatory reactions and pain by decreasing activity of enzyme cyclooxygenase, which results in decrease of prostaglandin synthesis.

## [Indomethacin (Indocin, Indochron E-R)](https://reference.medscape.com/drug/indocin-indomethacin-343290)

Rapidly absorbed; metabolism occurs in liver by demethylation, deacetylation, and glucuronide conjugation; inhibits prostaglandin synthesis.

## Corticosteroids

These agents have both anti-inflammatory (glucocorticoid) and salt-retaining (mineralocorticoid) properties. Glucocorticoids have profound and varied metabolic effects. In addition, these agents modify the body's immune response to diverse stimuli.

## [Dexamethasone acetate (Decadron, AK-Dex, Alba-Dex, Dexone)](https://reference.medscape.com/drug/decadron-dexamethasone-intensol-dexamethasone-342741)

Decreases inflammation by suppressing migration of polymorphonuclear leukocytes and reducing capillary permeability. Dosage varies with degree of inflammation and size of affected area.

## [Methylprednisolone acetate (Solu-Medrol, Depo-Medrol, Medrol)](https://reference.medscape.com/drug/medrol-medrol-dosepak-methylprednisolone-342746)

Decreases inflammation by suppressing migration of polymorphonuclear leukocytes and reversing increased capillary permeability.

Use 0.5-1 mL (40 mg/mL) mixed with equal or double volume of 1% local anesthetic (ie, lidocaine). Dosage varies with degree of inflammation and size of affected area.

## [Hydrocortisone acetate (Solu-Cortef, Cortef)](https://reference.medscape.com/drug/alkindi-sprinkle-cortef-hydrocortisone-342744)

Decreases inflammation by suppressing migration of polymorphonuclear leukocytes and reversing increased capillary permeability.

Use 0.5-1 mL (25 or 50 mg/mL) mixed with equal or double volume of 1% local anesthetic (ie, lidocaine). Dosage varies with degree of inflammation and size of affected area.

## **Tendonitis Procedures and Timelines**

## Initial Treatment (First 2-3 Weeks)

* Rest: Avoid activities that stress the affected tendon to allow healing. Rest for 2 to 3 days initially, then gradually resume gentle movement to prevent stiffness.
* Ice: Apply ice packs wrapped in a towel for 15-20 minutes every 2-3 hours to reduce pain and inflammation.
* Compression and Support: Use elastic bandages, braces, or soft splints to support the tendon and reduce swelling.
* Medications: Over-the-counter NSAIDs like ibuprofen or paracetamol can relieve pain and inflammation. Topical NSAID gels may also be used.
* Avoid: Heavy lifting, repetitive gripping, or twisting motions that worsen symptoms during healing.

## Physical Therapy (Starting After Initial Rest)

* Timeline: Usually begins after pain decreases, often within 1-3 weeks.
* Focus: Gentle stretching, strengthening exercises, and gradual return to normal tendon function. Therapy helps restore range of motion and prevent re-injury.
* Duration: Several weeks to months depending on severity.

## Advanced Treatments (If Symptoms Persist Beyond 3 Weeks)

* Steroid Injections: Cortisone injections may reduce inflammation and pain but are used cautiously due to potential tendon weakening.
* Platelet-Rich Plasma (PRP) Therapy: Uses concentrated platelets from your blood to promote healing; still under investigation.
* Dry Needling: Insertion of fine needles into the tendon to stimulate healing and relieve muscle tightness.
* Soft Tissue Massage: Helps improve blood flow and reduce muscle tension around the tendon.

## Surgical Intervention (Rare Cases)

* Indications: Severe tendon tears, chronic tendonitis unresponsive to conservative treatments, or tendon rupture.
* Procedures: Arthroscopic or open surgery to remove inflamed tissue, repair tears, or release tight structures.
* Recovery: Post-surgery rehabilitation includes rest, gradual mobilization, and physical therapy. Healing may take several weeks to months.

### **How long does tendonitis take to heal?**

It could take between two to three weeks for your tendon to heal after tendonitis treatment. It can take a few months if you have a severe case of tendonitis. The best way to speed up your healing time is to rest. Don’t participate in strenuous exercises or activities that can put stress on your healing tendon. Your healthcare provider will let you know when it’s safe to return to your favorite sports and activities after your tendon heals.

## **Outlook / Prognosis**

Most people diagnosed with tendonitis have an excellent prognosis after treatment and rest. It may take a few weeks to a couple of months to recover from tendonitis, depending on the severity of your injury. Wait until your healthcare provider gives you the “all clear” to resume your regular physical activities.

If you develop tendonitis and receive treatment for it, you can get the injury again in the future if you put too much stress on your tendons. This is a repetitive strain injury. Your healthcare provider, sports medicine physician or physical therapist can give you advice to reduce your risk of developing repeat tendonitis in the future.

## **Prevention**

To avoid getting tendonitis, follow these tips:

* Avoid staying in the same position. Take breaks every 30 minutes.
* Learn proper posture and body positions for all activities.
* Position your body directly in front of the object you want to pick up. Reach for the object by stretching your arm and hand directly forward toward the object. Never grab objects with your arm in a sideways position. If reaching for an object overhead, center your body and reach up and grab the item with both hands.
* Use a firm, but not a tightly squeezed, grip when working with or picking up objects.
* Don’t use one hand to carry heavy objects. Don’t hold the heavy object in one hand at the side of your body.
* Avoid sitting with your leg folded under your bottom.
* Stop any activity if you feel pain.

You can reduce your risk of developing tendonitis by following these steps before exercising or starting a sports activity:

* Stretch and warm up before starting the activity.
* Wear properly sized and fitted clothes, shoes and equipment.
* Start slow. Gradually increase your activity level.
* Stop your activity if you feel pain.

### **When should I see a healthcare provider?**

You should see a healthcare provider if you experience any of the following:

* Fever (over 100 degrees Fahrenheit or 38 degrees Celsius.).
* Swelling, redness and warmth.
* General illness.
* Multiple sites of pain.
* Inability to move the affected area.

These could be signs of another condition that needs more immediate attention.

## **Tendonitis Epidemiology**

* Tendonitis (also spelled tendinitis) is a common musculoskeletal condition characterized by inflammation or irritation of a tendon, often caused by repetitive motion, overuse, or injury.
* Prevalence:  
  Tendonitis affects a significant portion of the population, especially adults engaged in repetitive activities or sports. For example, rotator cuff tendonitis is one of the most frequent causes of shoulder pain in adults.
* Risk Factors:
  + Age: Tendonitis is more common in middle-aged and older adults due to tendon degeneration.
  + Occupation and activities involving repetitive motions (e.g., typing, manual labor, sports such as tennis, baseball).
  + Certain systemic conditions like diabetes and rheumatoid arthritis increase risk.
* Common Sites:
  + Shoulder (rotator cuff tendonitis)
  + Elbow (lateral epicondylitis or “tennis elbow”)
  + Wrist and hand (De Quervain’s tenosynovitis)
  + Knee (patellar tendonitis)
  + Achilles tendon (Achilles tendonitis)
* Incidence:  
  Exact incidence rates vary by tendon and population studied. For example, lateral epicondylitis affects approximately 1-3% of the general population annually.
* Gender:  
  Tendonitis can affect both males and females, though some types may be more common in one gender depending on activity patterns.
* Impact:  
  Tendonitis can cause significant pain and functional impairment, leading to decreased work productivity and quality of life.

## **Differential Diagnoses**

* Acute Compartment Syndrome
* Ankle Injury, Soft Tissue
* Bursitis
* Carpal Tunnel Syndrome in Emergency Medicine
* Deep Venous Thrombosis and Thrombophlebitis
* Diphyllobothriasis
* Gout and Pseudogout
* Hand Infections
* Plantar Fasciitis
* Reactive Arthritis
* Rheumatoid Arthritis (RA)
* Rotator Cuff Injury Management in the ED
* Knee Soft Tissue Injury (ACL, LCL, MCL, PCL) Management in the ED

#### **What questions should I ask my doctor?**

You may want to ask your healthcare provider:

## Do I have tendonitis or arthritis?

* Tendonitis is inflammation of a tendon (the tissue connecting muscle to bone), usually causing sudden or acute pain, often related to overuse or injury.
* Arthritis is inflammation of a joint itself, often causing chronic pain, stiffness, swelling, and reduced range of motion. It usually develops gradually and can be due to wear and tear (osteoarthritis) or autoimmune causes (rheumatoid arthritis).
* Because symptoms overlap (pain, swelling, difficulty moving), your doctor will use your history, physical exam, and possibly imaging or blood tests to distinguish between the two

## 2. When can I return to playing sports or exercising?

* For tendonitis, return to sports depends on symptom resolution. Mild cases often improve within 2-3 weeks with rest and treatment, and gradual return to activity is encouraged with physical therapy to prevent re-injury.
* For arthritis, activity may be limited by joint pain and stiffness. Low-impact exercises like swimming or cycling are usually recommended to maintain joint health without worsening symptoms
* Always follow your healthcare provider’s guidance on timing based on your specific condition and recovery.

## 3. Are there side effects of the treatment?

* NSAIDs (non-steroidal anti-inflammatory drugs) commonly used for both conditions can cause gastrointestinal irritation, kidney issues, or cardiovascular risks if used long-term or in high doses.
* Steroid injections (sometimes used in tendonitis or arthritis) may weaken tendons if overused and can cause local pain or infection.
* Physical therapy is generally safe but should be tailored to avoid aggravating symptoms.
* Surgery (if needed) carries risks such as infection, stiffness, or prolonged recovery.

## 4. Do I need surgery?

* Surgery is rarely needed for tendonitis and is reserved for cases where conservative treatments fail or if there is a tendon tear.
* For arthritis, surgery may be considered in advanced cases to repair or replace damaged joints (e.g., joint replacement) if pain and function are severely affected.
* Your doctor will evaluate your symptoms, imaging, and response to treatment before recommending surgery.

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### **SEPTIC ARTHRITIS**

**DEFINITION AND DESCRIPTION**

Septic arthritis (also known as infectious arthritis) happens when an infection spreads to one or more of your joints and causes inflammation. The inflammation is in the surface of the cartilage (a type of connective tissue) that lines your joints and the synovial fluid that lubricates your joints. Bacteria, a virus or fungus may cause the infection, which usually comes from another part of your body and spreads to your joint through your blood. Large joints such as your hip and knee are more commonly affected, but you could get septic arthritis in other joints such as your shoulder and ankle.

In the world of medicine, arthritis covers any type of joint inflammation. There are several different kinds of arthritis, including:

* Osteoarthritis.
* Rheumatoid arthritis.
* Psoriatic arthritis.
* Gout.

You might think that only older people get arthritis, but anyone at any age can get a type of arthritis. In fact, children more commonly experience septic arthritis than adults.

### **Which joints are more likely to have septic arthritis?**

The joint that is most likely to be affected by septic arthritis depends on different factors. In general, larger joints in the lower half of your body, such as your hips, knees and ankles, are more commonly affected.

* Children are most likely to get septic arthritis in their hip.
* Adults are most likely to get septic arthritis in their knee.
* Injection drug users are more likely to get septic arthritis in the joints that connect your pelvis and lower spine (sacroiliac joints) and in the joint that connects your clavicle, or collarbone, to your sternum, or breastbone (sternoclavicular joint).

### **Can septic arthritis spread to other places in my body?**

If the infection that caused your septic arthritis is not treated, the infection can spread to other parts of your body. This is called sepsis and is life-threatening.

Most cases of septic arthritis only involve one joint. In rare cases, multiple joints can have septic arthritis. Staphylococcal infections are the most common cause of septic arthritis, and most cases only involve one joint. Septic arthritis caused by *Neisseria* bacteria usually involves multiple joints.

### **Who does septic arthritis affect?**

Septic arthritis more commonly affects children, but adults can get it as well. People born male at birth between 2 and 3 years of age are most likely to get septic arthritis.

Septic arthritis is not very common. There are approximately 2 to 6 cases of septic arthritis per 100,000 people per year.

### **How serious is septic arthritis?**

Although it’s rare, septic arthritis is a serious condition. It can cause permanent damage to your affected joint and other complications. It can also cause death if it’s not treated. Be sure to see your healthcare provider or go to the nearest hospital immediately if you experience symptoms.

## **Symptoms and Causes**

Symptoms of septic arthritis can include:

* Experiencing pain and tenderness in your affected joint.
* Having swelling and warmth at your affected joint.
* Having limited range of motion in your affected joint.
* Not wanting to use or move your affected joint.
* Having a fever.

### **What causes septic arthritis?**

Septic arthritis is caused by an infection. It can be from bacteria, fungus, mycobacteria, a virus or other pathogens. In most cases, the infection begins somewhere else on or in your body and then spreads through your blood to your joint. More specifically, the following organisms can cause septic arthritis:

* ***Staphylococcus aureus***: This bacteria (also known as staph) is the most common cause of septic arthritis in both children and adults.
* **Methicillin-resistant *Staphylococcus aureus* (MRSA)**: MRSA is a type of staph infection that is resistant to some antibiotics. People who have a higher risk of getting septic arthritis from MRSA include those who use IV drugs, HIV (human immunodeficiency virus infection) or diabetes.
* **Groups A and B *streptococci***: *Streptococci* are a kind of bacteria. Elderly people and people with chronic diseases such as diabetes and cirrhosis are at higher risk of getting septic arthritis from *streptococci*.
* ***Neisseria gonorrhoeae***: This bacterium causes gonorrhea, a [sexually transmitted infection](https://my.clevelandclinic.org/health/diseases/9138-sexually-transmitted-diseases--infections-stds--stis) (STI). People who have gonorrhea can get gonococcal arthritis, which is a form of septic arthritis.
* ***Neisseria meningitides* (meningococcus)**: This bacterium causes meningitis, which is a condition that involves inflammation (swelling) of the protective membranes covering your brain and spinal cord. While it can happen, getting septic arthritis from *Neisseria meningitides* is rare.

### **What is the most common bacteria that causes septic arthritis?**

*Staphylococcus aureus*, a type of bacteria, is the most common cause of septic arthritis in both children and adults. Approximately 37% to 56% of septic arthritis cases are caused by *Staphylococcus aureus.*

### **Is septic arthritis contagious?**

Septic arthritis is not contagious. However, the bacteria that cause septic arthritis, such as *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus* (MRSA) and *Neisseria gonorrhoeae*, can spread from person-to-person contact.

**Diagnosis and Tests**

After a physical exam of your joint, if your healthcare provider suspects you have septic arthritis, they will most likely withdraw synovial fluid (the fluid that lubricates your joint) from your affected joint with a needle. This is called aspiration. They will then do a laboratory test to look at the synovial fluid. Having bacteria in the synovial fluid of your joint confirms the diagnosis of septic arthritis.

Tests that are used to diagnose septic arthritis include:

* **Synovial fluid aspiration**: Your healthcare provider may withdraw fluid from your affected joint with a fine needle to check it for bacteria. This is known as aspiration.
* **Blood tests**: Your provider may have you undergo blood tests to see if your body’s immune system is responding to an infection and/or to rule out other possible issues.
* **X-rays**: X-rays use radiation to take images of your bones. X-rays can show widened joint spaces and bulging of the soft tissues, which can be signs of septic arthritis.
* **Ultrasound**: Ultrasound uses sound waves to take pictures inside your body. An ultrasound can help your provider see how swollen your joint is and help them see your joint fluid when aspirating it.
* **MRI**: An MRI (magnetic resonance imaging) uses a large magnet, radio waves and a computer to make detailed images of your organs and bones. An MRI can help detect early cases of septic arthritis.

## **Management and Treatment**

The following treatments are used for septic arthritis:

* **Surgery:** Removal of the inflamed tissue (surgical debridement) and IV (intravenous) antibiotics are necessary in most cases.
* **Antibiotics**: All cases of septic arthritis need to be treated with antibiotics. Your healthcare provider may give you antibiotics through an IV and/or in pill form.
* **Joint fluid drainage**: Your provider may drain (aspirate) fluid from your joint using a fine needle. They may have to do this more than once as you recover.
* **Physical therapy**: You will likely need physical therapy to restore function in your joint and prevent the muscles around your joint from weakening.
* **Removal of an artificial joint**: If you get septic arthritis in an artificial (prosthetic) joint, you will likely have to have your artificial joint removed and replaced with a joint spacer, a device made of antibiotic cement. After several months, your healthcare provider will replace your artificial joint.

### **How long does it take septic arthritis to heal?**

The length of time it takes for septic arthritis to fully heal depends on what caused your infection and your overall health. You may have to take antibiotics for a few weeks. It could take longer for your joint to fully heal if the infection caused damage to your joint and the surrounding soft tissues.

### **Does septic arthritis go away on its own?**

Septic arthritis cannot go away on its own since it’s an infection. Bacterial infections need to be treated with antibiotics. If you’re experiencing signs and symptoms of septic arthritis, contact your healthcare provider right away or go to the nearest hospital. Septic arthritis can lead to serious complications and can be life-threatening if it’s not treated.

Antibiotics are a type of medication that healthcare professionals may prescribe to treat bacterial infections.

Just as several different types of bacteria can make a person sick, there are various antibiotics a doctor can use that may be more effective against certain types of bacteria.

These medications either cause the bacteria to slow their growth and reproduction rate or directly kill the bacteria. They do not affect viral or fungal infections, such as a [cold](https://www.medicalnewstoday.com/articles/166606), most types of sore throat, and many other types of infection.

### **Side effects**

Though most people can safely take antibiotics, they can cause a range of side effects, including:

* diarrhea
* rashes
* nausea
* yeast infections

More serious side effects may include:

* a *Clostridioides difficile* infection
* severe, potentially life threatening allergic reactions
* antibiotic-resistant infections

A person should speak with a healthcare professional if they experience side effects while taking antibiotics.

## **Antibiotics for septic arthritis**

The exact antibiotics a doctor recommends to treat septic arthritis will vary based primarily on the underlying infection. Viral and fungal causes will not require or benefit from antibiotic treatment.

In most cases, a person will receive about 2 weeks of IV antibiotics. Following this, they will continue to take oral antibiotics for 1–2 weeks, depending on a doctor’s instructions.

Some infections may require an additional 4–6 weeks of oral antibiotics. This is the case with *Pseudomonas aeruginosa*.

A type of septic arthritis called Gonococcal arthritis often responds well to ceftriaxone. Doctors typically continue intravenous delivery for 24–48 hours following an improvement in symptoms. At that point, they usually continue treatment with oral antibiotics.

A doctor will typically closely monitor the progress of treatment with antibiotics. If the joint shows no sign of improvement after about 5–6 days, they may need to reassess the underlying cause. They will likely check for the presence of Lyme disease.

Usually, a doctor will start a broad-spectrum antibiotic treatment to manage the infection. After cultures return from the lab, a doctor will likely change the treatment to target specific bacteria. Common antibiotics a healthcare professional may recommend include:

* nafcillin
* oxacillin
* vancomycin

A doctor may recommend vancomycin for Gram-positive bacteria, which includes any strains of bacteria that appear in a Gram stain test.

For Gram-negative bacteria, a healthcare professional may recommend cephalosporin antibiotics. They may also recommend this type of antibiotic for people with compromised immune systems or who regularly inject themselves with needles.

Examples of cephalosporins include:

* ceftriaxone
* ceftazidime
* cefotaxime

## **Other treatments for septic arthritis**

Septic arthritis has two main treatments: antibiotics in IV form followed by oral form and draining of the affected joint.

Drainage of the joint helps relieve pressure, reduces symptoms, and helps prevent damage. Methods include:

* **Joint aspiration:** This is the least invasive method to drain the joint. A healthcare professional inserts a needle into the joint during this procedure and removes some of the fluid.
* **Arthroscopy:** In this procedure, a surgeon makes a small incision in the skin and inserts a roughly pencil-sized instrument inside to observe the joint. They can drain the fluid during this procedure.
* **Open joint surgery:** A doctor may also recommend this option. In cases of infected joint replacements, a surgeon will need to remove the prosthetic joint and replace it with antibiotic-infused cement.

A person will likely need physical therapy following treatment. This will help restore flexibility and movement to the joint.

## Antibiotic Therapy

* First-line treatment for septic arthritis is antibiotics, typically started intravenously (IV) and later switched to oral form once improvement is seen. The choice of antibiotic depends on the suspected or confirmed causative organism and patient factors.
* Common antibiotics used:
  + Gram-positive coverage (most common bacteria like Staphylococcus aureus, including MRSA):
    - Vancomycin
    - Daptomycin
    - Oxacillin, Nafcillin (for methicillin-sensitive strains)
    - Linezolid (Zyvox)
    - Clindamycin (often combined with fluoroquinolones)
  + Gram-negative coverage (for patients with risk factors or specific infections):
    - Ceftriaxone (especially for Neisseria gonorrhoeae)
    - Ceftazidime, Cefepime
    - Piperacillin/tazobactam (Zosyn)
    - Carbapenems
    - Aztreonam or fluoroquinolones (if allergic to penicillins/cephalosporins)
* Duration of therapy:
  + Typically, 2 weeks of IV antibiotics followed by 1–4 weeks of oral antibiotics, depending on the joint involved, severity, and organism.
  + For small joints, 2 weeks may suffice; larger joints or MRSA infections often require 3–4 weeks or longer.

## Joint Drainage

* Alongside antibiotics, drainage of infected joint fluid is essential to remove pus and reduce pressure. This may be done via:
  + Needle aspiration (arthrocentesis)
  + Arthroscopic lavage
  + Open surgical drainage in severe cases
* Multiple drainages may be necessary.

## Side Effects of Treatment

* Antibiotics side effects:
  + Infusion site reactions: pain, redness, swelling, itching
  + Allergic reactions or rash
  + Gastrointestinal symptoms: nausea, vomiting, diarrhea
  + Rare but serious: nephrotoxicity (kidney damage), ototoxicity (hearing loss), blood dyscrasias
  + Specific drugs:
    - Vancomycin may cause "red man syndrome" (flushing) if infused too rapidly.
    - Linezolid can cause bone marrow suppression with prolonged use.
    - Fluoroquinolones carry risk of tendonitis or tendon rupture.
* Joint drainage risks: Infection risk, bleeding, or damage to joint structures, though generally safe.

## Additional Treatments

* Pain management with analgesics.
* Physical therapy after infection control to restore joint function and strength.
* Surgery if drainage is inadequate or if joint damage is severe.

**Differential diagnosis of acute monoarticular arthritis include:**

1. Infection: Bacterial, fungal, viral, spirochete, mycoplasma
2. Crystal-induced arthropathies: Acute gout, pseudogout, calcium oxalate, cholesterol, hydroxyapatite crystals
3. Osteoarthritis
4. Intra-articular injury: Fracture, meniscal tear, osteonecrosis, foreign body, plant thorn synovitis
5. Inflammatory arthritis: Rheumatoid arthritis, Bechet syndrome, seronegative spondyloarthropathies such as ankylosing spondylitis, psoriatic arthritis, reactive arthritis, inflammatory bowel disease-related arthritis; Sarcoid, systemic Lupus erythematosus, Still disease
6. Systemic infection: Bacterial endocarditis, human immunodeficiency virus, Lyme arthritis
7. Tumor: Metastasis, pigmented villonodular synovitis
8. Other: Hemarthrosis, clotting disorders or anticoagulant therapy, neuropathic arthropathy, dialysis-related amyloidosis, avascular necrosis

**EPIDEMIOLOGY**

The incidence of septic arthritis is between 2 to 6 cases per 100,000 people but varies based on the presence of risk factors.Septic arthritis is more common in children than in adults. The incidence of septic arthritis peaks between ages 2 and 3 years and has a male predominance (2:1). Subgroups of children at high risk include neonates, hemophiliacs with hemarthrosis, immunocompromised (e.g., sickle cell anemia, human immunodeficiency virus infection), and those treated with chemotherapy. Risk factors in adults include age older than 80, diabetes mellitus, rheumatoid arthritis, recent joint surgery, joint prosthesis, previous intra-articular injection, skin infections and cutaneous ulcers, Human immunodeficiency virus, osteoarthritis, sexual activity (especially in cases of suspected gonococcal septic arthritis), other causes of sepsis.

## **Septic Arthritis Procedures and Timelines**

## 1. Initial Diagnosis and Joint Aspiration

* Joint fluid is aspirated (arthrocentesis) to confirm infection and identify causative organisms.
* This is performed urgently once septic arthritis is suspected.

## 2. Antibiotic Therapy

* Start: Empiric intravenous (IV) antibiotics immediately after joint aspiration and culture collection.
* Duration:
  + Typically 2 weeks of IV antibiotics, followed by 1–2 weeks of oral antibiotics for uncomplicated cases involving small joints.
  + For larger joints (e.g., hip, knee) or complicated infections, treatment may extend to 3–6 weeks.
  + Longer durations (up to 6 weeks or more) are recommended for infections with resistant organisms (e.g., MRSA), axial joints, osteomyelitis, immunocompromised patients, or slow responders.
* Response: Symptoms often improve within 48 hours of starting antibiotics.

## 3. Joint Drainage

* Methods:
  + Needle aspiration (arthrocentesis), often repeated multiple times if needed.
  + Arthroscopic lavage (minimally invasive joint washout).
  + Open surgical drainage (arthrotomy) for severe or refractory cases.
* Timing: Drainage is performed as soon as possible after diagnosis to remove pus and reduce joint damage. Multiple drainages may be necessary.
* Recovery:
  + Arthroscopic incisions heal in days; open surgery incisions take longer.
  + Full joint recovery may take several weeks after drainage.

## 4. Physical Therapy and Supportive Care

* Begins after infection control to restore joint function and muscle strength.
* Splinting may be used initially to relieve pain.

## 5. Surgical Intervention for Severe Cases

* In cases of prosthetic joint infection, two-stage arthroplasty (removal of infected joint, antibiotic spacer, then new joint implantation) may be required.
* Recovery from surgery can take weeks to months, depending on procedure and patient factors.

## 6. Hospitalization and Monitoring

* Average hospital stay is about 11.5 days, but outpatient IV antibiotic therapy may be possible in stable patients.
* Close monitoring for clinical response and side effects is essential.

## **Outlook / Prognosis**

The prognosis (outlook) for septic arthritis depends on a few factors, including:

* The type of bacteria or organism that caused your infection.
* How long your infection lasts.
* Your age and overall health.

Some types of bacteria, such as MRSA, are more challenging to treat than others. The longer septic arthritis lasts, the more likely the affected joint will become damaged. People who have weakened immune systems are also more likely to have damage to their affected joint.

### **Can septic arthritis be fatal?**

Despite the use of antibiotics for treatment, there’s a 7% to 15% mortality (death) rate for septic arthritis. If you’re experiencing signs or symptoms of septic arthritis, be sure the contact your healthcare provider or go to the nearest hospital as soon as possible.

### **Are there complications associated with septic arthritis?**

Septic arthritis is a serious condition. Complications of septic arthritis can include:

* Chronic pain.
* Osteomyelitis (inflammation or swelling in the bone).
* Osteonecrosis (bone tissue dies due to lack of blood flow).
* A difference in leg length.
* Sepsis (widespread inflammation in the body).
* Death.

## **Prevention**

The risk factors for developing septic arthritis are different for children and adults. Risk factors for children include:

* **Age**: Newborn children are at a higher risk of getting septic arthritis because their immune systems aren’t as strong.
* **Having hemophilia**: Children who have hemophilia, an inherited bleeding disorder in which their blood does not clot properly, are at a higher risk of developing septic arthritis.
* **Having a weakened immune system**: Children who are immunocompromised (have a weak immune system) from conditions like sickle cell anemia and HIV have a higher risk of getting septic arthritis.
* **Being on chemotherapy**: Chemotherapy weakens your immune system, which makes it more likely that people undergoing it will develop septic arthritis.

Risk factors for adults include:

* **Age**: Adults over the age of 80 are at a higher risk of getting septic arthritis.
* **Having rheumatoid arthritis (RA) or osteoarthritis**: People who have damaged joints from rheumatoid arthritis or osteoarthritis are more susceptible to septic arthritis. Cases of septic arthritis in people who have rheumatoid arthritis are up to 70 per 100,000 people per year.
* **Having HIV (human immunodeficiency virus)**: HIV weakens your immune system, which makes it more likely that you’ll get an infection, which could lead to septic arthritis.
* **Having diabetes**: Having high blood sugar can weaken your immune system. People who have diabetes and have persistent high blood sugar are at a greater risk of getting an infection and septic arthritis.
* **Having skin infections**: Since septic arthritis is usually caused by an infection elsewhere on or in your body, having a skin infection could lead to septic arthritis.
* **Having a recent joint surgery**: Having a recent joint surgery puts you at a higher risk of getting septic arthritis because the wound from the surgery could become infected.
* **Having an artificial (prosthetic) joint**: Infections are more common in prosthetic (artificial) joints than in natural joints. Having a prosthetic joint increases your risk of getting septic arthritis.
* **Injection drug use**: Injection drug use puts you at a higher risk of getting septic arthritis because the needle can introduce harmful bacteria and other organisms into your body when it breaks the skin.
* **Sexual activity**: Sexual activity, especially unprotected sex, can put you at a higher risk of developing septic arthritis from the bacteria that causes gonorrhea, a sexually transmitted infection (STI). The bacterium is called *Neisseria gonorrhoeae*.

### **How can I prevent septic arthritis?**

While not all cases of septic arthritis are preventable, there are a few things you can do to try to prevent getting it, including:

* **Make sure cuts and wounds don’t get infected**: If you have a cut or wound on your skin, keep it clean to prevent infection. If you are experiencing signs of an infection — such as redness, warmth and/or pus in or around your wound — contact your healthcare provider immediately.
* **Try to manage your chronic health condition(s) well**: If you have a chronic health condition such as diabetes or AIDS (acquired immunodeficiency syndrome), try to manage your condition as well as you can in order to stay healthy.
* **Practice safe sex**: Always follow safe sex practices, such as always using a condom or dental dam and talking with your sexual partner about past partners and STI (sexually transmitted infection) history.
* **Don’t abuse drugs**: Injection drug use can cause infections. Only take medications as prescribed by your healthcare provider.

### **When should I see my healthcare provider?**

If you’re experiencing symptoms of septic arthritis, such as pain, fever, extreme warmth, redness or tenderness in your joint and having limited mobility in your joint, contact your healthcare provider or go to the nearest hospital immediately. Septic arthritis is a serious condition that needs to be treated with antibiotics. If left untreated, it can be life-threatening.

## **Common Questions**

### **What is the difference between septic arthritis and osteomyelitis?**

Osteomyelitis and septic arthritis are both rare and serious conditions. Osteomyelitis is an infection of the bone. Septic arthritis is inflammation in the surface of the cartilage that lines the joint and the synovial fluid that lubricates the joint that is caused by an infection. Both conditions are usually caused by the bacterium *Staphylococcus aureus.*

Osteomyelitis and septic arthritis can be tricky to tell apart because they have similar symptoms, including pain, tenderness and swelling in the affected area. Septic arthritis can lead to osteomyelitis, and you can have both at the same time. If you have symptoms of osteomyelitis and/or septic arthritis, go to the nearest hospital immediately. Both conditions need medical treatment. Your healthcare provider will perform certain tests to determine which condition is causing your symptoms.

### **What is the difference between septic arthritis and gout?**

Gout is a common form of inflammatory arthritis that’s caused by a crystal called uric acid. Septic arthritis is inflammation in a joint that’s caused by an infection.

Septic arthritis is a rare, but serious, complication of gout. Since both conditions may have similar symptoms, such as inflammation of the affected joint with redness and swelling, it can be difficult to tell them apart. If you are experiencing symptoms of gout and/or septic arthritis, contact your healthcare provider as soon as possible. Your healthcare provider will ask you questions about your symptoms and may have you come to the hospital to perform certain tests to determine which condition is causing your symptoms.

## 1. What is septic arthritis?

Septic arthritis is an infection in a joint caused by bacteria or sometimes fungi. It leads to joint pain, swelling, redness, and fever. It is a medical emergency because it can quickly damage the joint.

## 2. How is septic arthritis diagnosed?

Diagnosis involves:

* Aspiration of joint fluid (arthrocentesis) for analysis and culture to identify the infecting organism.
* Blood tests and imaging may support diagnosis.

## 3. How is septic arthritis treated?

* Antibiotics: Started intravenously after joint fluid is obtained for culture. Treatment usually lasts 2 weeks IV followed by 2-4 weeks oral antibiotics, depending on the joint and organism.
* Joint drainage: Removal of infected fluid is essential. This can be done by needle aspiration, arthroscopic lavage, or open surgery. Multiple drainages may be needed.
* Early mobilization and physical therapy help restore joint function.

## 4. How long does treatment take?

* IV antibiotics typically for 1-2 weeks, then oral antibiotics for 2-4 weeks or longer for complicated cases.
* Drainage procedures are done urgently and may be repeated.
* Full recovery can take weeks to months depending on severity.

## 5. When is surgery necessary?

* Surgery (arthroscopic or open) is recommended especially for larger joints or if drainage by needle aspiration is insufficient.
* Open surgery is considered in advanced infection stages or when there is cartilage or bone damage.

## 6. What are the risks if septic arthritis is not treated promptly?

* Permanent joint damage, chronic pain, loss of function, and systemic infection (sepsis) that can be life-threatening.

## 7. Are there special considerations for children?

* Empiric antibiotics cover common pathogens including *Staphylococcus aureus* and *Kingella kingae*.
* Shorter IV antibiotic courses may be possible with early switch to oral therapy.
* Surgery is more conservative compared to adults.

## 8. What if the infection is caused by tuberculosis?

* TB arthritis is treated primarily with prolonged antibiotic therapy (6-12 months) and surgery is reserved for severe cases.

## 9. Can septic arthritis recur?

* Yes, especially if treatment is delayed or incomplete. Careful follow-up is needed to detect treatment failure early.

## 10. How can I prevent septic arthritis?

* Prompt treatment of infections elsewhere in the body, good hygiene, and early medical evaluation for joint pain and swelling.

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### **POLYARTERITIS NODOSA**

**DEFINITION AND DESCRIPTION**

Polyarteritis nodosa (PAN) is a rare condition in which blood vessel inflammation (vasculitis) injures your organs. Inflammation can make a blood vessel:

* Weak and stretched out, which can lead to aneurysms.
* Thin to the point of rupturing and bleeding into the tissue.
* Narrow enough to close off entirely, damaging organs by cutting off their oxygen and nutrient supply.

Although PAN mainly affects medium-sized blood vessels, affected organs may lose some or all of their ability to function.

Polyarteritis nodosa most commonly affects your:

* Kidneys.
* Joints.
* Nerves.
* Intestinal tract.
* Skin.
* Muscles.

Most people have issues with more than one area of their body with PAN. Rarely, you may only have symptoms in your skin (cutaneous PAN). Your provider will need to keep checking on you to make sure you don’t develop symptoms in other parts of your body.

Polyarteritis nodosa usually doesn’t cause symptoms in your lungs.

#### **How rare is polyarteritis nodosa?**

Polyarteritis nodosa is very rare. Out of a million people in the United States, fewer than 10 people per year get a polyarteritis nodosa diagnosis. The same is true in England.

## **Symptoms and Causes**

PAN can affect many different parts of your body with a wide range of symptoms. Polyarteritis nodosa symptoms may include:

* A general ill feeling.
* Fatigue.
* Night sweats.
* Fever.
* Loss of appetite and weight.
* Pain in your muscles and/or joints.
* Headaches (these aren’t common).
* Skin sores that may appear as hard, tender nodules or ulcers.
* Abdominal pain.
* Blood in your stool (poop) or urine (pee).
* Shortness of breath.
* Chest pain.
* High blood pressure.
* Painful testicles.
* Nausea and vomiting.
* Numbness or loss of strength in your feet or hands.

### **What causes polyarteritis nodosa?**

Healthcare experts don’t know the cause of polyarteritis nodosa. It may have a genetic (inherited) cause or a connection to various blood disorders in some people.

Research strongly supports that your immune system plays a critical role in PAN. It does this by causing blood vessel and tissue inflammation and damage.

A hepatitis B (and sometimes hepatitis C) infection may set off polyarteritis nodosa. Rates of polyarteritis nodosa have decreased significantly since the creation of the hepatitis B vaccine.

#### **Risk factors for polyarteritis nodosa**

Polyarteritis nodosa risk factors include:

* Being male.
* Being between ages 45 and 65.
* Having a hepatitis B infection.

### **Complications of polyarteritis nodosa**

Complications may include:

* Aneurysms in arteries that go to organs like your liver or kidneys.
* Blood clots in blood vessels (not common).
* Damage to tissues that can’t receive oxygen and nutrients.
* Gangrene (dead tissue).
* Heart failure (not common).
* Kidney failure (not common).

## **Diagnosis and Tests**

To make a polyarteritis nodosa diagnosis, a provider will use information from:

* Your medical history.
* A physical exam to detect affected organs and to exclude other illnesses that may look similar.
* Blood tests.
* Imaging.

#### **What tests will be done to diagnose polyarteritis nodosa?**

A provider may order these tests:

* Blood tests and urinalysis to look for results that may suggest inflammation or affected organs.
* X-rays.
* Computed tomography (CT) angiogram.
* Magnetic resonance angiogram (MRA) scans.
* Biopsy to check for vasculitis if other tests show abnormal findings.

## **Management and Treatment**

Polyarteritis nodosa treatment uses medications that suppress your immune system.

The goal of treatment is to get rid of inflammation. When you do this, providers say you’re in remission. Once your condition improves, you’ll slowly reduce your medication dose and eventually stop taking it.

#### **Medicines**

If PAN affects your critical organ systems, you’ll take more than one medicine. Polyarteritis nodosa treatment will include:

* A corticosteroid like prednisone or prednisolone.
* Another immunosuppressive medication such as cyclophosphamide.

People with certain types of cancer may receive high doses of cyclophosphamide. But people with vasculitis get cyclophosphamide doses that are 10 to 100 times lower than the amount that treats cancer. In people with polyarteritis nodosa, the drug slows down their immune systems so they don’t cause inflammation.

Usually, you only take cyclophosphamide until remission (around three to six months). Then, you may switch to another immunosuppressive agent like methotrexate or azathioprine to maintain remission.

Different people take a maintenance immunosuppressive medication for different lengths of time. Most people take it for at least one to two years before a provider will consider slowly reducing their dosage and stopping it.

In rare instances, people might do well with corticosteroid therapy alone if polyarteritis nodosa doesn’t affect their nervous system, heart, kidneys or intestinal tract.

People who have a PAN-like vasculitis associated with hepatitis B may also take antiviral medications to treat the hepatitis.

#### **Side effects of the treatment**

Immunosuppressive medications can have side effects like mood changes, infection or swelling. Watching for side effects helps prevent or minimize them. You may tolerate treatment at first, but then not do well over time. This makes it important to do ongoing monitoring. In some cases, you may need to watch for long-term effects even after stopping the medication.

It can be harder to fight an infection while taking immunosuppressants. Vaccines can help you lower your risk of getting an infection like the flu or pneumonia.

## **Outlook / Prognosis**

For some people, polyarteritis nodosa comes on little by little. For others, it can get worse quickly and be fatal in just a few months. People who have symptoms in their digestive systems, hearts, kidneys and/or central nervous systems have a worse prognosis than those who don’t.

Although polyarteritis nodosa can be a sudden and serious illness, many people with PAN do extremely well. The severity of your illness affects how well you do. But you can achieve remission even with the most severe polyarteritis nodosa if a provider treats you promptly and monitors you closely.

After achieving remission, polyarteritis nodosa can recur or relapse. Estimates of the rate of relapse for PAN vary widely but range from 10% to 40%. Symptoms during relapses may be similar to what you experienced at the time of your diagnosis or they may be different. The treatment for relapses is like that of a newly diagnosed disease. Most people with polyarteritis nodosa can achieve remission again.

### **Outlook for polyarteritis nodosa**

If you get treatment for polyarteritis nodosa, you have at least an 80% chance of living another five years. If you don’t get treatment, your five-year survival odds drop to less than 15%.

## **Prevention**

You can’t change some of the things that put you at risk for polyarteritis nodosa, like age. But a vaccine can protect you from the hepatitis B infection that can set off PAN in some people.

## **Diagnostic Considerations**

The diagnosis of polyarteritis nodosa (PAN) can be difficult because of the spectrum of clinical manifestations and the rarity of the disease. Mimics of vasculitis, including processes that lead to a loss of vascular integrity and blood-vessel occlusion, alternative

e forms of vasculitis, and syndromes associated with vasculitis should be considered. Segmental arterial mediolysis is one example of a noninflammatory vasculopathy that can be misdiagnosed as a vasculitis process.Drugs such as minocycline have been reported to cause cutaneous and systemic PAN-type manifestations.Vitamin K antagonists have also been reported to cause cutaneous necrotic leg ulcers with leukocytoclastic vasculitis and microthrombosis on biopsy.

Microscopic polyangiitis (MPA; formerly called microscopic polyarteritis) and granulomatosis with polyangiitis (GPA; the disease formerly known as Wegener granulomatosis) are antineutrophil cytoplasmic antibody (ANCA)–associated systemic vasculitides that have some features similar to those of classic PAN, with the additional involvement of renal glomeruli and pulmonary capillaries.

A clear distinction should be made between limited disease versus systemic disease and idiopathic PAN versus hepatitis B–related PAN, because differences exist in the prognosis and treatment.

Finally, some patients with chronic hepatitis C virus (HCV) infection can present with vasculitis that is clinically consistent with PAN, not cryoglobulinemic vasculitis.

HCV-associated PAN may have a more severe presentation than HCV-associated cryoglobulinemia. In a cohort of 161 patients with HCV-related vasculitis, 31 patients were diagnosed with PAN. These patients had more frequent fevers, weight loss, gastrointestinal tract involvement, severe acute sensory-motor multifocal mononeuropathy, kidney and liver microaneurysms, and increased C-reactive protein levels than patients with HCV-associated mixed cryoglobulinemia.

## **Differential Diagnoses**

* Antiphospholipid Syndrome
* Atrial Myxoma
* Cholesterol Embolism
* Eosinophilic Granulomatosis with Polyangiitis (Churg-Strauss Syndrome)
* Cryoglobulinemia
* Genetics of Ehlers-Danlos Syndrome
* Goodpasture Syndrome
* Granulomatosis with Polyangiitis (GPA, formerly Wegener Granulomatosis)
* IgA Vasculitis (Henoch-Schonlein Purpura)
* Infective Endocarditis
* Leukocytoclastic (small vessel) vasculitis
* Microscopic Polyangiitis
* Segmental arterial mediolysis

## **Epidemiology**

### Occurrence in the United States

Polyarteritis nodosa (PAN) is a rare disease, with an incidence of about 3-4.5 cases per 100,000 population annually. Older estimates placed the prevalence as high as 7.7 cases per 100,000 population, for example, in a population of Alaskan Eskimos hyperendemic for HBV infection.

### International occurrence

Depending on the definitions used, the annual estimated incidence of PAN ranges from 1.6 cases per million in south Sweden to 4.6 cases per million in England to 30.7 cases per million adults in Paris, France.

### Sex- and age-related demographics

PAN affects men more frequently than women (male-to-female ratio 1.6-2:1). PAN has been diagnosed in persons of every age; however, it is predominantly observed in individuals aged approximately 45-65 years.

**GUIDELINES**

The guidelines offer the following conditional recommendations:

* Abdominal vascular imaging can aid in establishing a diagnosis and determining the extent of disease
* Follow-up abdominal vascular imaging for patients with a history of severe abdominal PAN who become asymptomatic
* A deep-skin biopsy is preferred over a superficial skin punch biopsy to aid in establishing a diagnosis of PAN involving the skin
* A combined nerve and muscle biopsy is preferred over a nerve biopsy alone to aid in establishing a diagnosis of peripheral neuropathy and suspected PAN
* Serial neurologic examinations instead of repeated electromyography/nerve conduction studies (eg, every 6 months) should be used to monitor disease activity in patients with a history of peripheral motor neuropathy secondary to PAN

### **Treatment**

Conditional recommendations for patients with newly diagnosed severe active disease (multi-organ involvement) include:

* Initiating treatment with IV pulse glucocorticoids (GCs) over high-dose oral GCs
* Initiating treatment with cyclophosphamide and high-dose GCs over high-dose GCs alone
* Initiating treatment with cyclophosphamide and GCs over rituximab and GCs
* Treat with other non-GC immunosuppressive agents and GCs over GCs alone for patients unable to tolerate cyclophosphamide
* The use of plasmapheresis combined with cyclophosphamide and GCs is not recommended

For patients with newly diagnosed nonsevere active disease, the guidelines conditionally recommend treatment with non-GC immunosuppressive agents and GCs over GCs alone. For patients with PAN in remission who are receiving non-GC immunosuppressive therapy, discontinuation of non-GC immunosuppressive agents after 18 months of continued (indefinite) treatment is conditionally recommended.

Physical therapy is conditionally recommended for patients with nerve and/or muscle involvement.

The guidelines strongly recommend treatment with tumor necrosis inhibitors over GCs alone for patients with PAN due to deficiency of ADA2 (DADA2).

## **Polyarteritis Nodosa (PAN): Procedures and Timelines**

## Initial Evaluation and Diagnosis

* Timeline: Urgent once symptoms suggest PAN (e.g., systemic inflammation, organ ischemia).
* Procedures: Clinical assessment, laboratory tests (inflammatory markers, hepatitis serology), imaging (angiography to detect aneurysms/stenosis), and tissue biopsy if needed.

## Induction of Remission (First 3 to 6 Months)

* Treatment:
  + Glucocorticoids (Prednisone): High-dose prednisone (1 mg/kg/day, max 60-80 mg/day) started immediately.
  + Immunosuppressive agents: Cyclophosphamide is added for moderate to severe disease or organ involvement.
* Duration: Cyclophosphamide is typically given for about 3 to 6 months until remission is achieved.
* Monitoring: Regular clinical and laboratory monitoring for response and side effects.

## Maintenance Therapy (1 to 2 Years or More)

* After remission, patients transition to maintenance immunosuppression with agents like azathioprine or methotrexate.
* Duration: Maintenance therapy usually continues for at least 12 to 24 months before gradual tapering is considered.
* Glucocorticoids are tapered slowly over 6 to 8 months or longer depending on disease activity.

## Special Considerations

* Hepatitis B-associated PAN:
  + Initial short course of corticosteroids (usually 2 weeks).
  + Followed by plasmapheresis (plasma exchange) combined with antiviral therapy until viral control and clinical remission are achieved (often 2 to 3 months).
* Surgical Interventions:
  + Required for complications such as bowel perforation, cholecystitis, or aneurysm repair.
  + Timing depends on clinical urgency; surgery is generally emergent or urgent.

## Supportive Care

* Hypertension management: Aggressive treatment with ACE inhibitors or calcium channel blockers, with close renal monitoring.
* Physical therapy and symptom management throughout treatment.

## **Staging and Phases of Polyarteritis Nodosa**

## 1. Acute Stage

* Characterized histologically by polymorphonuclear neutrophil infiltration in the vessel walls.
* Clinically, patients often present with systemic symptoms such as fever, weight loss, myalgia, and signs of active vasculitis (e.g., skin lesions, neuropathy).
* This stage represents active inflammation and vessel wall necrosis.

## 2. Subacute Stage

* Histology shows a shift to mononuclear cell infiltration (lymphocytes and macrophages) as inflammation evolves.
* Symptoms may persist but can be less intense; tissue repair and fibrosis may begin.
* This stage reflects ongoing but less aggressive inflammation.

## 3. Chronic Stage

* Characterized by fibrosis and scarring of vessel walls with reduced active inflammation.
* Clinically, patients may have residual organ damage or chronic symptoms related to ischemia or infarction.

## Clinical Severity and Prognostic Classification

Though not formal “stages,” PAN severity is often classified based on organ involvement and clinical features:

* Limited or Cutaneous PAN:
  + Involves mainly skin and peripheral nerves.
  + Generally has a better prognosis and may require less aggressive treatment.
* Systemic PAN:
  + Multisystem involvement including kidneys (renal arteries), gastrointestinal tract, heart, and central nervous system.
  + Associated with higher morbidity and mortality.
* Severe PAN:
  + Presence of critical organ involvement such as renal insufficiency, cardiomyopathy, gastrointestinal ischemia/perforation, or CNS involvement.
  + Requires aggressive immunosuppressive therapy.

Diagnosis is supported if 3 or more of the following are present:

* Weight loss >4 kg
* Livedo reticularis
* Testicular pain or tenderness
* Myalgias
* Mononeuropathy or polyneuropathy
* New diastolic blood pressure >90 mm Hg
* Elevated BUN or creatinine
* Hepatitis B infection evidence
* Arteriographic abnormalities (aneurysms or stenoses)
* Biopsy showing arteritis in medium-sized arteries

## **Living With**

You can lower your chances of having a severe relapse by:

* Reporting any new symptoms to a provider as soon as they start.
* Going to regular follow-up appointments with a provider.
* Keeping up with monitoring like lab tests.

### **When should I see my healthcare provider?**

Contact your provider if you have some of the symptoms of PAN. But if you have chest pain and shortness of breath, seek immediate care.

### **What questions should I ask my doctor?**

You may want to ask your healthcare provider:

## 1. What is polyarteritis nodosa (PAN)?

PAN is a rare systemic vasculitis that causes inflammation and damage to medium-sized arteries, leading to organ ischemia and symptoms such as fever, muscle pain, skin ulcers, and nerve problems. It can affect the kidneys, skin, joints, muscles, nerves, and gastrointestinal tract but usually spares the lungs

## 2. What causes PAN?

The exact cause is often unknown (idiopathic), but PAN can be associated with infections like hepatitis B or C, certain blood disorders, or autoimmune conditions. The immune system mistakenly attacks blood vessels, causing inflammation and damage

## 3. How is PAN diagnosed?

Diagnosis is challenging and based on a combination of:

* Clinical symptoms (fever, unexplained weight loss, muscle/joint pain, skin nodules, neuropathy, hypertension)
* Laboratory tests showing inflammation and organ involvement
* Biopsy of affected tissue showing necrotizing arteritis or
* Arteriography revealing aneurysms or stenoses in medium-sized arteries
* Testing for hepatitis B and C is important

## 4. What are the main treatments for PAN?

* Corticosteroids (e.g., prednisone) are the cornerstone to reduce inflammation.
* Immunosuppressive drugs such as cyclophosphamide, methotrexate, or azathioprine are added for severe or systemic disease.
* If hepatitis B or C is present, antiviral therapy combined with a short course of corticosteroids and sometimes plasmapheresis is used

## 5. What is the prognosis for PAN?

With prompt treatment, remission is achievable in about 90% of patients. However, involvement of kidneys, gastrointestinal tract, or nervous system can worsen prognosis. Untreated PAN is often fatal

## 6. What symptoms should prompt urgent medical attention?

* Severe abdominal pain (risk of bowel ischemia or perforation)
* Sudden onset of weakness or numbness (possible nerve or CNS involvement)
* Rapidly worsening hypertension or kidney failure symptoms
* Skin ulcers or rapidly spreading rash

## 7. Can PAN recur after treatment?

Relapses can occur, especially if treatment is stopped prematurely. Long-term follow-up is essential to monitor for recurrence and manage side effects of therapy

## 8. Are there lifestyle or supportive care measures that help?

* Managing blood pressure aggressively to protect kidneys
* Physical therapy to address muscle weakness or neuropathy
* Regular monitoring for treatment side effects and organ function

## **Doctor-Patient Conversation: Polyarteritis Nodosa (PAN)**

Doctor:  
“Hello, I’d like to discuss the results of your tests. You have a condition called Polyarteritis Nodosa, or PAN for short. It’s a type of vasculitis, which means inflammation of your blood vessels.”

Patient:  
“What does that mean exactly? Is it serious?”

Doctor:  
“Polyarteritis Nodosa causes inflammation in medium-sized arteries, which can reduce blood flow to your organs and tissues. It can affect many parts of the body, including your skin, muscles, nerves, kidneys, and digestive system. It’s a serious condition but treatable, especially when caught early.”

Patient:  
“What symptoms should I expect? I’ve been feeling tired and have some muscle pain.”

Doctor:  
“Those are common symptoms. People with PAN often experience fatigue, muscle and joint pain, fever, weight loss, and sometimes skin rashes or ulcers. You might also notice numbness or weakness if nerves are affected. Because it can affect different organs, symptoms vary widely.”

Patient:  
“How did I get this? Is it contagious?”

Doctor:  
“PAN is not contagious. The exact cause isn’t always clear, but it’s believed to be an autoimmune process, where your immune system mistakenly attacks your blood vessels. Sometimes it’s associated with infections like hepatitis B, but in many cases, the cause is unknown.”

Patient:  
“What’s the treatment? Will I need to take medications for a long time?”

Doctor:  
“The main treatment is medications that suppress the immune system, such as corticosteroids like prednisone. In some cases, other immunosuppressive drugs are added. Treatment duration varies but often lasts several months to years to control inflammation and prevent complications.”

Patient:  
“Are there any side effects I should worry about?”

Doctor:  
“Steroids can have side effects like increased blood sugar, bone thinning, or mood changes, especially with long-term use. We’ll monitor you closely and try to use the lowest effective dose. Other medications also have risks, which we’ll discuss if they become necessary.”

Patient:  
“What about my daily activities? Can I still work and exercise?”

Doctor:  
“At first, you might need to rest more, especially during flare-ups. As your symptoms improve, most people can return to normal activities gradually. We’ll tailor advice based on how you respond to treatment.”

Patient:  
“Is there anything I should watch for or report to you?”

Doctor:  
“Yes, please let me know if you develop new symptoms like severe pain, numbness, skin ulcers, unexplained fever, or signs of infection. Also, report any side effects from medications.”

Patient:  
“Thank you, doctor. I’m glad to know there’s a treatment.”

Doctor:  
“You’re welcome. We’ll work together closely to manage your condition and keep you as healthy as possible. I’ll schedule regular follow-ups and blood tests to monitor your progress.”

REFERENCES

[Polyarteritis Nodosa (PAN): Symptoms & Treatment](https://my.clevelandclinic.org/health/diseases/polyarteritis-nodosa-pan#overview)

<https://www.ncbi.nlm.nih.gov/books/NBK482157/>

<https://vasculitisfoundation.org/polyarteritis-nodosa-pan-guidelines/>

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**MICROSCOPIC POLYANGIITIS**

**DEFINITION AND DESCRIPTION**

Microscopic polyangiitis (MPA) is a rare disease. It’s the result of blood vessel inflammation (vasculitis), which can damage organ systems. The areas most commonly affected by MPA include the:

* Kidneys.
* Lung.
* Nerves.
* Skin.
* Joints.

MPA shares common features with another form of vasculitis called granulomatosis with polyangiitis (GPA, formerly called Wegener's granulomatosis). Treatments for these illnesses are similar.

**Vasculitis**

Vasculitis is inflammation of the blood vessels. When inflamed, the blood vessel may become weakened and stretch, forming an aneurysm. Or it may become so thin that it ruptures resulting in bleeding into the tissue.

Vasculitis can also cause blood vessels narrowing to the point of closing off the vessel entirely. This can cause organs to become damaged from loss of oxygen and nutrients that were being supplied by the blood. MPA affects small to medium-sized blood vessels.

MPA is very rare (affecting about 13 to 19 people in a million). It can occur in people of all ages, and appears to affect men and women equally.

## **Symptoms and Causes**

The cause of MPA is unknown. MPA isn’t a form of cancer, isn’t contagious and doesn’t usually occur within families. Research strongly suggests that the immune system plays a critical role in MPA in that the immune system causes blood vessel and tissue inflammation and damage.

### **symptoms and signs of microscopic polyangiitis (MPA)**

Because many different organ systems may be involved, a wide range of symptoms and signs are possible in MPA.

People who have MPA may feel generally ill and fatigued, have a fever, or a loss of appetite and weight. They usually also have symptoms related to areas of involvement such as rashes, muscle and/or joint pain.

When MPA affects the lungs they may have shortness of breath or cough up of blood. MPA affecting the nerves may cause an abnormal sensation followed by numbness or loss of strength. Any combination of these symptoms may be present.

Kidney disease caused by MPA often doesn’t produce symptoms. Inflammation of the kidney may not be apparent to the patient until the kidneys begin to stop working. So it’s very important for the provider, in dealing with any form of vasculitis, to always examine the urine.

## **Diagnosis and Tests**

Suspicion for MPA is based on information gathered from a variety of sources, including:

* Medical history to look for the presence of MPA symptoms.
* Physical examination to detect sites of organ involvement and to exclude other illnesses that may have a similar appearance.
* Blood tests to look for sites of organ involvement and testing for antineutrophil cytoplasmic antibodies (ANCA).
* Urinalysis to detect excessive protein or the presence of red blood cells.
* Imaging tests such as X-rays, computed tomography (CT) or magnetic resonance (MR) scans, which can show abnormalities in affected areas such as the lungs.

A positive blood test for ANCA can support a suspected diagnosis of MPA. However, the blood test doesn’t by itself prove the diagnosis of MPA or determine disease activity.

Once the diagnosis of MPA is suspected, a biopsy (tissue sample) of an affected area is often performed to try to confirm the presence of vasculitis. Biopsies are only recommended for organ sites in which there are abnormal findings present by examination, laboratory tests or imaging.

**Management and Treatment**

Medications that suppress the immune system form the foundation of treatment for MPA. There are a variety of immunosuppressive medications that are used in MPA, each of which has individual side effects.

People with MPA who have critical organ system involvement are generally treated with corticosteroids combined with other immunosuppressive medication such as cyclophosphamide (Cytoxan ®) or rituximab (Rituxan®). In patients who have less severe MPA, corticosteroids and methotrexate can be used first.

The goal of treatment is to stop all injuries that happen as a result of MPA. If disease activity can be completely "turned off," this is called "remission." Once it’s apparent that the disease is improving, doctors slowly reduce the corticosteroid dose and eventually hope to discontinue it completely.

When cyclophosphamide is used, it’s only given until the time of remission (usually around three to six months), After this, it’s switched to another immunosuppressive agent, such as methotrexate, azathioprine (Imuran®) or mycophenolate mofetil (Cellcept®) to maintain remission.

The treatment time of the maintenance immunosuppressive medication may be different between individuals. In most instances, it’s given for a minimum of one to two years before consideration is given to slowly reducing the dose toward discontinuation.

All of these medications are also used to treat other medical conditions. Azathioprine and mycophenolate mofetil are used to prevent organ transplant rejection. Methotrexate is used to treat rheumatoid arthritis and psoriasis. Both cyclophosphamide and methotrexate are given at high doses as a treatment for certain types of cancer and are sometimes referred to as chemotherapy. In cancer treatment, these medications work by killing or slowing the growth of rapidly multiplying cancer cells.

However, in vasculitis these medications are given at doses that are 10 to 100 times lower than those used to treat cancer. Their primary job is to influence the behavior of the immune system in a way that results in immunosuppression. Rituximab belongs to a class of medications called biologic agents that target a specific element of the immune system. Recent studies found that rituximab was as effective as cyclophosphamide for treating severe active MPA.

Because these medications suppress the immune system, there’s an increased risk of developing serious infections. Each immunosuppressive drug also has its own set of potential side effects. Monitoring for the side effects of all these drugs is critical to prevent or minimize their occurrence.

Also, an initial tolerance of treatment isn’t a guarantee that tolerance remains the same over time. This makes ongoing monitoring essential, and in some instances, monitoring for long-term side effects may be important even after the drug is stopped.

## **Differential Diagnosis**

* Acute Mesenteric Ischemia
* Eosinophilic Granulomatosis with Polyangiitis (Churg-Strauss Syndrome)
* Crescentic Glomerulonephritis
* Cryoglobulinemia
* Granulomatosis with Polyangiitis (GPA, formerly Wegener Granulomatosis)
* Infective Endocarditis
* Small-Vessel Vasculitis (Leukocytoclastic Vasculitis)
* Polyarteritis Nodosa

## **Epidemiology**

With the increased availability of ANCA testing, reported cases of MPA have also risen. A 20-year population-based study in Rochester, Minnesota estimated the incidence of MPA at 1.6 per 100,000 persons.

Internationally, the incidence is approximately two cases per 100,000 persons in the United Kingdom. In Sweden and Germany, the incidence is estimated to be 1.3 per 100,000 persons.

The median age of onset is approximately 50 years. MPA is more common in White persons than Black persons; males are affected slightly more frequently than females.

## **Microscopic Polyangiitis (MPA) Treatment: Drug Information and Side Effects**

## 1. Corticosteroids (e.g., Prednisone)

* + Use: First-line treatment to rapidly reduce inflammation and immune activity.
  + Administration: High-dose oral prednisone initially; intravenous methylprednisolone may be used in severe cases.
  + Side Effects:
    - Weight gain, fluid retention
    - Increased blood sugar and risk of diabetes
    - Hypertension
    - Osteoporosis
    - Mood changes, insomnia
    - Increased infection risk

## 2. Cyclophosphamide (Cytoxan)

* + Use: Potent immunosuppressant used with corticosteroids for induction therapy in severe or organ-threatening MPA.
  + Administration: Oral or intravenous, typically for 3–6 months until remission.
  + Side Effects:
    - Increased infection risk
    - Bladder toxicity (hemorrhagic cystitis)
    - Infertility
    - Bone marrow suppression (low blood counts)
    - Increased risk of secondary malignancies
    - Nausea, hair loss
  + Monitoring: Requires regular blood counts, hydration, and sometimes bladder-protective agents.

## 3. Rituximab (Rituxan and biosimilars)

* + Use: Biologic agent targeting B cells, effective alternative to cyclophosphamide for induction and maintenance therapy.
  + Administration: Intravenous infusions, dosing varies by protocol.
  + Side Effects:
    - Infusion reactions (fever, chills, rash)
    - Increased infection risk, including reactivation of hepatitis B
    - Rare progressive multifocal leukoencephalopathy (PML)
    - Fatigue, headache

## 4. Methotrexate

* + Use: Used for induction in less severe MPA or maintenance therapy after remission.
  + Side Effects:
    - Liver toxicity
    - Bone marrow suppression
    - Mouth ulcers
    - Nausea
    - Pulmonary toxicity (rare)
  + Monitoring: Liver function tests and blood counts regularly.

## 5. Azathioprine (Imuran) and Mycophenolate Mofetil (Cellcept)

* + Use: Maintenance immunosuppressants to prevent relapse after induction.
  + Side Effects:
    - Bone marrow suppression
    - Increased infection risk
    - Gastrointestinal upset
    - Liver enzyme elevation

## 6. Avacopan (Tavneos)

* + Use: Recently FDA-approved oral complement C5a receptor inhibitor used as adjunctive therapy to reduce steroid use.
  + Side Effects:
    - Nausea
    - Headache

## **Microscopic Polyangiitis (MPA): Procedures and Timelines**

## 1. Induction Phase

* Goal: Achieve remission by controlling active inflammation and preventing organ damage.
* Duration: Typically 3 to 6 months.
* Medications:
  + Glucocorticoids (Prednisone): High-dose oral prednisone (1 mg/kg/day) started immediately; sometimes preceded by intravenous methylprednisolone pulses (500 mg to 1 g daily for 3 days) in severe cases.
  + Cyclophosphamide: Given orally (2 mg/kg/day) or intravenously (15 mg/kg monthly pulses) for 3–6 months.
  + Rituximab: An alternative to cyclophosphamide, especially in severe or refractory cases; administered as 375 mg/m² weekly for 4 weeks.
  + Plasma exchange: Considered in severe cases with renal failure or pulmonary hemorrhage; typically 7 sessions over 2 weeks.
* Monitoring: Frequent clinical and laboratory assessments to evaluate response and side effects.

## 2. Maintenance Phase

* Goal: Maintain remission and prevent relapse.
* Duration: Usually 12 to 24 months or longer, individualized per patient.
* Medications:
  + Azathioprine: Commonly used at 2 mg/kg/day for 12 months or more.
  + Methotrexate or Mycophenolate mofetil: Alternatives if azathioprine is not tolerated.
  + Rituximab: Increasingly used for maintenance in some protocols.
* Glucocorticoids: Tapered gradually over months during maintenance.

## 3. Supportive and Additional Procedures

* Renal transplantation: For patients progressing to end-stage renal disease (ESRD); considered safe and effective.
* Physical therapy: To improve function and manage symptoms post-remission.
* Regular follow-up: To monitor for relapse, medication side effects, and organ function.

## **Outlook / Prognosis**

Because MPA is rare, accurate statistics on overall outcomes are approximate. On average, after five years of illness, more than 80% of people have survived the effects of MPA. The outcome is strongly related to the severity of illness. Although MPA can be a progressive and serious illness, many people with MPA do extremely well.

Organ damage can be minimized by beginning treatment early, followed by careful monitoring. Even people with the most severe MPA can achieve remission when treated promptly and followed closely.

After achieving remission, it’s possible for MPA to recur (often referred to as a "relapse"). Relapses occur in about 50% of people with MPA. Such relapses may be similar to what the person experienced at the time of their diagnosis or they may be different.

The chance of a severe relapse can be reduced by immediately reporting any new symptoms to the doctor, regular follow-up care and ongoing monitoring with laboratory tests and imaging. The treatment approach for relapses is similar to that of a newly diagnosed disease. Achieving remission again is possible for most people with MPA.

## **Microscopic Polyangiitis (MPA): Questions and Answers Set**

## 1. What is microscopic polyangiitis (MPA)?

MPA is a rare autoimmune disease causing inflammation of small blood vessels throughout the body. This inflammation can damage organs such as the kidneys, lungs, nerves, skin, and joints

## 2. What causes MPA?

The exact cause is unknown. It is believed to involve an abnormal immune response where antibodies called ANCA (anti-neutrophil cytoplasmic antibodies) attack blood vessels, leading to inflammation and damage. Genetic predisposition and environmental triggers like infections or drugs may play a role

## 3. What are the common symptoms of MPA?

* Constitutional symptoms: fever, weight loss, fatigue, muscle and joint aches
* Kidney involvement (in ~80-90%): blood and protein in urine, possible kidney failure
* Lung involvement (20-50%): cough, shortness of breath, coughing up blood
* Skin lesions (purpura, rash)
* Peripheral nerve symptoms: numbness, tingling, weakness
* Other: abdominal pain, hypertension

## 4. How is MPA diagnosed?

Diagnosis is based on:

* Clinical symptoms and physical exam
* Blood tests including ANCA antibodies
* Urine tests for kidney involvement
* Imaging (e.g., chest X-ray, CT)
* Biopsy of affected tissue (skin, kidney) showing small vessel vasculitis without granulomas

## 5. How is MPA treated?

Treatment depends on severity:

* Induction therapy: High-dose corticosteroids plus immunosuppressants such as cyclophosphamide or rituximab to achieve remission
* Maintenance therapy: Lower doses of immunosuppressants like azathioprine or methotrexate to prevent relapse
* Plasma exchange may be used in severe cases (e.g., pulmonary hemorrhage)

## 6. What is the prognosis of MPA?

With prompt treatment, many patients achieve remission. However, relapses can occur, and organ damage (especially kidney failure) can affect long-term outcomes. Early diagnosis and treatment improve prognosis

## 7. Can MPA affect children or only adults?

MPA most commonly affects adults in their 50s and 60s but can occur at any age, including children[1](https://www.cedars-sinai.org/health-library/diseases-and-conditions/m/microscopic-polyangiitis-mpa.html)[6](https://www.nm.org/conditions-and-care-areas/rheumatology/vasculitis-center/Microscopic%20polyangiitis).

## 8. What complications can arise from MPA?

* Rapidly progressive kidney failure
* Pulmonary hemorrhage and respiratory failure
* Peripheral neuropathy
* Hypertension
* Chronic organ damage from ongoing vasculitis

## 9. How is MPA different from other vasculitides like granulomatosis with polyangiitis (GPA)?

MPA affects small vessels without granulomatous inflammation, whereas GPA typically involves granulomas and upper respiratory tract involvement. Treatments are similar but differ in some clinical features

## 10. What should I do if I experience symptoms suggestive of MPA?

Seek prompt medical evaluation. Early diagnosis and treatment are crucial to prevent permanent organ damage. Inform your healthcare provider about symptoms like unexplained fever, weight loss, blood in urine, shortness of breath, or numbness

## **Doctor-Patient Conversation: Microscopic Polyangiitis (MPA)**

Doctor:  
“Thank you for coming in today. Based on your symptoms and test results, you have a condition called Microscopic Polyangiitis, or MPA. It is a rare autoimmune disease that causes inflammation of small blood vessels in your body.”

Patient:  
“What does that mean? How serious is it?”

Doctor:  
“MPA causes your immune system to mistakenly attack the small blood vessels, which can reduce blood flow and damage organs like your kidneys, lungs, nerves, and skin. It can cause symptoms like fatigue, fever, muscle and joint pain, weight loss, and sometimes breathing problems or nerve symptoms. It is serious but treatable, especially if we start treatment early.”

Patient:  
“I’ve been feeling tired and have some joint pain and numbness in my feet. Is that related?”

Doctor:  
“Yes, those symptoms are common in MPA. The inflammation can affect your nerves causing numbness or weakness, and the general inflammation can cause fatigue and joint pain.”

Patient:  
“How do you treat this? Will I need to take medications forever?”

Doctor:  
“We usually start with medications that suppress your immune system, such as corticosteroids like prednisone, often combined with other drugs like methotrexate or cyclophosphamide to control the inflammation. For more severe cases, we might use biologic medications like rituximab. Treatment typically lasts several months to induce remission, followed by maintenance therapy to keep the disease under control.”

Patient:  
“What are the side effects of these medicines?”

Doctor:  
“Steroids can cause side effects like increased blood sugar, mood changes, and bone thinning if used long-term. Other drugs can affect your immune system, increasing infection risk. We will monitor you closely to manage side effects and adjust treatment as needed.”

Patient:  
“Will I be able to do my normal activities?”

Doctor:  
“At first, you may need to rest more, especially during flare-ups. As treatment takes effect and symptoms improve, most people can gradually return to their usual activities. We’ll work together to monitor your progress.”

Patient:  
“What should I watch for and report?”

Doctor:  
“Please tell me if you develop new symptoms like worsening fatigue, shortness of breath, blood in urine, skin sores, or any signs of infection. Early reporting helps us adjust treatment promptly.”

Patient:  
“Is this condition curable?”

Doctor:  
“MPA is a chronic condition without a cure, but with treatment, many people achieve remission and live well. We aim to control inflammation and prevent organ damage.”

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[Microscopic Polyangiitis (MPA): Symptoms, Causes, Tests and Treatment](https://my.clevelandclinic.org/health/diseases/13285-microscopic-polyangiitis-mpa#overview)

### **MYOPATHY**

**DEFINITION AND DESCRIPTION**

Myopathy refers to diseases that affect skeletal muscles (muscles that connect to your bones). These diseases attack muscle fibers, making your muscles weak.

### **Types of myopathies**

Myopathy can be categorized by its cause. Basically, myopathies are separated into two categories: inherited and acquired.

#### **Inherited myopathies**

**Inherited myopathies** are those that you’re born with, often from inheriting an abnormal gene mutation from a parent that causes the disease. Conditions that are inherited myopathies include:

**Congenital myopathies**

Symptoms of congenital myopathies usually start at birth or in early childhood but may not appear until the teen years or even later in adulthood. Congenital myopathies are somewhat unique compared with other inherited myopathies, as weakness typically affects all muscles (not just the ones closest to the center of your body) and is often not progressive.

**Mitochondrial myopathies**

Mitochondrial myopathy is caused by a defect in the mitochondria, which are the energy-producing part of cells. These conditions have muscle weakness, but also a variety of other symptoms, as mitochondrial disorders typically affect other organ systems like your heart, brain and gastrointestinal tract. Diseases in this group can be caused by gene mutations with or without a family history.

**Metabolic myopathies**

Defects in genes that code for enzymes that are needed for normal muscle function and movement cause metabolic myopathies. They often show as exercise intolerance, exertional muscle pains in your shoulders and thighs, or non-traumatic rhabdomyolysis (muscle fiber condition). These can also happen with episodes of weakness that come and go with other times of normal strength.

**Muscular dystrophies**

Muscular dystrophies are characterized by progressive degeneration of muscle tissue due to abnormal or insufficient structural support proteins being present. They all involve your arms and/or legs to varying degrees, and some involve the muscles of your eyes or face.

#### **Acquired myopathies**

**Acquired myopathies** develop later in life and can be due to other medical disorders, infections, exposure to certain medications or electrolyte imbalances, among other possibilities. Conditions that are acquired myopathies include:

**Autoimmune/inflammatory myopathy**

Autoimmune/inflammatory myopathies are diseases in which your body attacks itself, causing problems with muscle function.

**Toxic myopathy**

Toxic myopathy happens when a toxin or medication interferes with muscle structure or function.

* **Toxins:** Alcohol and toluene (a vapor in spray paint and other substances that can be inhaled by people who abuse substances).
* **Medications:** Checkpoint inhibitor immunotherapy (pembrolizumab, nivolumab), corticosteroids (prednisone), cholesterol-lowering drugs (statins), amiodarone, colchicine, chloroquine, antivirals and protease inhibitors used in the treatment of HIV infection, omeprazole.

**Endocrine myopathies**

Endocrine myopathies happen when hormones interfere with muscle function.

* **Thyroid:** Low thyroid (hypothyroidism) is more common, but increased thyroid (hyperthyroidism) can also be problematic.
* **Parathyroid:** Hyperparathyroidism resulting in increased calcium levels.
* **Adrenal:** Addison’s disease and Cushing syndrome.

**Infectious myopathies**

Infectious myopathies occur as the result of infections that affect muscle function. These include:

* Viral infections like HIV, influenza, Epstein-Barr.
* Bacterial pyomyositis.
* Lyme disease.
* Parasitic infections like trichinosis, toxoplasmosis, cysticercosis.
* Fungal infections like Candida, Coccidiomycosis.

**Electrolyte imbalance**

High or low levels of the following electrolytes can interfere with muscle function:

* **Potassium:** Hypokalemia (low), hyperkalemia (high).
* **Magnesium:** Hypermagnesemia (high).

**Critical illness myopathy**

Critical illness myopathy is a disease of your limbs and the muscles that help you breathe (respiratory muscles). It develops while you’re being cared for in an intensive care unit, and may be caused in part by being in bed for a long period of time (prolonged immobility), or by the medications used during your care, such as muscle relaxants, corticosteroids or sedatives.

## **Symptoms and Causes**

Anyone can get myopathy.

Factors that might increase your risk include:

* **Having a family history of myopathy.** This increases the likelihood you might inherit an abnormal gene that causes muscle disease.
* **Being male.** Some myopathies are carried on the X chromosome, and actually affect more men than women. Other inherited forms of myopathy carried on other chromosomes affect everyone equally.
* **Having an autoimmune, metabolic or endocrine disorder.**
* **Being exposed to certain medications or toxins** (see toxic myopathy below for a list of some of these medications).

How common myopathies are depends on their type. In acquired myopathies, for example:

* Inflammatory and endocrine myopathies are more common than other types and are more common in females than males.
* The number of people diagnosed with inflammatory myopathy is between 9 and 32 per 100,000.
* Anywhere from 25% to 79% of adults with hypothyroidism will develop muscle symptoms; though, overt myopathy might be as low as 10%.

The most common inherited myopathies are muscular dystrophies, and these are typically more common in males.

* Duchenne’s and Becker’s muscular dystrophies are the most common, with 7 per 100,000 people worldwide.
* Mitochondrial disorders affect 1 in 5,000 people, and most affect skeletal muscle. Other forms of inherited myopathies are rare.

### **Symptoms of myopathy**

Many myopathies share common symptoms. These common symptoms include:

* Muscle weakness, most commonly of your upper arms and shoulders and thighs (more common and more severe).
* Muscle cramps, stiffness and spasms.
* Fatigue with exertion.
* Lack of energy.

### **What does myopathy feel like?**

Most myopathies share the common symptom of symmetric muscle weakness (similar on both sides of your body), especially in proximal muscles. Proximal muscles are those closest to the center of your body, such as the muscles in your shoulders, upper arms, hips and thighs. This can lead to the following:

* Difficulty performing activities of daily living such as bathing, dressing or combing your hair.
* Trouble getting out of a chair, climbing stairs or performing tasks that require reaching over your head, like changing a ceiling light bulb.
* Muscle cramps or spasms.
* Muscle fatigue with activity.
* Shortness of breath with exertion.

The muscles in your hands or feet aren’t usually affected.

Other symptoms vary depending on the type of myopathy.

* Muscle weakness can be either non-progressive, or very slowly progressive.
* In some disorders, muscle weakness is intermittent with other normal periods of strength.
* Slow development of skills requiring the use of muscles in children (such as walking, hopping, climbing stairs or grasping a spoon or pencil).
* Children who can’t keep up with their peers during sports or games like tag.
* Trouble with the muscles that control your swallowing and speech, which can lead to choking and slurring of words.

## **Diagnosis and Tests**

You should first contact your primary care doctor to alert them to the symptoms you’re concerned about. Depending on the nature of your symptoms, you might be referred to a specialist such as a neurologist or a rheumatologist.

Your healthcare provider will ask about your medical and family history, prescription drug history and your symptoms. Your healthcare provider will conduct a physical exam, which will include an exam of your skin, reflexes, muscle strength, balance, and sensation.

Tests your healthcare provider may order include:

* Blood tests:
  + Muscle enzymes such as creatine kinase (CK) or aldolase may be elevated in certain myopathies as a result of the breakdown of muscle fibers.
  + Electrolyte levels such as sodium, magnesium, potassium, calcium and phosphorus.
  + Autoimmune disease testing such as antinuclear antibodies (ANA), rheumatoid factor, sedimentation rate and c-reactive protein.
  + Endocrine testing such as thyroid hormone.
* Electromyography (EMG and nerve conduction studies), including testing the electrical conduction of your nerves and needle examination of your muscles to assess the type and degree of muscle damage.
* Magnetic resonance imaging (MRI) of your muscles.
* Genetic tests.
* Muscle biopsy, in which your healthcare provider surgically removes a small piece of muscle tissue for testing.

## **Management and Treatment**

After determining your specific type of myopathy, your healthcare provider will develop a treatment plan specific to your symptoms.

Most treatments include physical therapy, occupational therapy and some form of exercise. Other treatments are more specific and based on the type of myopathy. In general, most acquired myopathies can be well controlled and treated to minimize weakness and symptoms. Some inherited myopathies have specific treatments that can stop the progression of the disease. At the present time, most inherited myopathies don’t have specific treatments, but people can benefit from physical therapy and certain types of exercise.

#### **Inflammatory and autoimmune-related myopathies**

The goal of treatment is to decrease inflammation and your body’s autoimmune response. These myopathies are often treated with:

* Immunomodulatory/immunosuppressant drugs such as methotrexate, cyclosporine, tacrolimus, azathioprine, mycophenolate, rituximab and intravenous (IVIg) or subcutaneous (SubQIg) immunoglobulin.
* Corticosteroids such as prednisone or methylprednisolone.

#### **Inherited and genetic myopathies**

Most inherited and genetic myopathies don’t have a specific treatment or cure. Management is largely based on symptom control and different forms of therapy. There are multiple ongoing clinical trials in various areas of research looking at treatments and gene therapy.

Duchenne muscular dystrophy and Pompe disease are disorders that can be treated with specific medication.

#### **Other acquired myopathies**

Healthcare providers manage acquired myopathies including endocrine, toxic and infectious myopathies by treating the underlying disease causing the myopathy. Toxin-related myopathies are treated by stopping the offending agent (alcohol or toluene, for example) or medication (statins, for example). Muscle symptoms that result from infections caused by bacteria, viruses or other infectious organisms are improved by treating the infection directly with antibiotics.

## **Myopathy Treatment: Drug Information and Their Side Effects**

## 1. Stopping or Adjusting Offending Agents (Toxin-Related Myopathies)

* Many myopathies are caused or worsened by medications such as statins, colchicine, cyclosporine, tacrolimus, and antimalarials.
* Treatment: Discontinuation or dose reduction of the offending drug often leads to symptom improvement.
* Side Effects: Withdrawal may cause return of the original condition (e.g., cholesterol rise with statin cessation), so careful monitoring is needed.

## 2. Statins (HMG-CoA Reductase Inhibitors)

* Used to lower cholesterol but can cause statin-induced myopathy with symptoms ranging from mild muscle pain to severe rhabdomyolysis.
* Common drugs: Atorvastatin, simvastatin, rosuvastatin.
* Side Effects: Muscle pain, weakness, elevated creatine kinase (CK), rare rhabdomyolysis causing kidney damage. Risk increases with higher doses, combination with fibrates, older age, and genetic factors.

## 3. Immunosuppressive Agents (for Autoimmune Myopathies)

* Corticosteroids (e.g., prednisone): Reduce inflammation and immune response.
  + Side effects: Weight gain, hypertension, osteoporosis, glucose intolerance, mood changes, increased infection risk.
* Mycophenolate mofetil, rituximab: Used in refractory or severe autoimmune myopathies.
  + Side effects: Immunosuppression leading to infections, infusion reactions (rituximab), gastrointestinal upset.

## 4. Colchicine

* Used for gout and familial Mediterranean fever; can cause toxic neuromyopathy with proximal muscle weakness, especially with chronic use or renal impairment.
* Side Effects: Muscle weakness, sensory loss, diminished reflexes.

## 5. Cyclosporine and Tacrolimus

* Immunosuppressants used in transplantation and autoimmune diseases.
* Can cause generalized myalgias, proximal weakness, and rarely hypertrophic cardiomyopathy.
* Side Effects: Muscle necrosis, elevated CK, cardiac complications (especially tacrolimus).

## 6. Antimalarials (Chloroquine, Hydroxychloroquine)

* Used in autoimmune diseases; may cause a vacuolar myopathy with proximal muscle weakness and dysphagia after long-term use.
* Side Effects: Muscle weakness, elevated muscle enzymes, rarely cardiac involvement.

## 7. Other Drugs Causing Myopathy

* Antiarrhythmics (amiodarone, procainamide), corticosteroids (especially long-term high doses), some blood pressure medications (labetalol), and diuretics (furosemide) can also cause muscle weakness.

**DIFFERENTIAL DIAGNOSIS**

Differential diagnosis of myopathy is extensive, as it varies depends on the associated symptoms:

**Guillain-Barre syndrome:** The typical patient with GBS, which in most cases will manifest as acute inflammatory demyelinating polyradiculoneuropathy (AIDP), presents 2-4 weeks following a relatively benign respiratory or gastrointestinal illness with complaints of finger dysesthesias and proximal muscle weakness of the lower extremities. The weakness may progress over hours to days to involve the arms, truncal muscles, cranial nerves, and muscles of respiration.

**Tick-borne diseases:** The reference standard for the diagnosis of tickborne rickettsial diseases is the indirect immunofluorescence antibody (IFA) assay using paired serum samples obtained soon after illness onset and 2-4 weeks later.

**Lambert-Eaton myasthenic syndrome (LEMS):** proximal muscle weakness, depressed tendon reflexes, post-tetanic potentiation, and autonomic changes due to impairment in acetylcholine release.

**Myasthenia gravis:** an autoimmune disorder of peripheral nerves in which antibodies form against acetylcholine (ACh) nicotinic postsynaptic receptors at the myoneural junction. A reduction in the number of ACh receptors results in a characteristic pattern of progressively reduced muscle strength with repeated use of the muscle and recovery of muscle strength following a period of rest. The bulbar muscles are affected most commonly and most severely, but most patients also develop some degree of fluctuating generalized weakness.

Other differentials include the following:

* Malignant hyperthermia
* Myotonia
* Myositis ossificans
* Myositis associated with the vasculitides
* Paraneoplastic syndromes (eg. carcinomatous neuropathy, cachexia, myonecrosis)
* Direct muscle damage (trauma, excessive exercise)
* Nutritional deficiencies (vitamin E deficiency, malabsorption syndromes)

Inflammatory and endocrine myopathies are a more common type of myopathy in general which usually in middle-aged women> men. It was found that the incidence rate of inflammatory myopathies varied between 1.16 to 19/million/year while the prevalence varied between 2.4 to 33.8 per 100,000 population.

The most common inherited myopathies are the dystrophinopathies, which are more common in male patients and affect every race and ethnicity equally. Amongst them, Duchenne's and Becker's muscular dystrophy are the most prevalent which varied between 19.8 and 25.1 per 100,000 person-years.Mitochondrial myopathies affect 1 in 4300 people. Other forms of inherited myopathies are rare.

## **Myopathy Procedures and Timelines**

## 1. Initial Diagnosis and Evaluation

* Timeline: Days to weeks
* Procedures:
  + Clinical history and physical exam
  + Blood tests (e.g., creatine kinase, autoimmune markers)
  + Electromyography (EMG)
  + Muscle biopsy if needed
  + Genetic testing for inherited forms

## 2. Acute/Emergency Management (if applicable)

* Timeline: Immediate to days
* Procedures:
  + Manage respiratory failure (may require ventilation or tracheostomy)
  + Treat metabolic crises (e.g., hypokalemia or rhabdomyolysis) in metabolic myopathies
  + Address cardiac complications (monitor and treat cardiomyopathy or arrhythmias)
  + Hospitalization for severe cases

## 3. Medical Treatment

* Timeline: Weeks to months, ongoing
* Procedures:
  + Immunosuppressive therapy (e.g., corticosteroids, methotrexate) for inflammatory myopathies; improvement may take weeks
  + Discontinuation of offending drugs in toxic myopathies (e.g., statins) leads to gradual recovery over weeks to months
  + Specific treatments for certain genetic myopathies (e.g., enzyme replacement in Pompe disease)
  + Antibiotics for infectious myopathies

## 4. Physical and Occupational Therapy

* Timeline: Starts early, ongoing indefinitely
* Procedures:
  + Muscle strengthening and flexibility exercises
  + Assistive devices training (walking aids, wheelchairs)
  + Electrical muscle stimulation and occupational therapy to improve function and daily living activities

## 5. Surgical Interventions

* Timeline: As indicated, recovery weeks to months
* Procedures:
  + Tendon release surgery or contracture correction to improve mobility or prolong ambulation
  + Orthopedic surgeries for deformities if present

## 6. Long-Term Monitoring and Support

* Timeline: Lifelong
* Procedures:
  + Regular follow-up visits to monitor disease progression and treatment side effects
  + Pulmonary function tests to detect respiratory muscle weakness early
  + Cardiac monitoring for cardiomyopathy or conduction defects
  + Genetic counseling for inherited forms
  + Nutritional and dietary advice to maintain optimal health

## **Major Genes Implicated in Genetic Myopathies**

| Gene | Associated Myopathy Type | Frequency in Study | Notes |
| --- | --- | --- | --- |
| GNE | GNE-myopathy (hereditary inclusion body myopathy) | 31% | Missense variants distributed throughout gene; common variants c.2179G>A (p.V727M) and c.1760T>C (p.I587T) |
| DYSF | Dysferlinopathy (limb-girdle muscular dystrophy type 2B) | 27% | Majority homozygous variants; autosomal recessive inheritance |
| CAPN3 | Calpainopathy (limb-girdle muscular dystrophy type 2A) | 19% | Autosomal recessive; important cause of LGMD |

Other less common genes identified include:

* Sarcoglycanopathies (*SGCA/B/D/G*)
* Collagenopathies (*COL6A1/2/3*)
* Anoctaminopathy (*ANO5*)
* Telethoninopathy (*TCAP*)
* Pompe disease (*GAA*)
* Myoadenylate deaminase deficiency (*AMPD1*)
* Myotilinopathy (*MYOT*)
* Laminopathy (*LMNA*)
* Emery-Dreifuss muscular dystrophy (*EMD*)
* Filaminopathy (*FLNC*)
* TRIM32-related myopathy (*TRIM32*)
* POMT1-related myopathy (*POMT1*)
* Merosin-deficient congenital muscular dystrophy (*LAMA2*)

## Examples of Specific Genetic Myopathies

* MYPN (Myopalladin) mutations: Cause rare cap myopathy with slowly progressive proximal and distal weakness, mild ptosis, and bulbar symptoms. Only a few cases reported worldwide, including recent South Asian patients[4](https://thejcn.com/DOIx.php?id=10.3988%2Fjcn.2021.17.3.409).
* Mitochondrial myopathies: Caused by mutations in mitochondrial or nuclear genes affecting mitochondrial function; clinical and genetic heterogeneity is high

## **Living With**

Although myopathy is a long-term (chronic) disease whether inherited or acquired, you can take steps to improve your health to help control your illness. These might include:

* Eat a healthy, well-balanced diet full of a variety of fruits and vegetables.
* Stay active with mild cardiovascular exercise. It may be recommended to avoid certain types of weightlifting depending on your myopathy type, and you should discuss this with your doctor prior to starting any exercise routine.
* Maintain a healthy weight.
* If you have a dermatomyositis rash, protect your skin from sunlight, which can worsen the rash. Wear full-cover clothing and a hat when able. Be sure to apply sunscreen with a sun-protective factor (SPF) of at least 30 before going outdoors.
* If you have trouble swallowing, eat soft or semisolid foods. Consider pureeing your food. If you’re bedbound, eat sitting up in bed.
* Take all medications as prescribed.
* Participate in your therapies if recommended — physical, occupational or speech.

## **Common Questions and Answers**

## 1. What is myopathy?

Myopathy refers to diseases of the muscles where muscle fibers do not function properly, leading to muscle weakness, cramps, stiffness, and sometimes pain.

## 2. What causes myopathy?

Causes include:

* Genetic mutations (inherited myopathies)
* Autoimmune inflammation (inflammatory myopathies)
* Medications or toxins (e.g., statins, steroids)
* Metabolic or endocrine disorders (e.g., thyroid disease)
* Infections
* Critical illness-related factors

## 3. What are the common symptoms of myopathy?

* Muscle weakness (typically proximal muscles like hips and shoulders)
* Muscle pain or cramps
* Fatigue
* Difficulty climbing stairs, rising from a chair, or lifting objects
* In severe cases, respiratory or swallowing difficulties

## 4. How is myopathy diagnosed?

* Medical history and physical exam
* Blood tests (e.g., creatine kinase levels)
* Electromyography (EMG)
* Muscle biopsy
* Genetic testing for inherited forms
* Imaging such as MRI in some cases

## 5. How is myopathy treated?

* Depends on cause:
  + Immunosuppressive drugs for inflammatory myopathies
  + Stopping offending drugs in toxic myopathies
  + Supportive care including physical therapy
  + Specific treatments like enzyme replacement in metabolic myopathies
* No cure for many inherited forms, but symptom management is key.

## 6. Can myopathy be prevented?

* Avoiding known toxins or medications that cause muscle damage
* Early diagnosis and treatment of autoimmune or metabolic causes
* Genetic counseling for inherited myopathies

## 7. Is myopathy life-threatening?

* Most myopathies cause chronic disability rather than death.
* Severe cases affecting respiratory muscles or heart can be life-threatening and require close monitoring.

## 8. Can myopathy symptoms improve?

* Inflammatory and toxic myopathies often improve with treatment.
* Genetic myopathies are usually progressive but physical therapy can help maintain function.

## 9. When should I see a doctor?

* If you experience unexplained muscle weakness, pain, or fatigue, especially if worsening or interfering with daily activities.

## 10. What specialists treat myopathy?

* Neurologists, rheumatologists, geneticists, and physiatrists often manage myopathy depending on the underlying cause.

## **Doctor-Patient Conversation: Myopathy**

Doctor:  
“Hello, I want to talk about the muscle symptoms you’ve been experiencing. Based on your exam and tests, you have a condition called myopathy, which means your muscles are weak or not working properly.”

Patient:  
“What causes myopathy? Is it serious?”

Doctor:  
“Myopathy can have many causes. It might be due to inflammation, genetic factors, medications, or other underlying conditions. Some types are temporary and treatable, while others may be chronic. The seriousness depends on the cause and how much your muscles are affected.”

Patient:  
“I’ve noticed muscle weakness and sometimes cramps. Is that typical?”

Doctor:  
“Yes, muscle weakness is the main symptom of myopathy. You might also experience muscle cramps, stiffness, or fatigue. Sometimes it can affect certain muscle groups more than others.”

Patient:  
“How do you find out what type of myopathy I have?”

Doctor:  
“We use a combination of your medical history, physical exam, blood tests for muscle enzymes, electromyography (EMG), and sometimes a muscle biopsy. These help us identify the cause and guide treatment.”

Patient:  
“What treatments are available?”

Doctor:  
“Treatment depends on the cause. If it’s inflammatory myopathy, we use medications like corticosteroids or immunosuppressants. If it’s due to medication side effects, stopping the medication may help. Physical therapy is often important to maintain muscle strength and function.”

Patient:  
“Will I be able to get better?”

Doctor:  
“Many people improve with treatment, especially if we start early. Some myopathies require long-term management, but we aim to help you maintain the best possible muscle function.”

Patient:  
“Are there things I should avoid or do to help my muscles?”

Doctor:  
“Regular, gentle exercise tailored to your ability is helpful. Avoid overexertion, and let me know if you notice worsening weakness or new symptoms. Proper nutrition and avoiding harmful medications are also important.”

Patient:  
“How often will I need follow-up?”

Doctor:  
“We’ll schedule regular visits to monitor your progress and adjust treatment as needed. If you experience new or worsening symptoms, please contact me sooner.”

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### **HIP REVISION SURGERY**

**DESCRIPTION**

Hip revision surgery is a procedure that repairs or replaces an artificial hip joint. You may need this procedure after hip replacement surgery to correct any damage to your artificial hip that happened because of:

* Normal wear and tear.
* Loosening of the implant from the bone.
* Dislocation (“popping out”).
* An infection.
* A broken bone around the prosthetic (artificial hip joint).
* Alignment issues.

Damage to your artificial hip joint can cause symptoms of pain and discomfort. You might not be able to use your hip to its full potential. The goal of hip revision surgery is to improve the function of your hip.

You may wonder why you need additional surgery after hip replacement surgery. Human-made (artificial) implants, or prosthesis, that your orthopaedic surgeon used to replace your hip during your first surgery doesn’t last forever. The typical life of an artificial hip joint is 10 to 20 years, depending on the daily use of your joint.

Think of your artificial hip implant as a vehicle. Over time, your car will need maintenance to keep it running. Your car is susceptible to normal wear and tear from frequent use. You may need to repair or replace your vehicle with a newer model that will get you back on the road. Hip revision surgery is the maintenance or repair that your artificial hip joint needs to keep functioning as expected.

#### **What does hip revision surgery treat or manage?**

After hip replacement surgery, normal, day-to-day movements wear down your artificial joint. This can cause your prosthetic to be loose, dislocate or not fit securely, which can keep it from functioning as it should. You’ll likely feel pain around your artificial hip. This is a sign that you might need this procedure. After revision surgery, your pain should lessen or go away and you’ll regain function of your artificial hip.

Infection is another reason why you may need hip revision surgery. An infection around your artificial hip joint can cause pain and weaken and damage your muscle, tendon and ligaments, along with your hip bone. To prevent this damage, your healthcare provider may recommend hip revision surgery.

Hip revision surgery isn’t common but may be necessary if you have an infection or damage to your artificial joint.

## **Procedure Details**

About a month before your hip revision surgery, you’ll meet with your care team to discuss your surgery and possible risks. They’ll also perform a physical exam, take a complete medical history and review any medications or supplements you currently take. Tests are also necessary and could include:

* Lab testing.
* Urine analysis.
* Electrocardiogram (EKG).
* X-rays.

When you schedule your hip revision surgery, you’ll also schedule appointments to meet with a physical therapist after your procedure. To prepare you for your surgery, your surgeon will go over specific instructions, like what medications are safe to take and what you should stop taking before the procedure. Don’t stop taking any medications unless your provider tells you it’s safe to do so.

#### **Preparing for hip revision surgery at home**

You can take steps at home to help you prepare for an easier recovery after hip revision surgery by:

* Asking someone to help you out at home for the first few weeks after surgery.
* Trying to stop or cut down on smoking before your surgery, if you smoke.
* Removing tripping hazards — like loose rugs or electrical cords — from your home.
* Moving commonly used household items, foods and beverages to a shelf or counter at your waist or shoulder level.
* Organizing your sleeping area on the main floor to avoid going up and down stairs.
* Using special equipment around your home to help you complete your daily tasks. You can use an elevated toilet or shower seat or a grasping device to help you put on your socks and shoes.

#### **Dental preparations for hip revision surgery**

Before hip revision surgery, your surgeon may recommend visiting a dentist to get a teeth cleaning and to take care of any cavities. You’re more at risk of developing an infection after your surgery because germs can enter your bloodstream via your mouth. Your hip needs extra blood supply while you heal, which makes you more susceptible to infection. After your surgery, your surgeon may recommend you wait three months before you visit the dentist unless you have a dental emergency. After your surgery, you’ll need to take antibiotics before you get any dental work done to prevent infections.

### **What happens during hip revision surgery?**

During hip revision surgery, your surgeon will remove all or part of your artificial hip joint and replace it with a new one.

In more severe infection cases, hip revision surgery happens in two different surgeries. The first surgery removes the artificial joint and treats the infection with antibiotics. Once the infection clears, the surgeon will perform a second surgery to place a new hip joint.

#### **TIMELINE**

Hip revision surgery can take about two hours. Your surgeon will give you an approximate time estimate before your procedure.

### **What can I expect after hip revision surgery?**

After hip revision surgery, you’ll need to stay in the hospital for a few days so your care team can monitor your healing progress. When you leave the hospital, you’ll complete your recovery at home. Your surgeon will give you care instructions that could include:

* Taking medications as directed to relieve pain and reduce your chance of getting a blood clot.
* Attending follow-up appointments and physical therapy on schedule.
* Keeping both legs elevated with a pillow or on a reclining chair for the first four to six weeks following surgery.
* Using equipment to help you walk, like a walker or cane, until you’re able to put full weight on your hip.
* Using handrails when going up or down stairs. Avoid using stairs immediately after surgery.

## **Risks / Benefits**

Hip revision surgery is a voluntary but safe procedure. The benefits of hip revision surgery include:

* Relieving pain.
* Improving mobility, strength and coordination of your torso and leg.
* Allowing you to return to your normal activities.

#### **How successful is hip revision surgery?**

The majority of hip revision surgeries successfully reduce pain and improve your range of motion. To increase the success of hip revision surgery, you’ll need to complete rehabilitation and physical therapy during your recovery as directed.

### **Risks or complications of hip revision surgery**

Every surgical procedure comes with potential risks. The possible complications of hip revision surgery could include:

* Lung or heart complications from anesthesia.
* Infection.
* Blood clots.
* Scarring.
* Injury to nerves or blood vessels.
* Weakness or instability of the joint.
* A need for additional revision surgeries in the future.

Your surgeon will explain the possible risks of your surgery before your procedure.

## **Recovery and Outlook**

The recovery time for hip revision surgery is approximately six months. There’s an adjusting period after surgery because normal activities like getting into a car and climbing stairs are going to be difficult. You’ll have a limp when walking and some pain that should go away after six months when you’re completely healed.

After surgery, you can improve your recovery time by:

* Exercising your legs to reduce swelling as directed.
* Elevating your legs above your heart when resting by placing your feet on a pillow.
* Using a walker after surgery. When you’re comfortable, following your doctor’s instructions, you can switch to a cane.

After approximately a month, your healthcare provider will take X-rays of your leg to monitor healing. If you have severe pain or swelling after surgery, contact your provider.

#### **Do I need physical therapy after hip revision surgery?**

Yes, immediately after surgery, you’ll start rehabilitation and physical therapy. Your physical therapist will monitor the strength and flexibility in your leg and hip, as well as your ability to stand and sit.

Physical therapy will continue while you’re in the hospital and when you go home. You’ll need to keep doing physical therapy for about a year. Your physical therapist will give you instructions so you can continue exercising at home, outside of your appointments. They’ll also explain what exercises and activities are safe to do following your surgery and when you can get back to your normal routine.

## **When To Call the Doctor**

Contact your provider if you notice any of the following symptoms after hip revision surgery:

* Increasing redness or color changes to your skin near your surgical site.
* Severe pain or swelling.
* Drainage at the incision.
* Bumps or pimples.
* Calf pain, coughing, chest pain, trouble breathing.
* Any other changes that concern you.

**How frequently should I schedule follow-up appointments with my doctor after hip revision surgery?**

You’ll need to schedule follow-up appointments after your surgery so your surgeon can monitor how well your hip is healing. After your surgery, you may need to schedule appointments during the following times:

* Four to six weeks.
* Three to six months.
* One year.
* Annually, on the anniversary date of your surgery.

You’ll need hip X-rays at most or all of your appointments.

**DOCTOR-PATIENT CONVERSATION**

Doctor:

Good morning. I understand you’re experiencing ongoing hip pain and issues after your previous hip surgery. After reviewing your imaging and clinical findings, it appears that your hip replacement is failing, and you may need a revision surgery.

Patient:

What exactly is revision hip replacement? How is it different from the first surgery I had?

Doctor:

Revision hip replacement is a more complex procedure than your initial hip replacement. It involves removing some or all of the existing prosthetic components and replacing them with new ones. Sometimes, the bone around the implant may have weakened or there may be complications like loosening or infection, which we need to address during surgery.

Patient:

Is this similar to conversion surgery? I heard about that term recently.

Doctor:

Good question. Conversion total hip arthroplasty refers to a hip replacement done after previous surgeries around the hip, such as fracture fixation or hip preservation procedures, that have failed. While conversion and revision surgeries share similarities, conversion surgeries often require specialized implants and longer hospital stays, similar to revision cases.

Patient:

What can I expect in terms of recovery and risks?

Doctor:

Recovery from revision or conversion hip surgery is generally longer than the primary surgery. You may stay in the hospital for a few days longer. The risks, such as infection, fracture, or dislocation, are somewhat higher but overall complication and reoperation rates are comparable to primary surgeries.

Patient-reported outcomes, including pain relief and physical function, tend to improve similarly over time.

Patient:

How long will I be in the hospital?

Doctor:

On average, patients stay about 3 to 4 days after revision or conversion hip surgery, compared to about 2 days for primary hip replacement. This allows us to monitor your recovery and manage pain effectively.

Patient:

Will I be able to return to my normal activities?

Doctor:

Most patients regain significant function and can return to many activities, though high-impact sports are generally discouraged. Physical therapy will be an important part of your recovery to restore strength and mobility.

Patient:

Are there special preparations I need before surgery?

Doctor:

Yes, you’ll need a thorough medical evaluation to ensure you’re fit for surgery. We’ll also do imaging studies like X-rays or CT scans to plan the surgery carefully.

Patient:

Thank you, Doctor. I feel better understanding what to expect.

REFERENCE

[Hip Revision Surgery: How To Prepare for Your Procedure](https://my.clevelandclinic.org/health/treatments/17104-hip-revision-surgery)

**ANKYLOSING SPONDYLITIS**

**DEFINITION AND DESCRIPTION**

Ankylosing spondylitis is a type of arthritis that affects joints in your spine. Healthcare providers sometimes call it axial spondyloarthritis.

Ankylosing spondylitis (AS) also affects the joints where the base of your spine meets your pelvis (your sacroiliac joints). Your sacroiliac joints are the connection between your spine and pelvis. Specifically, they’re the place where the sacrum (the triangle-shaped last section of your spine) meets the ilium (the top and back part of your pelvis).

The sacroiliac joints are some of the biggest joints in your body, and you use them every time you move or shift your hips.

It’s less common, but ankylosing spondylitis can affect other joints, including your:

* Shoulders.
* Hips.
* Knees.

Ankylosing spondylitis causes pain, stiffness and gastrointestinal (GI) symptoms. Visit a healthcare provider if you’re experiencing lower back pain, especially if it’s getting worse or making it hard to do all your usual daily activities.

## **Symptoms and Causes**

Everyone with ankylosing spondylitis experiences a unique combination of symptoms. Lower back pain due to sacroiliitis (painful inflammation in your sacroiliac joints) is the most common AS symptom.

The pain can spread (radiate). You might experience other types of pain, including:

* Hip pain.
* Pain in your butt (buttocks).
* Neck pain.
* Abdominal (stomach) pain.

Other ankylosing spondylitis symptoms can include:

* Stiffness or trouble moving your hips and lower back (especially first thing in the morning or after you’ve been resting in one position for a long time).
* Fatigue (feeling tired all the time).
* Shortness of breath (dyspnea).
* Losing your appetite or having unexplained weight loss.
* Diarrhea.
* Skin rashes.
* Vision problems.

### **What causes ankylosing spondylitis?**

Ankylosing spondylitis is an autoimmune disease. Autoimmune diseases happen when your immune system attacks your body instead of protecting it.

Experts aren’t certain what causes ankylosing spondylitis. Studies have found that specific genetic mutations are closely linked to having AS. Genetic mutations are changes to your DNA sequence that happen when your cells divide to make copies of themselves.

There are more than 60 mutated genes that might cause AS. One example is the *human leukocyte antigen-B (HLA-B27)* gene. More than 90% of white people who have AS also have a mutated *HLA-B27* gene.

#### **Risk factors**

Anyone can develop ankylosing spondylitis, but certain groups of people are more likely to have it, including:

* People younger than 40 (more than 80% of people with AS are diagnosed when they’re around 30).
* Males.
* People who have a close biological relative with AS (especially a biological parent).

People with certain health conditions are more likely to have ankylosing spondylitis, including:

* Crohn’s disease.
* Ulcerative colitis.
* Psoriasis.

### **Complications of ankylosing spondylitis**

People with ankylosing spondylitis have a higher risk of [spinal fractures](https://my.clevelandclinic.org/health/diseases/17498-spinal-fractures) (broken bones in your spine).

Other complications can include:

* Fused vertebrae (bones in your spine joining together).
* Kyphosis (a forward curve in your spine).
* Osteoporosis.
* Eye and vision issues like uveitis or light sensitivity.
* Heart issues, including aortitis, arrhythmia and cardiomyopathy.
* Nerve damage.

## **Diagnosis and Tests**

A healthcare provider will diagnose ankylosing spondylitis with a physical exam. They’ll examine your body and discuss your symptoms. Tell your provider when you first noticed pain or other symptoms, including if any time of day or activity makes them worse.

You might need to visit a rheumatologist, a healthcare provider who specializes in treating arthritis and similar conditions.

There’s no one test that can confirm you have AS. Your provider might use a few tests to help diagnose it, including:

* Sacroiliac joint and spine X-rays to check for signs of arthritis.
* Magnetic resonance imaging (MRI), which can show more details than X-rays.
* Blood tests to check for the mutated *HLA-B27* gene.

## **Management and Treatment**

Your healthcare provider will suggest treatments to manage your symptoms and reduce how much they affect your daily routine.

Common treatments for ankylosing spondylitis include:

* **Exercise:** Regular physical activity can reduce stiffness and stop AS from getting worse. Many people experience more severe pain when they’re inactive. A physical therapist can suggest specific stretches and exercises to help strengthen the muscles that support your back and spine.
* **Nonsteroidal anti-inflammatory drugs (NSAIDs):** Over-the-counter (OTC) NSAIDs, including ibuprofen and naproxen ease pain and inflammation. Talk to your provider before taking NSAIDs for more than 10 days in a row
* Biologic **disease-modifying anti-rheumatic drugs (DMARDs):** Biologic DMARDs are prescription medications that reduce inflammation and pain. They might also stop AS from getting worse.
* **Corticosteroids:** Corticosteroids are prescription anti-inflammatory medications. You might need cortisone shots (an injection of corticosteroids directly into your affected joints).
* **Surgery:** It’s rare to need surgery to treat AS. Your provider will usually only suggest it if you have severe symptoms that don’t get better after trying other treatments.

### **How soon will I feel better?**

You should start feeling better soon after starting treatment. Your symptoms might not completely go away, but they should improve as you find treatments that work for you. Ask your provider when to expect improvements. Exercise and physical therapy are a gradual process, and medications take different amounts of time to take effect.

## **Physiotherapy and exercise**

Keeping active can improve your posture and range of spinal movement, along with preventing your spine becoming stiff and painful.

As well as keeping active, physiotherapy is a key part of treating AS. A physiotherapist can advise about the most effective exercises and draw up an exercise programme that suits you.

Types of physiotherapy recommended for AS include:

* **a group exercise programme** – where you exercise with others
* **an individual exercise programme** – you are given exercises to do by yourself
* **hydrotherapy** – exercise in water, usually a warm, shallow swimming pool or a special hydrotherapy bath; the buoyancy of the water helps make movement easier by supporting you, and the warmth can relax your muscles

Some people prefer to swim or play sports to keep flexible. This is usually fine, although some daily stretching and exercise is also important.

If you're ever in doubt, speak to your physiotherapist or rheumatologist before taking up a new form of sport or exercise.

**Painkillers**

You may need painkillers to manage your condition while you're being referred to a rheumatologist. The rheumatologist may continue prescribing painkillers, although not everyone needs them all the time.

### **Non-steroidal anti-inflammatory drugs (NSAIDs)**

The first type of painkiller usually prescribed is a non-steroidal anti-inflammatory drug (NSAID). As well as helping ease pain, NSAIDs can help relieve swelling (inflammation) in your joints.

Examples of NSAIDs include:

* ibuprofen
* naproxen
* diclofenac
* etoricoxib

When prescribing NSAIDs, your GP or rheumatologist will try to find the 1 that suits you and the lowest possible dose that relieves your symptoms. Your dose will be monitored and reviewed as necessary.

* Side Effects:
  + Gastrointestinal irritation, heartburn, gastritis, ulcers, bleeding
  + Increased risk of heart attack or stroke, especially in patients with cardiovascular disease
  + Kidney function impairment with long-term use
* Management: Often prescribed with antacids or protective agents (e.g., proton pump inhibitors) to reduce stomach side effect

### **Paracetamol**

If NSAIDs are unsuitable for you or if you need extra pain relief, an alternative painkiller, such as paracetamol, may be recommended.

Paracetamol rarely causes side effects and can be used in women who are pregnant or breastfeeding. However, paracetamol may not be suitable for people with liver problems or those dependent on alcohol.

### **Codeine**

If necessary, you may also be prescribed a stronger type of painkiller called codeine.

Codeine can cause side effects, including:

* feeling sick
* being sick
* constipation
* drowsiness

## **Biological treatments**

### **Anti-TNF medicine**

If your symptoms cannot be controlled using NSAIDs and exercising and stretching, anti-tumour necrosis factor (TNF) medicine may be recommended. TNF is a chemical produced by cells when tissue is inflamed.

Anti-TNF medicines are given by injection and work by preventing the effects of TNF, as well as reducing the inflammation in your joints caused by ankylosing spondylitis.

If your rheumatologist recommends using anti-TNF medicine, the decision about whether they're right for you must be discussed carefully, and your progress will be closely monitored.

In rare cases anti-TNF medicine can interfere with the immune system, increasing your risk of developing potentially serious infections.

If your symptoms do not improve significantly after taking anti-TNF medicine for at least 3 months the treatment will be stopped. You may be offered a different anti-TNF medicine.

### **Monoclonal antibody treatment**

Monoclonal antibodies, such as secukinumab and ixekizumab, may be offered to people with AS who do not respond to NSAIDs or anti-TNF medicine, or as an alternative to anti-TNF medicine.

This type of treatment works by blocking the effects of a protein involved in triggering inflammation.

## **JAK inhibitors**

JAK inhibitors are a type of medicine that may be offered to people with AS who do not respond to anti-TNF medicine or cannot take it.

They work by blocking enzymes (proteins) that the immune system uses to trigger inflammation. They're taken as tablets.

* Side Effects:
  + Increased risk of infections, including serious infections like tuberculosis
  + Injection site reactions
  + Rarely, demyelinating diseases or heart failure exacerbation
  + Possible increased risk of certain malignancies
* Monitoring: Requires screening for latent infections before starting treatment

## **Corticosteroids**

Corticosteroids have a powerful anti-inflammatory effect and can be taken as injections by people with AS.

If a particular joint is inflamed, corticosteroids can be injected directly into the joint. You'll need to rest the joint for up to 48 hours after the injection.

It's usually recommended to limit corticosteroid injections to no more than 3 times in one year, with at least 3 months between injections in the same joint.

This is because corticosteroid injections can cause a number of side effects, such as:

* infection in response to the injection
* the skin around the injection may change colour (depigmentation)
* the surrounding tissue may waste away
* a tendon near the joint may burst (rupture)

## **Disease-modifying anti-rheumatic drugs (DMARDs)**

Disease-modifying anti-rheumatic drugs (DMARDs) are an alternative type of medicine often used to treat other types of arthritis.

DMARDs may be prescribed for AS, although they're only beneficial in treating pain and inflammation in joints in areas of the body other than the spine.

Sulfasalazine and methotrexate are the main DMARDs sometimes used to treat inflammation of joints other than the spine.

## **Surgery**

Most people with AS will not need surgery. However, joint replacement surgery may be recommended to improve pain and movement in the affected joint if the joint has become severely damaged.

For example, if the hip joints are affected, a hip replacement may be carried out.

In rare cases corrective surgery may be needed if the spine becomes badly bent.

## **Procedures and Timelines**

## 1. Diagnosis Phase

* Timeline: Weeks to months
* Procedures:
  + Medical history and physical examination focusing on back pain, stiffness, and mobility.
  + Laboratory tests: Complete blood count (CBC), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and HLA-B27 genetic testing.
  + Imaging: X-rays to detect sacroiliitis and spinal changes; MRI for early detection of inflammation before X-ray changes appear.
  + Ultrasound may be used to assess enthesitis (inflammation at tendon/ligament insertions).

## 2. Initial Treatment Phase

* Timeline: Immediate and ongoing
* Procedures:
  + NSAIDs: First-line medications to reduce pain and inflammation; patients often start these immediately after diagnosis.
  + Physical Therapy: Begins early and is lifelong; includes stretching, strengthening exercises, posture training, and hydrotherapy to maintain spinal mobility and reduce stiffness.
  + Patient Education: Emphasizes the importance of exercise and posture.

## 3. Advanced Medical Treatment

* Timeline: If symptoms persist or worsen after 3 months of NSAIDs and physical therapy
* Procedures:
  + Biologic Agents:
    - TNF inhibitors (e.g., adalimumab, etanercept) are started if NSAIDs are insufficient.
    - IL-17 inhibitors (e.g., secukinumab, ixekizumab) may be used if TNF inhibitors fail or are contraindicated.
  + Janus Kinase (JAK) Inhibitors: Oral medications like tofacitinib or upadacitinib may be prescribed for refractory cases.
  + Corticosteroid injections: Occasionally used for joint inflammation or enthesitis for short-term relief.

## 4. Monitoring and Follow-up

* Timeline: Lifelong
* Procedures:
  + Regular clinical reviews every 3 to 6 months to assess disease activity, medication side effects, and functional status.
  + Periodic imaging to monitor spinal and joint progression.
  + Screening for complications such as uveitis (eye inflammation), inflammatory bowel disease, or cardiovascular risk.

## 5. Surgical Interventions

* Timeline: Considered in advanced disease or complications
* Procedures:
  + Hip replacement surgery: For advanced hip joint damage causing severe pain and disability.
  + Spinal surgery: For correction of severe spinal deformities like kyphosis or to relieve nerve compression.
  + Surgery is relatively rare and reserved for specific indications.

## **Ankylosing Spondylitis Genomic Data**

## 1. HLA-B27 Gene Variant

* Over 80% of people with ankylosing spondylitis (AS) carry the HLA-B27 gene variant, a major genetic risk factor
* Despite this strong association, only a minority of people with HLA-B27 develop AS (estimated 5-10% of carriers), indicating other genetic and environmental factors contribute
* HLA-B27 accounts for about 20-50% of the heritability of AS depending on the study

## 2. Additional HLA and MHC Variants

* Besides HLA-B27, other HLA Class I and II alleles (e.g., HLA-B60) and multiple variants within the major histocompatibility complex (MHC) region contribute to AS risk.
* The genetic architecture of the MHC locus is complex and varies between ethnic groups

## 3. Non-HLA Genetic Associations

* More than 40 non-HLA genetic variants have been identified that influence AS susceptibility
* Key non-HLA genes include:
  + ERAP1 (Endoplasmic Reticulum Aminopeptidase 1): Involved in peptide processing for HLA presentation; contributes about 10-25% of genetic risk
  + IL23R (Interleukin-23 Receptor): Part of the IL-23/IL-17 inflammatory pathway implicated in AS pathogenesis
  + IL1A, KIR genes, and others also show associations but require further validation

## 4. Pathways and Mechanisms

* Genetic studies highlight the role of immune system pathways:
  + Antigen processing and presentation (HLA-B27, ERAP1)
  + IL-23/IL-17 inflammatory axis
  + Innate and adaptive immune cell activation
  + Interaction between gut microbiome and host immunity

## 5. Ethnic Variation

* Frequency of HLA-B27 and other risk alleles varies widely among populations, influencing AS prevalence
* Large international genetic consortia are pooling data to better understand these differences.

## 6. Heritability and Family Risk

* AS is highly heritable; family studies show increased risk among first-degree relatives
* If a parent has AS and carries HLA-B27, there is approximately a 50% chance of passing the gene to offspring, with 5-10% of carriers developing AS

## **Outlook / Prognosis**

Ankylosing spondylitis is a chronic (long-term) condition. You should expect to manage your symptoms for a long time (maybe the rest of your life). Some people with AS have periods of remission where they have fewer, or milder, symptoms. Even if it’s been a while since you experienced symptoms, there’s always a chance they can come back.

There’s no cure for AS (or any other type of arthritis), but that doesn’t mean you have to live in pain. Talk to your provider about what you’re feeling. Tell them how much your symptoms impact your ability to do your favorite activities.

## **Living With**

In addition to following your AS treatment regimen, there are some steps you can take to reduce inflammation in your body and stress on your joints:

* Follow a diet and exercise plan that’s healthy for you.
* Limit how much alcohol you drink.
* Quit smoking.

### **When should I see my healthcare provider?**

Visit your healthcare provider if you notice new symptoms, or if your symptoms get worse. Talk to your provider if it feels like your treatments aren’t managing your symptoms as well as they used to.

See a healthcare provider if you experience any of the following symptoms:

* Chest pain.
* Difficulty breathing.
* Vision problems.
* Severe back pain or other joint pain.
* Your spine feels unusually stiff or rigid.
* Unexplained weight loss.

### **What questions should I ask my healthcare provider?**

Questions to ask your provider include:

## What is ankylosing spondylitis (AS)?

Ankylosing spondylitis is a type of chronic inflammatory arthritis that primarily affects the spine and sacroiliac joints, causing pain, stiffness, and eventual fusion of the vertebrae. It can also affect other joints such as hips, knees, and shoulders, and sometimes other organs like the eyes and heart

## 2. What causes ankylosing spondylitis?

The exact cause is unknown, but AS is considered an autoimmune disease with a strong genetic component, especially related to the HLA-B27 gene. Environmental triggers may also play a role in triggering the immune system to attack joints and ligaments

## 3. Can ankylosing spondylitis be cured?

There is currently no cure for AS. However, treatments can relieve symptoms, improve function, and may slow disease progression

## 4. What are the common symptoms of AS?

* Chronic back pain and stiffness, especially in the lower back and buttocks
* Morning stiffness lasting more than 30 minutes
* Improvement of pain with exercise but not with rest
* Fatigue and reduced spinal mobility
* Possible peripheral joint pain and enthesitis (inflammation where tendons attach to bone)

## 5. How is ankylosing spondylitis diagnosed?

Diagnosis is based on:

* Medical history and physical exam
* Blood tests including inflammatory markers (CRP, ESR) and HLA-B27 testing
* Imaging such as X-rays and MRI to detect sacroiliitis and spinal changes

## 6. What treatments are available for AS?

* NSAIDs are first-line to reduce pain and inflammation
* Physical therapy and exercise to maintain spinal mobility and posture
* Biologic therapies such as TNF inhibitors and IL-17 inhibitors for patients who do not respond to NSAIDs
* DMARDs may be used for peripheral joint involvement
* Surgery (e.g., hip replacement) may be necessary in advanced joint damage

## 7. What lifestyle changes help manage AS?

Regular exercise, maintaining good posture, quitting smoking, and ergonomic adjustments can improve symptoms and quality of life

## 8. Can AS affect other parts of the body?

Yes, AS can cause complications including:

* Eye inflammation (uveitis)
* Heart problems such as aortitis and conduction abnormalities
* Lung fibrosis in advanced disease
* Osteoporosis and increased fracture risk

## 9. How long does it take for treatments to work?

Medications like NSAIDs may provide relief within days to weeks. Biologics may take several weeks to months to show full effect. Physical therapy effects accumulate over time with consistent effort

## 10. When should I see a doctor?

If you have persistent back pain and stiffness lasting more than 3 months, especially if it improves with exercise and worsens with rest, or if you have a family history of AS, you should seek medical evaluation

## **Differential Diagnoses**

* Congenital Spinal Deformity
* Degenerative Disk Disease
* Diabetic Foot Ulcers
* Herniated Nucleus Pulposus
* Heterotopic Ossification Imaging
* Diffuse Idiopathic Skeletal Hyperostosis (DISH) Imaging and Diagnosis
* Kyphosis
* Lower (Subaxial) Cervical Spine Fractures and Dislocations
* Lumbar Disc Disease
* Lumbar Spine Fractures and Dislocations
* Lumbar Spondylosis (Osteophytes, Bone Spurs)
* Osteoarthritis
* Osteofibrous Dysplasia
* Psoriatic Arthritis
* Reactive Arthritis
* Spinal Stenosis
* Spondylolisthesis, Spondylolysis, and Spondylosis
* Thoracic Spine Fractures and Dislocations

## **Epidemiology**

AS is the most common of the classic spondyloarthropathies. Prevalence varies with the prevalence of the *HLA-B27* gene in a given population, which increases with distance from the equator. In general, AS is more common in whites than in nonwhites. It occurs in 0.1-1% of the general population,with the highest prevalence in northern European countries and the lowest in sub-Saharan Africa.

Approximately 1-2% of all people who are positive for *HLA-B27* develop AS. This increases to 15-20% if they have a first-degree relative with HLA-B27 positive AS.

Prevalence data for nr-axSpA and USpA are scarce, although this disorder appears to be at least as common as AS, if not more so.The actual prevalence may be as high as 1-2% of the general population. The prevalence of nr-axSpA geographically and among different sexes and ethnic groups is probably similar to AS but specific data are limited, as it is also associated with HLA-B27.

### Age-related demographics

The age of onset of AS is usually from the late teens to age 40 years. Approximately 10%-20% of all patients experience symptom onset before age 16 years; in such patients, the disease is referred to as juvenile-onset AS. Onset of AS in persons older than 50 years is unusual, although a diagnosis of mild or asymptomatic disease may be made at a later age. Uncommonly, patients may not come to medical attention until they have advanced disease.

Diagnosis is often significantly delayed, usually for several years after the onset of inflammatory rheumatic symptoms. In a study of German and Austrian patients with AS, the age of onset of disease symptoms was 25 years in *HLA-B27*–positive and 28 years in *HLA-B27*–negative patients, with a delay in diagnosis of 8.5 years in *HLA-B27*–positive and 11.4 years in *HLA-B27*–negative patients.

In a study of Turkish patients with AS, the age of onset of disease symptoms was 23 years, with a delay in diagnosis of 5.3 years in *HLA-B27*–positive patients and 9.2 years in *HLA-B27*–negative patients. [[58](about:blank)] Patients with inflammatory back pain or a positive family history of AS had a shorter diagnostic delay.

USpA is generally found in young to middle-aged adults but can develop from late childhood into the fifth decade of life.

### Sex-related demographics

According to radiographic survey studies, prevalence rates of AS are approximately equal in men and women. However, men have more severe radiographic changes in the spine and hips than women,and clinical AS is more common in men than in women, with a male-to-female ratio of approximately 3:1.Females may have milder or subclinical disease. The male-to-female ratio for USpA is 1:3.

### Race-related demographics

The prevalence of AS parallels the prevalence of *HLA-B27* in the general population. The prevalence of *HLA-B27* and AS is higher in whites and certain Native Americans than in African Americans, Asians, and other non-white ethnic groups. However, a study of racial differences in AS among patients in the United States found that African Americans have high disease activity and co-morbidities compared with whites.AS is least prevalent in sub-Saharan Africa. The less common juvenile-onset version of AS is more common among Native Americans, Mexicans, and persons in developing countries.

USpA is not associated as strongly with *HLA-B27,* although it is more prevalent in whites than in nonwhite ethnic groups

## **Doctor-Patient Conversation: Ankylosing Spondylitis (AS)**

Doctor:  
“Thank you for coming in today. Based on your symptoms and imaging tests, you have a condition called Ankylosing Spondylitis, or AS. It’s a type of arthritis that mainly affects your spine and the joints where your spine meets your pelvis.”

Patient:  
“What exactly is Ankylosing Spondylitis? Is it serious?”

Doctor:  
“Ankylosing Spondylitis is a chronic inflammatory disease. It causes inflammation in your spinal joints, which can lead to pain and stiffness, especially in the lower back and hips. Over time, it can cause some of the bones in your spine to fuse together, reducing flexibility. While it’s a long-term condition, many people manage it well with treatment.”

Patient:  
“I’ve had back pain and stiffness, especially in the morning. Is that typical?”

Doctor:  
“Yes, morning stiffness and pain that improves with activity are classic symptoms of AS. You might also notice pain at night or after periods of inactivity.”

Patient:  
“What causes this condition?”

Doctor:  
“The exact cause isn’t fully understood, but genetics play a big role. Most people with AS have a gene called HLA-B27. It’s not contagious or caused by injury.”

Patient:  
“How is it treated? Will I need medication for life?”

Doctor:  
“Treatment focuses on reducing inflammation, relieving pain, and maintaining mobility. This usually includes physical therapy and medications like NSAIDs (nonsteroidal anti-inflammatory drugs). In some cases, biologic drugs that target the immune system are used. Many people take medication long-term to control symptoms.”

Patient:  
“Can I still work and stay active?”

Doctor:  
“Absolutely. Staying active with regular exercise and physical therapy is very important to keep your spine flexible and reduce stiffness. Most people with AS continue working and enjoy an active lifestyle.”

Patient:  
“Are there any complications I should be aware of?”

Doctor:  
“Sometimes AS can affect other parts of the body, like your eyes (causing inflammation called uveitis), heart, or lungs. We’ll monitor you regularly to catch any complications early.”

Patient:  
“What should I do if my symptoms get worse?”

Doctor:  
“If you notice increased pain, stiffness, or new symptoms like eye redness or vision changes, please contact me promptly. Early treatment helps prevent complications.”

Patient:  
“Thank you, doctor. I’m glad to know there are ways to manage this.”

Doctor:  
“You’re welcome. We’ll work together to keep your symptoms under control and maintain your quality of life. I’ll also refer you to a physical therapist who specializes in AS.”

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**TRANSVERSE FRACTURE**

**DEFINITION AND DESCRIPTION**

Transverse fractures are a type of broken bone. Transverse fractures run horizontally perpendicular to your bone (opposite the direction of your bone). You might see them referred to as complete fractures. This means the line of the brake goes all the way through your bone.

Transverse fractures usually affect long bones in your body. Some of the most common include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Humerus (upper arm).
* Radius and ulna (forearm).
* Clavicle (collarbone).

Transverse fractures are almost always caused by traumas like falls or car accidents. You might need surgery to repair your bone. Some people only need a splint or cast for the bone to heal.

How long it takes to recover fully depends on which of your bones are fractured and what caused the breaks. Most people need a few months to recover from a transverse fracture.

#### **Transverse fractures vs. transverse process fractures**

Transverse fractures and transverse process fractures are different types of bone fractures. Even though they have similar names, they’re very different injuries.

Transverse fractures occur when your bone is broken perpendicular to its length. The fracture pattern is a straight line that runs in the opposite direction of your bone. They can happen to any bone in your body, but usually affect longer bones after a trauma like a fall or accident.

Transverse process fractures are a type of spinal fracture. The transverse process is the bony projection on either side of your vertebrae (the bones that make up your spinal column). They’re usually caused by traumas like any other type of broken bone. Some transverse process fractures are caused by osteoporosis weakening your bones without you knowing. Transverse process fractures can happen along any part of your spine, but they’re most common in your lower back (your lumbar spine).

#### **Transverse fractures vs. oblique fractures**

Transverse fractures and oblique fractures are both types of bone fractures that create a straight break across your bone’s width.

Transverse fractures run horizontally perpendicular to your bone (opposite the direction of your bone). Oblique fractures are angled across your bone.

No matter which names and terms end up applied to your fracture, the most important first step is getting your injury examined by a provider as soon as possible.

Transverse fractures are one of the most common kinds of broken bones, especially within long bones.

Transverse fractures can affect anyone. This is especially true because they’re caused by accidents and traumas.

If you’re at risk for falls you might be more likely to experience a transverse fracture. People with osteoporosis (weakened bones) have an increased risk for all types of broken bones, including transverse fractures.

## **Symptoms and Causes**

Symptoms of a transverse fracture include:

* Pain.
* Swelling.
* Tenderness.
* Inability to move a part of your body like you usually can.
* Bruising or discoloration.
* A deformity or bump that’s not usually on your body.

#### **Open vs. closed fractures**

Your healthcare provider will classify your fracture as either open or closed. If you have an open fracture your bone breaks through your skin. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone does not push through your skin.

#### **Displaced transverse fractures**

Displaced or nondisplaced are more words your provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair.

### **What causes transverse fractures?**

Any impact on your bones can cause a transverse fracture. Some of the most common causes include:

* Falls.
* Car accidents.
* Sports injuries.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a transverse fracture with a physical exam and imaging tests, including:

* **X-rays:** An X-ray will confirm any fractures and show how damaged your bones are.
* **Magnetic Resonance Imaging (MRI):** Your provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This will show them the tissue around your bones too. This is especially important to determine if your muscles, connective tissue and organs were injured.
* **CT scan:** If you need surgery, your provider or surgeon needs to know exactly how damaged your bones are. A CT scan will give them a more detailed picture of your bones and the surrounding tissue than an X-ray. You might need a CT scan if your X-rays were inconclusive or to help your surgeon plan your surgery.

## **Management and Treatment**

How your transverse fracture is treated depends on the severity of the original break. Your broken bones need to heal back together. Depending on how damaged they are and what caused them to break, there are a few treatments your provider might use.

#### **Immobilization**

If your fracture is mild and the bones did not move far out of place (if it’s non-displaced), you might only need a splint or cast. Splinting usually lasts for three to five weeks. If you need a cast, it will likely be for longer, typically six to eight weeks. In both cases, you’ll likely need follow-up X-rays to make sure your bones are healing correctly.

#### **Closed reduction**

More severe breaks require a closed reduction to set (realign) your bones. During this non-surgical procedure, your provider will physically push and pull your body on the outside to line up the broken bones inside you. To prevent you from feeling pain during the procedure you’ll receive one of the following:

* Local anesthetic to numb the area around your fracture.
* Sedatives to relax your whole body.
* General anesthesia to make you sleep through the procedure.

After the closed reduction, your provider will put you in a splint or cast.

### **Transverse fracture surgery**

#### **Internal fixation**

The most severe fractures require surgery. Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. You’ll need to limit how much you use the surgically repaired part of your body to make sure your bone can fully heal.

Internal fixation techniques include:

* **Rods:** A rod inserted through the center of your bone that runs from top-to-bottom.
* **Plates and screws:** Metal plates screwed into your bone to hold the pieces together in place.
* **Pins and wires:** Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

Transverse fracture surgeries are usually outpatient procedures, and you should be able to go home the same day. You might need to stay in the hospital after surgery on a larger bone (like your femur).

After your surgery, the part of your body with the fractured bone in it will be immobilized. You’ll need some combination of a brace, splint or cast before you can start putting any weight on it again or using it as you did before your fracture.

### **Medications used to treat transverse fractures and their side effects**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

#### **NSAID side effects**

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

#### **Complications of transverse fracture treatment**

Transverse fracture surgery complications include:

* **Acute compartment syndrome** **(ACS)**: A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.
* **Malunion**: This happens when your broken bones don't line up correctly while they heal.
* **Nonunion**: Your bones may not grow back together fully or at all.
* **Bone infection (osteomyelitis)**: If you have an open fracture (the bone breaks through your skin) you have an increased risk of bacterial infection.
* **Other internal damage**: Fractures can damage the area around the injury including your muscles, nerves, blood vessels, tendons and ligaments.

## **Transverse Fracture Procedures and Their Timelines**

## 1. Immobilization (Non-Surgical Treatment)

* Indication: Mild, non-displaced transverse fractures where bone fragments remain aligned.
* Procedure: Use of a splint or cast to immobilize the affected bone and allow natural healing.
* Timeline:
  + Splinting typically lasts 3 to 5 weeks.
  + Casting usually lasts longer, about 6 to 8 weeks.
* Follow-up: Regular X-rays during this period to monitor bone healing and alignment.
* Expected Outcome: Gradual bone healing with minimal intervention.

## 2. Closed Reduction

* Indication: More severe fractures where bones are displaced but surgery is not immediately necessary.
* Procedure: A non-surgical realignment of bones by external manipulation under anesthesia (local, sedation, or general).
* Post-Procedure: Immobilization with splint or cast after reduction.
* Timeline: Same immobilization period as above (3-8 weeks), with follow-up imaging.
* Purpose: Restore bone alignment to promote proper healing without surgery.

## 3. Internal Fixation Surgery (Open Reduction and Internal Fixation - ORIF)

* Indication: Severe or complex transverse fractures with significant displacement, instability, or when closed reduction fails.
* Procedure: Surgical realignment of bone fragments followed by fixation using metal implants such as:
  + Rods inserted inside the bone canal
  + Plates and screws attached to the bone surface
  + Pins and wires for small fragments, often combined with rods or plates
* Post-Procedure: Limited use of the affected limb/body part to allow healing; physical therapy may begin after initial healing.
* Timeline:
  + Bone healing typically takes 6 to 8 weeks, but full recovery and return to normal activities may take several months.
  + Follow-up X-rays monitor healing and implant position.
  + Some implants may remain permanently; others might require removal in a later surgery.

## 4. Fracture Healing Phases

* Hematoma Formation: Within hours to days after fracture.
* Granulation Tissue Formation: Days to weeks.
* Callus Formation: Weeks to months; visible on X-rays as new bone forms bridging fracture.
* Remodeling Phase: Months to years; bone regains strength and shape, callus is reshaped.

## 5. Recovery and Rehabilitation

* Mild fractures may allow return to normal activities after immobilization ends (~6-8 weeks).
* More severe fractures treated surgically may require longer rehabilitation, including physical therapy to restore strength and mobility.
* Full functional recovery can take several months depending on fracture severity and patient factors.

**EPIDEMIOLOGY**

## Incidence and Demographics

Transverse fractures represent a significant proportion of long bone fractures. For example, one study in Nigeria found that transverse fractures accounted for 40.3% of closed long bone diaphyseal fractures, making them the most common fracture pattern in that cohort[3](https://africa.pagepress.net/acbr/article/view/175).

In open fractures, transverse patterns are less common than comminuted fractures but still significant, comprising about 14.4% of cases in a trauma center study[5](https://www.scirp.org/journal/paperinformation?paperid=112088).

Transverse process fractures of the spine are often seen in trauma patients, with a predominance in males (~68%) and a mean age around 46 years[2](https://pmc.ncbi.nlm.nih.gov/articles/PMC11154072/).

The majority of transverse process fractures occur in the lumbar spine (about 88%), followed by thoracic and cervical regions

**GUIDELINES**

#### **Initial pharmacological management of pain in adults (16 or over)**

For the initial management of pain in adults (16 or over) with suspected long bone fractures of the legs (tibia, fibula) or arms (humerus, radius, ulna), offer:

* oral paracetamol for mild pain
* oral paracetamol and codeine for moderate pain
* intravenous paracetamol supplemented with intravenous morphine titrated to effect for severe pain.

Use intravenous opioids with caution in frail or older adults.

Do not offer non-steroidal anti-inflammatory drugs (NSAIDs) to frail or older adults with fractures.

Consider NSAIDs to supplement the pain relief in recommendation except for frail or older adults.

#### **Initial pharmacological management of pain in children (under 16s)**

For the initial management of pain in children (under 16s) with suspected long bone fractures of the legs (femur, tibia, fibula) or arms (humerus, radius, ulna), offer:

* oral ibuprofen, or oral paracetamol, or both for mild to moderate pain
* intranasal or intravenous opioids for moderate to severe pain (use intravenous opioids if intravenous access has been established).

#### **Splinting long bone fractures of the leg in the pre‑hospital setting**

In the pre‑hospital setting, consider the following for people with suspected long bone fractures of the legs:

* a traction splint or adjacent leg as a splint if the suspected fracture is above the knee
* a vacuum splint for all other suspected long bone fractures.

#### **Femoral nerve blocks in children (under 16s)**

Consider a femoral nerve block or fascia iliaca block in the emergency department for children (under 16s) with suspected displaced femoral fractures.

### **1.2 Acute stage assessment and diagnostic imaging**

#### **Use of clinical prediction rules for suspected knee fractures**

Use the Ottawa knee rules to determine whether an X‑ray is needed in people over 2 years with suspected knee fractures.

#### **Use of clinical prediction rules for suspected ankle fractures**

Use the Ottawa ankle and foot rules to determine whether an X‑ray is needed in people over 5 years with suspected ankle fractures.

#### **Imaging of scaphoid fractures**

Consider MRI for first-line imaging in people with suspected scaphoid fractures following a thorough clinical examination.

### **Management in the emergency department**

#### **Reduction of distal radius fractures**

Consider intravenous regional anaesthesia (Bier's block) when reducing dorsally displaced distal radius fractures in adults (16 or over) in the emergency department. This should be performed by healthcare professionals trained in the technique, not necessarily anaesthetists.

Do not use gas and air (nitrous oxide and oxygen) on its own when reducing dorsally displaced distal radius fractures in the emergency department.

#### **Management of torus fractures**

Do not use a rigid cast for torus fractures of the distal radius.

Discharge children with torus fractures after first assessment and advise parents and carers that further review is not usually needed.

### **Ongoing orthopedic management**

#### **Non-surgical orthopedic management of Un malleolar ankle fractures**

In the non‑surgical orthopedic management of unimalleolar ankle fractures:

* advise immediate unrestricted weight-bearing as tolerated
* arrange for orthopaedic follow‑up within 2 weeks if there is uncertainty about stability
* advise all patients to return for review if symptoms are not improving 6 weeks after injury.

#### **Timing of surgery for ankle fractures**

If treating an ankle fracture with surgery, consider operating on the day of injury or the next day.

#### **Timing of surgery for distal radius fractures**

When needed for distal radius fractures, perform surgery:

* within 72 hours of injury for intra-articular fractures
* within 7 days of injury for extra-articular fractures.

When needed for re‑displacement of distal radius fractures, perform surgery within 72 hours of the decision to operate.

#### **Definitive treatment of distal radius fractures in adults (skeletally mature)**

Consider manipulation and a plaster cast in adults (skeletally mature) with dorsally displaced distal radius fractures.

When surgical fixation is needed for dorsally displaced distal radius fractures in adults (skeletally mature):

* offer K‑wire fixation if:
  + no fracture of the articular surface of the radiocarpal joint is detected **or**
  + displacement of the radiocarpal joint can be reduced by closed manipulation
* consider open reduction and internal fixation if closed reduction of the radiocarpal joint surface is not possible.

#### **Definitive treatment of distal radius fractures in children (skeletally immature)**

In children (skeletally immature) with dorsally displaced distal radius fractures (including fractures involving a growth plate) who have undergone manipulation, consider:

* a below-elbow plaster cast **or**
* K-wire fixation if the fracture is completely displaced (off‑ended).

#### **Definitive treatment of proximal humerus fractures in adults (skeletally mature)**

For adults (skeletally mature) with displaced low energy proximal humerus fractures:

* offer non-surgical management for definitive treatment of uncomplicated injuries
* consider surgery for injuries complicated by an open wound, tenting of the skin, vascular injury, fracture dislocation or a split of the humeral head.

#### **Definitive treatment of femoral shaft fractures in children (skeletally immature)**

Admit all children (skeletally immature) with femoral shaft fractures and consider 1 of the following according to age and weight:

* prematurity and birth injuries: simple padded splint
* 0 to 6 months: Pavlik's harness or Gallows traction
* 3 to 18 months (but not in children over 15 kg): Gallows traction
* 1 to 6 years: straight leg skin traction (becomes impractical in children over 25 kg) with possible conversion to hip spica cast to enable early discharge
* 4 to 12 years (but not in children over 50 kg): elastic intramedullary nail
* 11 years to skeletal maturity (weight more than 50 kg): elastic intramedullary nails supplemented by end‑caps, lateral-entry antegrade rigid intramedullary nail, or submuscular plating.

#### **Mobilization after surgery in people with distal femoral fractures**

Consider advising immediate unrestricted weight-bearing as tolerated for people who have had surgery for distal femoral fractures.

### **How soon after treatment will I feel better?**

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your transverse fracture — and which bones were broken — you should be able to start moving again in a few weeks.

Contact your healthcare provider right away if you experience intense pain that doesn’t get better.

## **Outlook / Prognosis**

If you have a transverse fracture, you should expect to make a full recovery.

You will need physical therapy to regain strength and range of motion in the part of your body that was injured. Most people don’t have any long-term effects after a transverse fracture.

#### **How long does it take a transverse fracture to heal?**

How long it takes you to heal depends on the severity of your fracture and which treatments you need. Most people need a few months to recover from a transverse fracture.

There are lots of factors that can affect how long it takes your body to heal. Talk to your provider or surgeon about a timeline that fits your specific injury.

#### **Will I need to miss work or school?**

Which bones are fractured and any other injuries you experienced during your fracture will impact how long you’ll need to miss work, school and other activities.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

* Always wear your seatbelt.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help you maintain good bone health.
* Talk to your provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.
* Use your cane or walker if you have difficulty walking or an increased risk for falls.

Transverse fractures are usually caused by falls or other accidents that are hard to prevent. If you need them, use a cane or walker to increase your stability and prevent falls.

After age 50, women have an increased risk of developing osteoporosis. Talk to your provider about a bone density screening that can catch osteoporosis before it causes a fracture.

## **Living With**

If you think you have a transverse fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body that you normally can.
* A part of your body is noticeably different looking or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

### **What questions should I ask my doctor?**

## Which bones are fractured?

Transverse fractures most commonly affect the long bones in your body. These include:

* Femur (thigh bone)
* Tibia (shin bone)
* Fibula (calf bone)
* Humerus (upper arm)
* Radius and ulna (forearm bones)
* Clavicle (collarbone)  
  They can also occur in other bones but are especially frequent in these long bones due to trauma or accidents

## 2. Do I have a transverse fracture or another type of break?

A transverse fracture is characterized by a break line that runs perpendicular (at a right angle) to the long axis of the bone, producing a straight horizontal fracture line across the bone. Other fracture types include oblique, spiral, comminuted, or greenstick fractures, which have different fracture patterns.  
Your healthcare provider will determine the exact fracture type through physical examination and imaging tests like X-rays

## 3. Will I need surgery?

* If your fracture is nondisplaced (bone pieces are aligned) and stable, you may be treated with immobilization (splint or cast) without surgery.
* If your fracture is displaced (bone pieces have shifted apart) or unstable, surgery such as internal fixation (using rods, plates, screws) may be necessary to realign and stabilize the bone.
* Open fractures (bone breaks through the skin) usually require surgery and have a higher risk of complications.  
  Your doctor will recommend surgery based on fracture severity, displacement, bone involved, and overall health

## 4. How long will it take to recover?

* Bone healing typically takes 6 to 8 weeks for most transverse fractures, but full recovery including regaining strength and mobility can take several months depending on the fracture severity and treatment method.
* Non-surgical treatment involves immobilization for 3 to 8 weeks with regular follow-up.
* Surgical cases may require longer recovery and rehabilitation

## 5. When can I resume physical activities?

* Light activities may resume gradually after the immobilization period, usually starting around 6 to 8 weeks post-injury if healing is adequate.
* Full return to normal or high-impact physical activities depends on bone healing, pain, strength, and mobility, often taking 3 to 6 months or longer.
* Physical therapy is often recommended to restore function and prevent stiffness or weakness

**DOCTOR PATIENT CONVERSATION**

Doctor:

Good morning. What brings you in today?

Patient:

Hello, doctor. I fell yesterday and now my leg hurts a lot.

Doctor:

I’m sorry to hear that. Can you show me exactly where the pain is?

Patient:

It’s right here, on my shin. It hurts a lot when I try to move it.

Doctor:

Have you noticed any swelling, bruising, or deformity?

Patient:

Yes, it’s swollen and bruised, and the leg feels tender.

Doctor:

Did you hear or feel a snap or crack when you fell?

Patient:

Yes, I heard a cracking sound when I fell.

Doctor:

Based on your symptoms, I suspect you may have a fracture. We’ll need to do an X-ray to confirm.

Patient:

What kind of fracture could it be?

Doctor:

One common type is a transverse fracture, where the bone breaks straight across. But the X-ray will tell us the exact type.

Patient:

Will I need surgery?

Doctor:

It depends on the fracture’s severity and alignment. If the bone pieces are well aligned, we may treat it with a cast or splint. But if the bone is displaced or unstable, surgery might be necessary to realign and stabilize it.

Patient:

How long will it take to heal?

Doctor:

Typically, bone healing takes about 6 to 8 weeks. Full recovery, including regaining strength and mobility, may take a few months.

Patient:

When can I start walking and doing my normal activities again?

Doctor:

You’ll likely start with limited weight-bearing during the healing phase. Gradually, with physical therapy, you can return to normal activities, usually within 3 to 6 months, depending on your progress.

Patient:

Thank you, doctor. I appreciate the explanation.

Doctor:

You’re welcome. We’ll get the X-rays done now and discuss the treatment plan once we have the results.

REFERENCES

[Transverse Fracture: Symptoms, Causes & Treatment](https://my.clevelandclinic.org/health/diseases/22956-transverse-fracture#overview)

<https://emedicine.medscape.com/article/1270717-treatment>

<https://www.nice.org.uk/guidance/NG38/chapter/Recommendations#initial-pain-management-and-immobilisation>

### **OBLIQUE FRACTURE**

**DEFINITION AND DESCRIPTION**

Oblique fractures are a type of broken bone. They happen when one of your bones is broken at an angle. You might see oblique fractures referred to as complete fractures. This means the line of the brake goes all the way through your bone.

Oblique fractures usually affect long bones in your body. Some of the most common include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Humerus (upper arm).
* Radius and ulna (forearm).
* Clavicle (collarbone).

Oblique fractures are almost always caused by falls or other traumas. You might need surgery to repair your bone. Some people only need a splint or cast for the bone to heal. How long it takes to recover fully depends on which of your bones are fractured — and what caused the breaks. Most people need a few months to recover from an oblique fracture.

#### **Oblique fractures vs. spiral fractures**

Oblique fractures and spiral fractures are different types of bone fractures. They are different terms that tell your healthcare provider specific details about how your bones are broken and the shape of the fracture.

Oblique fractures occur when your bone is broken at an angle. The fracture is a straight line that’s angled across the width of your bone. They’re usually caused by landing on your bone at an angle after a fall, or when your bone is hit suddenly from an angle (like in a car accident).

Spiral fractures happen when a fracture winds around the length of your bone — like a spiral staircase. They’re common in sports injuries when people’s bones are twisted with great force (like getting tackled in football).

#### **Oblique fractures vs. transverse fractures**

Oblique fractures and transverse fractures both mean the break goes across your bone’s width in a straight line.

Oblique fractures are angled across your bone. Transverse fractures run horizontally perpendicular to your bone (opposite the direction of your bone).

No matter which names and terms end up applied to your fracture, the most important first step is getting your injury examined by your healthcare provider as soon as possible.

Oblique fractures are one of the most common kinds of broken bones, especially in long bones.

Oblique fractures — like all bone fractures — can affect anyone. This is especially true because they’re caused by falls or traumas. If you’re at risk for falls, you might be more likely to experience an oblique fracture. People with osteoporosis (weakened bones) have an increased risk for all types of broken bones, including oblique fractures.

## **Symptoms and Causes**

Symptoms of an oblique fracture include:

* Pain.
* Swelling.
* Tenderness.
* Inability to move a part of your body that you usually can.
* Bruising or discoloration.
* A deformity or bump that’s not usually on your body.

#### **Open vs. closed fractures**

Your healthcare provider will classify your fracture as either open or closed. If you have an open fracture, your bone breaks through your skin. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone doesn’t push through your skin.

#### **Displaced oblique fractures**

Displaced or nondisplaced are more terms your healthcare provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair.

### **What causes oblique fractures?**

Any impact to your bones can cause oblique fractures. They’re usually caused by something hitting your body at an angle. Some of the most common causes are falls, car accidents and sports injuries.

## **Diagnosis and Tests**

Your healthcare provider will diagnose an oblique fracture with a physical exam and imaging tests.

After a physical exam, you’ll likely need at least one of a few imaging tests:

* **X-rays:** An X-ray will confirm any oblique or other fractures and show how damaged your bones are.
* **Magnetic resonance imaging (MRI):** Your healthcare provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This will show them tissue around your bones, too. This is especially important to determine if your muscles, connective tissue and organs were injured.
* **CT scan:** If you need surgery, your healthcare provider or surgeon needs to know exactly how damaged your bones are. A CT scan will give them a more detailed picture of your bones and the surrounding tissue than an X-ray. You might need a CT scan if your X-rays were inconclusive or to help your surgeon plan your surgery.

## **Management and Treatment**

How your oblique fracture is treated depends on the severity of your original break. Your broken bones need to heal back together. Depending on how damaged they are and what caused their break, there are a few treatments your healthcare provider might use.

#### **Immobilization**

If your break is mild and your bones didn’t move far out of place (if it’s non-displaced), you might only need a splint or cast. Splinting usually lasts three to five weeks. If you need a cast, it will likely be for longer, typically six to eight weeks. In both cases, you’ll likely need follow-up X-rays to make sure your bones are healing correctly.

#### **Closed reduction**

More severe breaks require a closed reduction to set (realign) your bones. During this nonsurgical procedure, your healthcare provider will physically push and pull your body on the outside to line up your broken bones on the inside. To prevent you from feeling pain during the procedure, you’ll receive one of the following:

* Local anesthetic to numb the area around your fracture.
* Sedatives to relax your whole body.
* General anesthesia to make you sleep through the procedure.

After the closed reduction, your healthcare provider will put you in a splint or cast.

### **Oblique fracture surgery**

#### **Internal fixation**

The most serious fractures require surgery. Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. You’ll probably need to limit how much you use the surgically repaired part of your body to make sure your bone can fully heal.

Internal fixation techniques include:

* **Rods:** A rod inserted through the center of your bone that runs from top to bottom.
* **Plates and screws:** Metal plates screwed into your bone to hold the pieces together in place.
* **Pins and wires:** Pins and wires hold pieces of your bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### **External fixation**

You might need an external fixation. Your surgeon will put screws in your bone on either side of the fracture inside your body, then connect them to a brace or bracket around the bone outside of your body. This is usually a temporary way to stabilize your fracture and give it time to begin healing before you have an internal fixation.

#### **Arthroplasty**

If you fracture a joint — like your hip, knee or shoulder — you might need an arthroplasty (joint replacement). Your surgeon will remove your damaged joint and replace it with an artificial joint. The artificial joint (prosthesis) can be metal, ceramic or heavy-duty plastic. Your new joint will look like your natural joint and move in a similar way.

#### **Bone grafting**

You might need bone grafting if your oblique fracture is severely displaced or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to rejoin your fractured bone. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

* Internally from somewhere else in your body — usually the top of your hip bone.
* An external donor.
* An artificial replacement piece.

Oblique fracture surgeries are usually outpatient procedures, and you should be able to go home the same day. You might need to stay in the hospital after surgery on a larger bone (like your femur).

After your surgery, the part of your body with the fractured bone in it will be immobilized. You’ll need some combination of a brace, splint or cast before you can start putting any weight on it again or using it as you did before your fracture.

### **Medications used to treat oblique fractures**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

#### **NSAID side effects**

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

#### **Complications of oblique fracture treatment**

Oblique fracture surgery complications include:

* **Acute compartment syndrome** (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.
* **Malunion**: This happens when your broken bones don't line up correctly while they heal.
* **Nonunion**: Your bones may not grow back together fully or at all.
* **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin) you have an increased risk of bacterial infection.
* **Other internal damage**: Fractures can damage the area around your injury, including your muscles, nerves, blood vessels, tendons and ligaments.

### **How soon after treatment will I feel better?**

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your oblique fracture — and which bones were broken — you should be able to start moving again in a few weeks.

Contact your healthcare provider right away if you experience intense pain that doesn’t get better.

### **Differential Diagnosis**

It is essential to differentiate oblique fractures from other conditions that may present with similar symptoms, such as:

* Sprains or strains
* Other types of fractures (e.g., transverse, spiral)
* Bone tumors or infections

### **Non-Pharmacological Treatments**

In addition to medical treatments, several non-pharmacological approaches can aid recovery:

* **Physical Therapy:** Once healing has progressed, physical therapy can help restore strength and mobility.
* **Dietary Changes:** Ensuring adequate intake of calcium and vitamin D can support bone healing.
* **Alternative Therapies:** Some individuals may benefit from acupuncture or chiropractic care, although these should be discussed with a healthcare provider.

### **Special Considerations for Different Populations**

* **Pediatric Patients:** Children may heal faster than adults, but their treatment must consider growth plate involvement.
* **Geriatric Patients:** Older adults may require more comprehensive management due to underlying health conditions and the risk of complications.

**QUESTIONS AND ANSWER SET**

**What are the common causes of oblique fractures?** Oblique fractures are commonly caused by trauma, such as falls, sports injuries, or accidents. They can also occur due to conditions that weaken bones, such as osteoporosis.

**How can I tell if I have an oblique fracture?** Symptoms of an oblique fracture include severe pain, swelling, deformity, and difficulty using the affected limb. If you suspect a fracture, seek medical attention for evaluation.

**What is the treatment for an oblique fracture?** Treatment typically involves immobilization with a cast or splint, pain management, and possibly surgery for severe cases. Physical therapy may also be recommended during recovery.

**How long does it take for an oblique fracture to heal?** Most oblique fractures heal within 6 to 12 weeks, but healing time can vary based on factors such as age, health status, and the severity of the fracture.

**Are there any complications associated with oblique fractures?** Yes, potential complications include nonunion or malunion of the bone, infection, and damage to nearby nerves or blood vessels.

**Can I prevent oblique fractures?** Preventive measures include maintaining a healthy diet rich in calcium and vitamin D, engaging in weight-bearing exercises, and taking safety precautions to avoid falls.

**When should I seek medical attention for a suspected fracture?** Seek immediate medical attention if you experience severe pain, visible deformity, open wounds, or signs of infection.

**Are children at risk for oblique fractures?** Yes, children can experience oblique fractures, especially during sports or play. However, they typically heal faster than adults.

**What role does physical therapy play in recovery?** Physical therapy can help restore strength, flexibility, and function to the affected limb after the fracture has healed.

**Can oblique fractures lead to long-term issues?** If not treated properly, oblique fractures can lead to chronic pain, reduced mobility, and an increased risk of future fractures.

## **Oblique Fracture Epidemiology**

* Oblique fractures are a common fracture pattern characterized by a diagonal fracture line across the bone.
* They frequently occur in long bones such as the femur, tibia, humerus, and clavicle.
* Oblique fractures are among the most common fracture types alongside transverse and tuft fractures, each representing about 19% of certain fracture cohorts, such as phalangeal fractures in adults
* In a large adult trauma cohort, fractures of the hand, distal forearm, and foot were most frequent, though oblique fractures were common across various bones
* Men tend to sustain fractures, including oblique types, more frequently and at a younger age compared to women, who have a higher incidence at older ages
* The median age for phalangeal fractures (including oblique) is around 45 years, with a predominance of males (~65%)
* Road traffic accidents and falls are leading causes of fractures, including oblique fractures, especially in younger adults
* Trauma from falls, motor vehicle accidents, and sports injuries are the primary causes of oblique fractures.
* Work-related injuries account for a significant portion of fractures in the hand and fingers
* Oblique fractures are common in the phalanges (finger bones), where they account for a significant proportion of fractures along with transverse and tuft fractures
* In long bones, oblique fractures occur due to angled or bending forces.

## **Genetic Variants Affecting Bone Health and Fracture Risk**

* Variants in genes related to collagen type I (e.g., *COL1A1*, *COL1A2*) influence bone mineral density (BMD) and fracture risk, including fracture healing and susceptibility
* Polymorphisms in genes regulating bone remodeling and mineralization, such as *ALPL* (alkaline phosphatase gene), have been linked to atypical femoral fractures, which may include oblique fracture patterns
* Genome-wide association studies (GWAS) have identified multiple loci associated with fracture risk, many of which influence BMD, a major determinant of fracture susceptibility

## **Outlook / Prognosis**

If you have an oblique fracture, you should expect to make a full recovery.

You’ll need physical therapy to regain strength and range of motion in the part of your body that was injured.

#### **How long does it take an oblique fracture to heal?**

How long it takes you to heal depends on the severity of your fracture and which treatments you need. Most people need a few months to recover from an oblique fracture.

There are lots of factors that can affect how long it takes your body to heal, though. Talk to your healthcare provider or surgeon about a timeline that fits your specific situation.

#### **Will I need to miss work or school?**

Your specific injuries and which bones are fractured will impact how long you’ll need to miss work, school and other activities.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### **Outlook for an oblique fracture**

The outlook for most oblique fractures is positive. Even if you need surgery, you should make a full recovery.

## **Prevention**

Follow these general safety tips to reduce your risk of injury:

* Always wear your seatbelt.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help you maintain good bone health.
* Talk to your healthcare provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.
* Use your cane or walker if you have difficulty walking or have an increased risk for falls.

### **How can I prevent an oblique fracture?**

Oblique fractures are usually caused by falls or other accidents, so there’s not much you can do to prevent them. You can use a cane or walker to increase your stability and try to prevent falls, though.

Also, if you have osteoporosis, treating it will prevent future bone density loss.

## **Living With**

If you think you have an oblique fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body that you normally can.
* A part of your body is noticeably different looking or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

**DOCTOR-PATIENT CONVERSATION**

Doctor:

Good afternoon. I’ve reviewed your X-rays, and it looks like you have an oblique fracture in your forearm. Do you know what that means?

Patient:

Not exactly. What is an oblique fracture?

Doctor:

An oblique fracture is when the bone breaks diagonally across the shaft, rather than straight across. It’s caused by an angled force or twist to the bone.

Patient:

Is this serious? Will I need surgery?

Doctor:

It depends on how much the bone fragments have shifted. If the pieces are well aligned, we can often treat it with a cast or splint to keep the bone stable while it heals. But if the bone is displaced or unstable, surgery might be necessary to realign and fix the bone with plates and screws.

Patient:

How long will it take to heal?

Doctor:

Typically, bone healing takes about 6 to 12 weeks for oblique fractures. After that, you’ll need physical therapy to regain strength and mobility. Full recovery may take a few months depending on your overall health and how well you follow the rehab plan.

Patient:

Will I be able to use my arm normally again?

Doctor:

Most patients regain full function with proper treatment and rehabilitation. We’ll work closely with you to monitor healing and help you get back to your usual activities safely.

Patient:

What should I watch out for during recovery?

Doctor:

Watch for increased pain, swelling, numbness, or changes in skin color. These could indicate complications and should be reported immediately. Also, follow your cast care instructions carefully and attend all follow-up appointments.

Patient:

Thank you, doctor. I feel better knowing what to expect.

Doctor:

You’re welcome. We’ll get started on your treatment plan and support you through your recovery.

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**SPIRAL FRACTURE**

**DEFINITION AND DESCRIPTION**

Spiral fractures are a type of broken bone. They happen when one of your bones is broken with a twisting motion. They create a fracture line that wraps around your bone and looks like a corkscrew. You might see spiral fractures referred to as complete fractures. This means the line of the break goes all the way through your bone.

Spiral fractures usually affect long bones in your body. Some of the most common include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Talus (ankle).
* Humerus (upper arm).
* Radius and ulna (forearm).
* Phalanges and metacarpals (fingers and hand).

Spiral fractures are almost always caused by falls or other traumas. You might need surgery to repair your bone. How long it takes to recover fully depends on which of your bones are fractured — and what caused the breaks. Most people need a few months to recover from a spiral fracture.

#### **Spiral fractures vs. greenstick fractures**

Spiral fractures and greenstick fractures are different types of bone fractures. They are different terms that tell your healthcare provider specific details about how your bones are broken, where they are broken and what they look like inside of your body right now.

Spiral fractures happen when a fracture winds around the length of your bone — like a spiral staircase. They can be caused by falls, accidents and sports injuries when your bones are twisted with great force (like getting tackled in football).

Greenstick fractures happen when your bone is bent to the point that it cracks but doesn’t break all the way through. If you’ve ever tried breaking a green, or young, stick with your hands, it cracks but doesn’t break cleanly as a dry twig would. That cracking without snapping completely is the difference between greenstick fractures and complete fractures. Greenstick fractures are more common in kids than adults.

#### **Spiral fractures vs. toddler fractures**

Toddler fractures are a type of spiral fracture that usually affects children younger than three. Toddler fractures are caused by the same twisting motions as other spiral fractures, but almost always happen to children’s shin bones (tibia).

No matter which names and terms are applied to your fracture, the most important first step is getting your injury examined by a healthcare provider as soon as possible.

Spiral fractures are rare. Because they’re caused by serious accidents and traumas most people don’t experience, spiral fractures are much less common than other types of broken bones.

Spiral fractures — like all bone fractures — can affect anyone. This is especially true because they’re caused by accidents or traumas. If you’re at risk for falls, you might be more likely to experience a spiral fracture. People with osteoporosis have an increased risk for all types of broken bones, including spiral fractures.

## **Symptoms and Causes**

Symptoms of a spiral fracture include:

* Pain.
* Swelling.
* Tenderness.
* Inability to move a part of your body that you usually can.
* Bruising or discoloration.
* A deformity or bump that’s not usually on your body.

#### **Open vs. closed fractures**

Your healthcare provider will classify your fracture as either open or closed. If you have an open fracture, your bone breaks through your skin. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone doesn’t push through your skin.

#### **Displaced spiral fractures**

Displaced or nondisplaced are more terms your healthcare provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair.

### **What causes spiral fractures?**

Any impact to your bones that twists them can cause spiral fractures. They’re usually caused by something suddenly jerking one of your limbs or your body away from their usual position. Some of the most common causes include:

* Falls.
* Car accidents.
* Sports injuries.
* Workplace accidents.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a spiral fracture with a physical exam and imaging tests.

After a physical exam, you’ll likely need at least one of a few imaging tests:

* **X-rays:** An X-ray will confirm any spiral or other fractures and show how damaged your bones are.
* **Magnetic resonance imaging (MRI):** Your healthcare provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This’ll show them tissue around your bones, too. This is especially important to determine if your muscles, connective tissue and organs were injured.
* **CT scan:** If you need surgery, your healthcare provider or surgeon needs to know exactly how damaged your bones are. A CT scan will give them a more detailed picture of your bones and the surrounding tissue than an X-ray.

## **Management and Treatment**

How your spiral fracture is treated depends on the severity of your original break and which bone is broken. Your broken bones need to heal back together. Depending on how damaged they are and what caused them to break, there are a few treatments your healthcare provider might use.

#### **Immobilization**

If your break is mild and your bones didn’t move far out of place (if it’s non-displaced), you might only need a splint or cast. Splinting usually lasts for three to five weeks. If you need a cast, it will likely be for longer, typically six to eight weeks. In both cases, you’ll likely need follow-up X-rays to make sure your bones are healing correctly.

#### **Closed reduction**

More severe breaks require a closed reduction to set (realign) your bones. During this nonsurgical procedure, your healthcare provider will physically push and pull your body on the outside to line up your broken bones on the inside. To prevent you from feeling pain during the procedure, you’ll receive one of the following:

* Local anesthetic to numb the area around your fracture.
* Sedatives to relax your whole body.
* General anesthesia to make you sleep through the procedure.

After the closed reduction, your healthcare provider will put you in a splint or cast.

### **Spiral fracture surgery**

#### **Internal fixation**

The most severe fractures require surgery. Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. Internal fixation techniques include:

* **Rods:** A rod inserted through the center of your bone that runs from top to bottom.
* **Plates and screws:** Metal plates screwed into your bone to hold the pieces together in place.
* **Pins and wires:** Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### **External fixation**

You might need an external fixation. Your surgeon will put screws or pins in your bone on either side of your fracture inside your body, then connect them to a brace or bracket around the bone outside of your body. This is usually a temporary way to stabilize your fracture and give it time to begin healing before you have an internal fixation.

#### **Bone grafting**

You might need bone grafting if your spiral fracture is severely displaced or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to rejoin your fractured bone. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

* Internally from somewhere else in your body — usually the top of your hip bone.
* An external donor.
* An artificial replacement piece.

Spiral fracture surgeries are usually outpatient procedures, and you should be able to go home the same day depending on the bone that was fractured. If you need surgery on a larger bone like your femur (thigh) or tibia (shin), you’ll probably need to stay in the hospital for a day or two after your surgery.

After your surgery, the part of your body with the fractured bone in it will be immobilized. You’ll need some combination of a brace, splint or cast before you can start putting any weight on it again or using it like you did before your fracture.

### **What medications are used to treat spiral fractures?**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after a surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

#### **Complications of spiral fracture treatment**

Spiral fracture surgery complications include:

* **Acute compartment syndrome** (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.
* **Malunion**: This happens when your broken bones don't line up correctly while they heal.
* **Nonunion**: Your bones may not grow back together fully or at all.
* **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin), you have an increased risk of bacterial infection.
* **Other internal damage**: Fractures can damage the area around the injury, including your muscles, nerves, blood vessels, tendons and ligaments.

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

### **How soon after treatment will I feel better?**

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your spiral fracture — and which bones were broken — you should be able to start moving again in a few weeks.

If you experience intense pain that doesn’t get better, contact your healthcare provider right away.

### **Differential Diagnosis**

It is essential to differentiate spiral fractures from other types of fractures or injuries, such as:

* **Transverse Fractures:** These fractures occur straight across the bone and are typically caused by direct impact.
* **Oblique Fractures:** Similar to spiral fractures but occur at an angle rather than a spiral pattern.
* **Soft Tissue Injuries:** Conditions such as sprains or strains may present with similar symptoms but do not involve bone fractures.

### **Non-Pharmacological Treatments**

In addition to medical treatments, several non-pharmacological approaches can aid recovery:

* **Physical Therapy:** Once the fracture begins to heal, physical therapy may be recommended to restore strength and mobility.
* **Dietary Changes:** A diet rich in calcium and vitamin D can support bone health and healing.
* **Alternative Therapies:** Some individuals may benefit from complementary therapies such as acupuncture or chiropractic care, although these should be discussed with a healthcare provider.

### **Special Considerations for Different Populations**

* **Pediatric Patients:** Children may heal more quickly than adults, but their treatment must consider growth plate involvement.
* **Geriatric Patients:** Older adults may require more comprehensive management due to underlying health conditions and the risk of complications.

**QUESTIONS AND ANSWER SET**

**What are the common causes of spiral fractures?**

Spiral fractures are typically caused by twisting or rotational forces, often resulting from falls, sports injuries, or accidents.

**How can I tell if I have a spiral fracture?**

Symptoms include severe pain, swelling, deformity, and difficulty using the affected limb. If you suspect a fracture, seek medical attention.

**What is the treatment for a spiral fracture?**

Treatment may involve immobilization with a cast, pain management, and, in some cases, surgery to realign and stabilize the bone.

**How long does it take for a spiral fracture to heal?**

Healing time varies but typically ranges from 6 to 12 weeks, depending on the fracture's severity and the individual's overall health.

**Can I prevent spiral fractures?**

Yes, maintaining a healthy lifestyle, including regular exercise and a balanced diet, can help strengthen bones and reduce the risk of fractures.

**What are the complications of untreated spiral fractures?**

Potential complications include nonunion, malunion, infection, and damage to surrounding nerves or blood vessels.

**Are children more prone to spiral fractures?**

Children can sustain spiral fractures, especially during sports or play, but they often heal more quickly than adults.

**What should I do if I suspect a spiral fracture?**

Seek immediate medical attention for evaluation and treatment to prevent complications.

**Is surgery always necessary for spiral fractures?**

Not always; many spiral fractures can heal with conservative treatment, but surgery may be required for severe cases.

**How can I support my recovery from a spiral fracture?**

Follow your healthcare provider's recommendations, engage in physical therapy, and maintain a nutritious diet to support healing.

## **Spiral Fracture Procedures and Timelines**

## 1. Initial Assessment and Diagnosis

* Physical exam and imaging (X-rays, possibly CT or MRI) confirm the spiral fracture and assess displacement and soft tissue injury.

## 2. Non-Surgical Treatment (for Stable, Non-Displaced Fractures)

* Immobilization: Use of a cast or splint to keep the bone stable and allow natural healing.
* Timeline: Typically 4 to 6 weeks of immobilization, depending on the bone and healing progress.
* Follow-up: Regular X-rays to monitor bone healing and alignment.
* Physical therapy: Begins after cast removal to restore strength and mobility.

## 3. Closed Reduction (if Bone is Displaced but Surgery Not Immediately Needed)

* A nonsurgical procedure where the doctor realigns the bone fragments externally under anesthesia (local or sedation).
* Followed by immobilization with a cast or splint.
* Timeline similar to non-surgical treatment, with close monitoring.

## 4. Surgical Treatment (Open Reduction and Internal Fixation - ORIF)

* Indication: Displaced fractures, unstable fractures, open fractures, or fractures with bone fragments.
* Procedure:
  + Surgeon makes an incision to expose the fracture (open reduction).
  + Realigns bone fragments and fixes them with internal hardware such as pins, screws, rods, or plates.
  + In some cases, bone grafting may be performed if healing is compromised or bone loss occurs.
* Hospital Stay: Usually outpatient for smaller bones; 1-2 days inpatient for larger bones like femur or tibia.
* Post-surgery immobilization: Cast, splint, or brace applied to protect the repair.
* Timeline: Bone healing typically takes 6 to 8 weeks, but full recovery including physical therapy can take several months.

## 5. Recovery and Rehabilitation

* Pain management: Acetaminophen with codeine preferred over NSAIDs, which may slow healing.
* Physical therapy: Critical after immobilization or surgery to regain range of motion, strength, and function.
* Weight bearing: Gradually introduced based on healing progress and surgeon’s advice, often starting weeks after surgery or immobilization.

## **Spiral Fracture Epidemiology**

## Incidence and Population Data

Spiral fractures are a common pattern among long bone fractures caused by twisting forces.

In infants, spiral fractures of the femur occur at an estimated incidence of 0.13 per 1000 live births, often related to birth trauma or, in some cases, non-accidental injury (child abuse)

Overall fracture incidence increases with age, with a mean age of fracture around 58 years, and fractures are more common in women (about 65% of cases) due to factors like osteoporosis

Fracture incidence rates in adults have shown an increase of about 11% over two decades, largely driven by vertebral fractures; however, hip fractures have declined in women

Spiral fractures typically result from twisting or rotational injuries, common in sports, falls, vehicle accidents, and physical abuse in children.

In infants and young children, spiral fractures are often scrutinized for potential non-accidental injury, especially if the history is inconsistent with the injury pattern

Osteoporosis and low bone mineral density significantly increase fracture risk in older adults, contributing to spiral and other fracture types

Spiral fractures occur across all age groups but are more frequent in:

Infants and young children (often related to trauma or abuse)

Older adults, especially women, due to fragility fractures linked to osteoporosis

Men tend to sustain fractures, including spiral fractures, more frequently at younger ages, while women have higher fracture incidence post-menopause

Road traffic accidents and falls are leading causes of spiral fractures in adults and children alike

## **Outlook / Prognosis**

If you have a spiral fracture, you should expect to make a full recovery.

You’ll need physical therapy to regain strength and range of motion in the part of your body that was injured.

#### **How long does it take a spiral fracture to heal?**

How long it takes you to heal depends on the severity of your fracture and which treatments you need. Most people need a few months to recover from a spiral fracture.

There are lots of factors that can affect how long it takes your body to heal. Talk to your healthcare provider or surgeon about a timeline that fits your specific situation.

#### **Will I need to miss work or school?**

Your specific injuries and which bones are fractured will impact how long you’ll need to miss work, school and other activities.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### **Outlook for a spiral fracture**

The outlook for most spiral fractures is positive. Even if you need surgery, you should make a full recovery. Depending on the severity of your fracture, you might need to avoid certain activities even after you’ve recovered. Talk to your healthcare provider or surgeon about the best ways to prevent future injuries and fractures.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

* Always wear your seatbelt.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help you maintain good bone health.
* Talk to your provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

Spiral fractures are usually caused by falls, accidents or sports injuries so there’s not much you can do to prevent them.

## **Living With**

If you think you have a spiral fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body that you usually can.
* A part of your body is noticeably different looking or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

**DOCTOR PATIENT CONVERSATION**

Doctor: Hello, I’ve reviewed your X-rays, and it looks like you have a spiral fracture in your lower leg. Do you know what that means?

Patient:

Not really. What is a spiral fracture?

Doctor:

A spiral fracture is a type of break where the bone has been twisted, causing a corkscrew-like crack that spirals around the bone. It usually happens when the limb is twisted forcefully, like during a fall or sports injury.

Patient:

Is it serious? Will I need surgery?

Doctor:

It depends on how much the bone fragments have moved. If the pieces are still well aligned, we might treat it with a cast or splint to immobilize the leg while it heals. But if the bone is displaced or unstable, surgery will be necessary to realign and stabilize the bone using metal plates or rods.

Patient:

How long will it take to heal?

Doctor:

Bone healing usually takes about 6 to 8 weeks, but full recovery including regaining strength and mobility can take several months. We’ll also have you do physical therapy after the bone starts healing.

Patient:

Will I be able to walk again normally?

Doctor:

Yes, most patients regain normal function with proper treatment and rehabilitation. We’ll guide you through the recovery process step-by-step.

Patient:

What should I watch out for during recovery?

Doctor:

If you notice increasing pain, swelling, numbness, or changes in skin color, let us know immediately. Also, follow all instructions for cast care and attend your follow-up appointments to monitor healing.

Patient:

Thank you, doctor. That helps a lot.

Doctor:

You’re welcome. We’ll start your treatment plan right away and support you throughout your recovery.

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### **GREENSTICK FRACTURE**

**DEFINITION AND DESCRIPTION**

A greenstick fracture is a type of bone fracture (broken bone). Greenstick fractures happen when something bends a bone enough to crack it without breaking it into multiple pieces.

Greenstick fractures get their name from the shape (pattern) of the break in your bone. Picture the difference between snapping a young, green twig and an older, dried out branch. Green twigs bend without snapping, but — at a certain point — they crack or splinter where you’re bending them. Older branches snap cleanly apart. Greenstick fractures are the same as bending that young twig — a break along one side of a bone that doesn’t snap it into more than one piece.

Almost all greenstick fractures happen to children younger than 10 because kids have softer and less brittle bones than adults.

Your child will probably need to wear a cast while their bone heals after a greenstick fracture. More severe fractures require surgery to repair — especially if they have other injuries.

#### **Types of greenstick fractures**

Greenstick fractures usually affect longer bones, including your:

* Humerus (upper arm bone).
* Radius and ulna (forearm bones).
* Phalanges (finger and toe bones).
* Femur (thigh bone).
* Fibula (calf bone).

## **Symptoms and Causes**

The most common greenstick fracture symptoms include:

* Pain.
* Bruising or discoloration.
* Tenderness.
* Swelling.
* Part of your child’s body looks more bent or twisted than usual.

### **What causes greenstick fractures?**

Anything that puts a lot of force on one of your child’s long bones can cause a greenstick fracture. The most common causes include:

* Falls (especially catching themselves from a fall with outstretched hands).
* Sports injuries.
* Car accidents.

#### **Risk factors for greenstick fractures**

Anyone can experience a greenstick fracture, but it almost always affects children younger than 10. Kids are more likely to experience a greenstick fracture because their bones aren’t fully developed — they’re softer and more pliable than adults’ bones.

Young children are also more likely to experience greenstick fractures because they fall more than most adults. Kids younger than 10 are especially likely to catch themselves with their hands, wrists and arms outstretched.

Children with malnutrition or a vitamin D deficiency are also more likely to break a bone.

Adults can experience greenstick fractures, but it’s rare. It’s much more common for adults’ bones to break into multiple pieces.

## **Diagnosis and Tests**

A healthcare provider will diagnose a greenstick fracture with a physical exam and imaging tests.

They’ll examine your child’s injury and the area around it. Tell their provider as much information as you can about what your child was doing before they were hurt (especially if you know they fell or got hit during sports or another physical activity).

Your provider will use X-rays to take pictures of your child’s bones to confirm a greenstick fracture. They may also use magnetic resonance imaging (MRI) or a computed tomography (CT) scan to take three-dimensional pictures of your child’s bones and the surrounding tissue (especially if they need surgery).

## **Management and Treatment**

Providers treat most greenstick fractures by immobilizing the bone (keeping it from moving) with a cast. Your child will probably need to wear a cast for around six weeks. They’ll need follow-up X-rays to make sure their bone is healing correctly.

#### **Greenstick fracture surgery**

Your child might need surgery to repair their bone, especially if the greenstick fracture has a severe angle (bend).

Your surgeon will realign (set) your child’s bone to its correct position and secure it in place so it can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts metal pins into your child’s bone to hold it in place. They might need follow-up procedures to remove the pins after their bone has healed.

##### **Greenstick fracture surgery complications**

The most common greenstick fracture surgery complications include:

* **Malunion**: This happens when a broken bone doesn’t line up correctly while it heals.
* **Nonunion**: A bone may not grow back together fully or at all.
* **Acute compartment syndrome** (ACS): A buildup of pressure in the muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.

**EPIDEMIOLOGY**

Approximately 12% of all pediatric emergency department visits in the United States are due to musculoskeletal injuries. Fractures make up a large percentage of musculoskeletal injuries resulting in significant morbidity and complications. Greenstick fractures are most likely to be found in the pediatric population under 10 years of age but can occur in any age group, including adults. There is an equal incidence rate in female and male patients; however, male patients are more likely to sustain fractures

## **Greenstick Fractures: Procedures and Timeline**

## 1. Diagnosis and Initial Assessment

* Physical examination to assess pain, swelling, deformity, and neurovascular status.
* Imaging with X-rays confirms the greenstick fracture, showing an incomplete break with bending on one side.
* MRI or CT scans may be used if surgery is considered or to evaluate soft tissue.

## 2. Immobilization

* Primary treatment for most greenstick fractures is immobilization to prevent movement and allow healing.
* A cast or splint is applied, often initially a splint to accommodate swelling, followed by a full cast.
* Immobilization duration is typically around 6 weeks.
* The type of cast depends on fracture location:
  + Distal fractures (near wrist or ankle) may use short arm or leg casts.
  + Proximal fractures (closer to elbow or knee) often require long arm or leg casts initially, possibly switching to short casts midway (~3 weeks).
* Follow-up X-rays monitor bone alignment and healing progress.

## 3. Reduction (if Needed)

* If the fracture has significant angulation or deformity, a closed reduction (non-surgical realignment) is performed before casting.
* This is usually done under sedation or local anesthesia.
* Surgery is rare but may be required if the fracture is severely displaced or unstable.

## 4. Follow-Up Care

* Orthopedic follow-up is important due to the unstable nature of greenstick fractures and risk of displacement or refracture.
* Follow-ups are scheduled during the immobilization period to check healing and cast fit.

## 5. Rehabilitation

* After cast removal (around 6 weeks), physical therapy may be recommended to restore range of motion, strength, and function.
* Therapies can include gentle exercises, massage, heat therapy, and joint mobilization.

## 6. Additional Supportive Measures

* Ice packs and elevation during the first 48 hours to reduce swelling and pain.
* Pain management with acetaminophen or ibuprofen as needed.

## **Differential Diagnosis**

## 1. Torus (Buckle) Fracture

## 2. Bowing Fracture

## 3. Salter-Harris Fracture

## 4. Toddler’s Fracture

## **Outlook / Prognosis**

Most children who experience a greenstick fracture fully recover and can resume all their usual activities after their bone heals. Talk to your healthcare provider before your child resumes any physical activities or plays sports.

Kids who experience a greenstick fracture in their forearm bones may have an increased risk of re-breaking that same bone in the future. This is especially true if a healthcare provider doesn’t diagnose and treat the fracture right away. Visit a provider as soon as your child has symptoms like pain or swelling around a bone.

#### **Healing time**

Most greenstick fractures take around six weeks to heal. How long it’ll take depends on which of your child’s bones is broken, the fracture’s severity and if they experienced any other injuries. Your provider will tell you what to expect, and when they can resume physical activities.

## **Prevention**

You may not be able to prevent a greenstick fracture, especially if your child falls or experiences another type of trauma. But there are a few ways you can reduce your family’s injury risk:

* Always wear your seatbelt.
* Make sure everyone wears the right protective equipment for all activities and sports.
* Make sure your home is free of clutter that could trip anyone.
* Always use the proper tools or equipment at home to reach things. Never let children stand on chairs, tables or countertops.

### **When should I see my healthcare provider?**

Visit a healthcare provider if your child has pain or swelling around a bone — especially if they experience a fall or another injury.

Go to the ER if you experience trauma or think your child has a broken bone. Go to the emergency room if your child experiences any of the following:

* Intense pain.
* They can’t move a part of their body.
* A part of their body is noticeably different-looking or out of its usual place.
* You can see their bones through their skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

**Questions and Answers Set**

## 1. What is a greenstick fracture?

A greenstick fracture is an incomplete fracture where the bone cracks on one side but does not break all the way through. It is common in children because their bones are softer and more flexible

## 2. How does a greenstick fracture happen?

Most greenstick fractures occur when a child falls and tries to break the fall with an outstretched hand (FOOSH). It can also happen due to direct blows or twisting injuries

## 3. What are the symptoms of a greenstick fracture?

Symptoms include pain, swelling, bruising, tenderness, deformity (the injured limb may look crooked), and limited use or range of motion of the affected area

## 4. How is a greenstick fracture diagnosed?

Doctors diagnose it through a physical exam and confirm it with X-rays. Sometimes MRI or CT scans are used if surgery is needed or to get detailed images

## 5. How are greenstick fractures treated?

Most greenstick fractures are treated by immobilizing the bone with a cast or splint for about six weeks. If the bone is significantly bent, a doctor may first perform a reduction (setting the bone) before casting

## 6. When is surgery needed for a greenstick fracture?

Surgery is rare but may be necessary if the fracture has a severe angle or displacement. Surgery involves realigning the bone and securing it with metal pins (internal fixation)

## 7. How long does it take to heal?

Healing typically takes around six weeks, but follow-up X-rays are needed to ensure proper healing. After cast removal, physical therapy may be recommended to restore strength and mobility

## 8. Can my child use the injured limb during healing?

Using the limb gently is encouraged to prevent stiffness and muscle loss, but heavy lifting or strenuous activity should be avoided until healing is sufficient

## 9. What complications can occur with greenstick fractures?

Possible complications include malunion (bone heals out of alignment), nonunion (bone fails to heal), and acute compartment syndrome (a serious condition caused by pressure buildup affecting blood flow)

## 10. How often should follow-up visits occur?

Regular orthopedic follow-up is important, especially for proximal fractures or those with angulation, to monitor healing and prevent displacement. Follow-ups are typically scheduled every few weeks during immobilization

**DOCTOR PATIENT CONVERSATION**

Doctor: Hello, I understand your child fell and hurt his arm. Can you tell me what happened?

Parent:

Yes, he fell while playing and now his forearm hurts a lot.

Doctor:

I see. We did an X-ray, and it shows a greenstick fracture. This means the bone has bent and cracked on one side but hasn’t broken completely. It’s common in children because their bones are softer and more flexible.

Parent:

Is this serious? Will he need surgery?

Doctor:

Most greenstick fractures heal well with a cast or splint to keep the arm still. Surgery is rarely needed unless the bone is severely bent or displaced.

Parent:

How long will the cast be on?

Doctor:

Usually about six weeks. We’ll check his progress with follow-up X-rays to make sure the bone is healing properly.

Parent:

What can we do to help him recover?

Doctor:

Keep the cast dry and intact, and encourage him to avoid using the injured arm too much. After the cast is removed, we might recommend some gentle exercises or physical therapy to restore strength and movement.

Parent:

What signs should I watch for that might mean a problem?

Doctor:

If he has increased pain, swelling, numbness, or if the fingers become cold or blue, seek medical attention immediately. Also, if the cast becomes too tight or damaged, let us know.

Parent:

Thank you, doctor. That helps me understand what to expect.

Doctor:

You’re welcome. We’ll support you and your child throughout the healing process.

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### **STRESS FRACTURE**

**DEFINITION AND DESCRIPTION**

A stress fracture is a small crack in one of your bones. It’s a type of bone fracture (the medical term for broken bones).

Stress fractures are exactly what their name sounds like — fractures that happen when something puts too much stress on your bone. Healthcare providers sometimes call stress fractures overuse injuries because repetitively using the same part of your body usually causes them. You might also see stress fractures called hairline fractures, a name that refers to the hairline crack that forms in your bone.

Any repetitive motion or activity that puts pressure on your bones can cause a stress fracture — playing a sport or doing physical work are common causes. Visit a healthcare provider if you feel pain, swelling or tenderness on or near a bone (especially during or after physical activity).

#### **Types of stress fractures**

Stress fractures usually affect weight-bearing bones in your lower body. These are the bones that support the weight of your body when you’re standing or moving. You’re most likely to experience a stress fracture in your:

* Lower leg (your tibia and fibula).
* Foot (especially your metatarsals that connect your ankle and heel to your toes).
* Heel (calcaneus).

They’re less common, but stress fractures can also affect bones in your:

* Lower back (lumbar spine).
* Hips.
* Hands and wrists.

Stress fractures are common injuries for athletes and people who do physical work. Experts estimate that stress fractures make up around 20% of all sports injuries.

## **Symptoms and Causes**

The most common symptoms of a stress fracture include:

* Pain that starts and gets worse during physical activity.
* Pain that doesn’t get better after stopping activity.
* Pain that’s more noticeable when you’re resting.
* Tenderness to even a light touch on or near your affected bone.
* Swelling.

#### **What does a stress fracture feel like?**

Most people with a stress fracture feel less pain after they stop physical activity. But you might feel pain all the time depending on where the stress fracture is. Because stress fractures are more common in your lower legs and feet, the pain is usually worse when you’re walking or standing with weight on your affected bone.

You’ll probably feel pain that’s focused (localized) in one spot near the fracture. For example, if you have a stress fracture in your foot, your whole foot might hurt, but the area around your damaged bone will be the most painful and tender.

### **What causes stress fractures?**

Stress fractures are almost always overuse injuries. This means they happen when something puts too much pressure on a bone and the bone doesn’t have enough time to recover after physical activity. Stress fractures usually develop slowly over time when you do a repetitive motion (like training for a sport or performing the same type of movement all day at work).

Stress fractures start as inflammation on a bone’s surface (healthcare providers call this a stress reaction). Stress reactions are like deep bone bruises. If something keeps putting pressure on that same spot before the stress reaction can heal, your bone can crack and create a stress fracture. The bruise will reach deeper into the bone over time until it makes it weak enough to break. That’s when a stress reaction becomes a stress fracture.

Some of the most common causes of stress fractures include:

* Practicing or training too often without resting enough.
* Starting a new sport or physical activity without the right training, guidance or equipment.
* Quickly increasing your activity level (suddenly ramping up workouts, training or other physical activity).
* Changing the surface you train or work on (switching from running on an indoor track to road running, or starting a job that requires you to stand on a hard floor like concrete).
* Working or training without proper equipment.
* Specializing in one sport too early (children who play the same sport year-round without a break between seasons are more likely to experience a stress fracture than kids who play a variety of sports).

#### **Stress fracture risk factors**

Athletes who play sports that put a lot of stress on their lower bodies are more likely to develop stress fractures, including:

* Running (both long-distance running and track and field sports).
* Basketball.
* Tennis.
* Gymnastics (gymnasts are also more likely to develop hand and wrist stress fractures).
* Dance.

Certain health conditions can increase your risk of a stress fracture, including:

* Osteoporosis (providers sometimes call these insufficiency fractures).
* Bunions.
* High arch feet.
* Flat feet.
* Vitamin D deficiency.
* Being overweight or obese.
* Eating disorders.

## **Diagnosis and Tests**

A healthcare provider will diagnose a stress fracture with a physical exam. They might use imaging tests to confirm the diagnosis and take pictures of the fracture. They’ll examine the part of your body that hurts. Tell them what you were doing when you first noticed pain and other symptoms.

Your provider might ask you to stand or hop on one leg and then the other. This will help them understand where you might have a stress fracture, and how much it affects your ability to move normally.

Your provider might use some of the following tests to take pictures of your bones:

* X-rays.
* Magnetic resonance imaging (MRI).
* Computed tomography (CT) scan.
* Whole body bone scan.

## **Management and Treatment**

Your provider will suggest treatments based on the location of the fracture and the severity of your symptoms. The most common treatments for stress fractures include:

* **Rest:** Stop physical activity — especially the sport or activity that caused the fracture.
* **Icing:** Apply ice or a cold pack to your injured bone. Wrap ice packs in a thin towel to avoid putting them directly on your skin. Your provider will tell you how often (and for how long) you should ice your injury.
* **Pain relievers:** Over-the-counter (OTC) nonsteroidal anti-inflammatory medications (NSAIDs) and acetaminophen (Tylenol®) can relieve pain and reduce swelling. Your provider might recommend over-the-counter lidocaine patches to numb the area around the fracture. Don’t take pain relievers for more than 10 days in a row without talking to your provider.
* **Elevating your injury:** Try to keep your injured bone above the level of your heart as often as possible. For example, if the stress fracture is in your leg or foot, you can prop your leg up with pillows or cushions while you’re lying down.
* **Compression:** Compression helps reduce blood flow to your injured bone and reduces swelling. Apply a compression bandage or wrap around the fracture.
* **Immobilization:** You might need to wear a cast, boot or special shoe to support your injury and reduce how much pressure you put on it.
* **Crutches:** Your provider may suggest you use crutches to take pressure off your injured bone.

#### **Stress fracture surgery**

Most people don’t need surgery to treat a stress fracture. Your provider might suggest surgery if the fracture isn’t healing like it should, or if you’re experiencing severe symptoms. You might need surgery if the fracture’s in a bone that’s more likely to cause other complications (like your hip joint).

A surgeon will perform a procedure called an internal fixation. They’ll put pins, screws or metal plates into your bone to hold it together while it heals. Your provider and surgeon will tell you what to expect and how long it’ll take to recover.

### **How soon after treatment will I feel better?**

You should start feeling better as soon as you stop putting stress on your injured bone and start treating your symptoms. Don’t resume training, working out or practicing before your provider says it’s safe, even if you’re feeling better. It’ll probably take at least a few weeks for your bone to heal enough before you can return to physical activities. The fracture can come back or get worse if you resume activity too soon.

## **Stress Fracture Procedures and Timeline**

## 1. Initial Diagnosis and Assessment

* Diagnosis typically involves a physical exam, patient history, and imaging such as X-rays, MRI, or bone scan.
* Early diagnosis is crucial to prevent worsening of the fracture.

## 2. Conservative Treatment (Most Common)

* Rest and Activity Modification: Avoid activities that cause pain or stress on the affected bone.
* Immobilization: Use of braces, splints, or non-walking short leg casts (especially for lower extremity fractures) for 4 to 8 weeks depending on fracture location and severity.
* Pain Management: Acetaminophen preferred; NSAIDs may be avoided as they can slow bone healing.
* Physical Therapy: Initiated during or after immobilization to maintain cardiovascular fitness and gradually restore strength, flexibility, and balance.
* Cross-Training: Low-impact activities such as swimming, cycling, or pool running to maintain fitness without stressing the fracture site.
* Protective Footwear: Shock-absorbing shoes or orthotics to reduce impact during recovery.

## 3. Surgical Treatment

* Indicated for high-risk stress fractures (e.g., femoral neck, anterior tibia) or fractures that do not heal with conservative management (nonunion or delayed union).
* Surgery involves internal fixation with pins, screws, or plates to stabilize the bone.
* Post-surgery recovery includes immobilization and gradual rehabilitation.

## 4. Rehabilitation Phases

* Phase 1: Rest of the injured site, maintenance of aerobic fitness with low-impact exercises, and pain control. Weight-bearing as tolerated but no running or high-impact activities.
* Phase 2: Begins 2 weeks after pain resolution; gradual return to impact activities like running, focusing on muscular endurance, core stability, balance, and gait retraining.
* Duration of rehabilitation varies but typically spans several weeks to months.

## 5. Healing Timeline

* Most stress fractures heal within 6 to 8 weeks with appropriate treatment.
* Healing time may extend to 3 to 6 months or longer for more severe or complicated fractures.
* Return to full activity is gradual and guided by symptom resolution and medical supervision.

## **Stress Fracture Epidemiology**

## Incidence and Prevalence

Stress fractures account for 10%-20% of all injuries in sports medicine and about 10% of all orthopedic injuries

The incidence varies widely depending on the population and activity:

Military training: Stress fracture rates range from 0.9% to 5.2% in males and 3.4% to 21.0% in females during basic army training lasting 8 weeks

In the US Army, incidence rates are approximately 19.3 per 1,000 males and 79.9 per 1,000 females during 10 weeks of basic training

Among athletes, around 0.8% of high school athletes sustain stress fractures, with an incidence rate of 1.54 per 100,000 athlete exposures

Competitive track and field athletes have an incidence rate of about 21.1%, or 0.70 stress fractures per 1,000 training hours

Females have a significantly higher risk of stress fractures compared to males, partly due to factors like the female athlete triad and relative energy deficiency in sport (RED-S)

Female athletes have about 2.22 stress fractures per 100,000 exposures, compared to 1.27 per 100,000 in males in sex-comparable sports

Stress fractures occur across all ages but are more common in adolescents and young adults engaged in intense physical activity.

Incidence may increase with age due to decreased bone mineral density (BMD).

Individuals of Black African descent have lower rates of stress fractures compared to Caucasians, likely due to higher BMD

Lower extremities are most commonly affected (80%-90% of cases), especially:

Tibia (about 49% of stress fractures)

Tarsal bones (25%)

Metatarsals (9%)

Femur and fibula (6%)

The ulna is the most commonly affected bone in the upper extremity but accounts for less than 10% of stress fractures overall

Sports with higher stress fracture rates include endurance running, track and field, dance, and military training

Repetitive mechanical loading without adequate rest

Sudden increases in training intensity or duration

Female athlete triad / RED-S (energy deficiency, menstrual dysfunction, low BMD)

Biomechanical factors and improper footwear

Nutritional deficiencies, especially calcium and vitamin D

## **Outlook / Prognosis**

Most people need to rest for at least a few weeks after experiencing a stress fracture. You might need to avoid sports and other physical activities for a few months.

As long as you can feel pain, the bone is still fragile in that area, and could break again in the same place. It usually takes six to eight weeks for a stress fracture to heal. Stop the activities that caused the stress fracture while you’re healing.

Your provider will tell you how long you need to take a break from playing sports or working out.

## **Prevention**

These steps can help prevent a stress fracture:

* Stop exercising or training as soon as you feel pain. Never “play through pain”.
* Warm up and cool down before physical activity.
* Wear the right equipment for all sports and physical activities.
* Follow a diet and exercise plan that’s healthy for you.
* Visit a healthcare provider as soon as you notice pain or other symptoms.

## **Living With**

Don’t resume physical activities before your healthcare provider says it’s safe. If you stress your bone again before it has time to heal, you’re more likely to reinjure it.

* Ask your provider when it’s safe to increase your activity level.
* Talk to a healthcare provider before starting an exercise program or before taking a job that’ll involve a higher level of physical activity than you’re used to.
* If you’re a runner, wear well-fitting running shoes. You should replace your running shoes every 300 miles.
* Try low-impact activities (like swimming or biking).

### **When should I see my healthcare provider?**

Visit a healthcare provider as soon as you notice new symptoms like pain and swelling. Even if you don’t have a stress fracture, your provider can examine your injury and suggest treatments to prevent more serious complications.

Listen to your body if you’re experiencing pain during and after physical activity. Pain is often the first sign that you need to stop and rest. You can prevent a stress fracture before it happens by stopping physical activity and visiting a healthcare provider as soon as you notice pain and other symptoms.

Go to the emergency room right away if you’ve experienced trauma.

If you think you have a bone fracture, you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body.
* A part of your body looks noticeably different or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

## **Common Questions**

### **Can you walk with a stress fracture?**

You might be able to walk normally with a stress fracture. It depends on which bone is fractured, and how severe your symptoms are. Your provider will tell you which types of movements are safe while you’re healing. Don’t jog, run, work out or do any intense physical activity without talking to your provider.

### **Will a stress fracture heal on its own?**

A healthcare provider needs to diagnose and treat all stress fractures. Even though rest and giving your body time to heal are the most common treatments, you still need your injury examined and diagnosed by a provider before you can return to sports or other physical activities.

Visit a provider if you’re experiencing stress fracture symptoms. The sooner it’s diagnosed, the faster your bone can start healing. Your provider will help you understand why the stress fracture happened and how you can prevent injuries in the future.

## **Do I have a stress fracture or another injury?**

A stress fracture is a tiny crack in a bone caused by repetitive stress or overuse, often starting as inflammation or a "bone bruise" that deepens over time. Unlike a complete fracture from a sudden, severe impact, a stress fracture develops gradually

Your healthcare provider will conduct a physical examination, asking about your symptoms and recent activity levels. They might ask you to stand or hop on one leg to see how much it affects your movement and pai

Diagnosis can be challenging because symptoms can mimic other musculoskeletal injuries . While X-rays are often used, they may not show a stress fracture until healing has begun Therefore, MRI (Magnetic Resonance Imaging) or bone scans are often the preferred methods for early and accurate diagnosis, as they are more sensitive in detecting bone marrow edema and periosteal reaction. CT scans can also be used for detailed bone visualization

## Which treatments will I need?

Treatment for a stress fracture typically focuses on rest and protecting the affected bone. Common treatments include:

* Rest and activity modification to avoid putting pressure on the bone
* Protection using a brace, splint, or cast to reduce stress on the bone
* Pain management with over-the-counter medications
* Physical therapy to help regain strength and flexibility as the bone heals

## Will I need surgery?

Most stress fractures do not require surgery. Surgery is usually reserved for high-risk stress fractures (e.g., in the femoral neck or anterior tibia) or those that do not heal with conservative management

## How long should I avoid sports or physical activity?

The duration of rest and avoidance of sports depends on the severity and location of the stress fracture. Recovery for most stress fractures typically takes 6 to 8 weeks with proper rest and treatment However, some more severe cases can require 12 to 16 weeks or even longer. A classification system based on MRI findings can help determine the necessary resting period, ranging from 3 weeks for mild injuries to 16 weeks for those with a visible cortical rupture

## How should I ramp my activity back up when it’s safe to start training again?

Ramping activity back up should be a gradual process guided by your healthcare provider and physical therapist. Once the pain has resolved and the bone shows signs of healing, you will typically begin with low-impact activities. Your physical therapist will help you gradually increase the intensity and duration of your exercises while monitoring your symptoms to ensure a safe return to full activity

## **Doctor-Patient Conversation: Stress Fracture**

Doctor:  
“Hello, I’ve reviewed your symptoms and imaging results, and it looks like you have a stress fracture. This is a small crack in the bone caused by repetitive stress or overuse.”

Patient:  
“Oh, I see. How did this happen? I don’t remember a specific injury.”

Doctor:  
“Stress fractures often develop gradually from repeated activities like running, jumping, or other high-impact sports. They’re common in athletes, military recruits, or anyone who suddenly increases their activity level.”

Patient:  
“What symptoms should I expect? I’ve had some pain in my leg that gets worse when I exercise.”

Doctor:  
“That’s typical. You might feel localized pain that worsens with activity and improves with rest. Swelling or tenderness over the affected bone can also occur.”

Patient:  
“How is a stress fracture treated?”

Doctor:  
“The main treatment is rest to allow the bone to heal. This means avoiding the activity that caused the fracture for several weeks. Sometimes, we use protective devices like a walking boot or crutches to reduce weight-bearing.”

Patient:  
“How long will it take to heal?”

Doctor:  
“Most stress fractures heal within 6 to 8 weeks, but it depends on the bone involved and how well you follow the treatment plan.”

Patient:  
“When can I start exercising again?”

Doctor:  
“Once your pain has completely resolved and your doctor confirms healing on follow-up imaging, you can gradually return to activity. We’ll work on a gradual increase to avoid recurrence.”

Patient:  
“Is there anything I can do to prevent this from happening again?”

Doctor:  
“Yes, proper training techniques, gradual increases in activity, good footwear, and ensuring adequate nutrition, especially calcium and vitamin D, help prevent stress fractures. Cross-training and strength exercises can also reduce risk.”

Patient:  
“Should I see a physical therapist?”

Doctor:  
“Physical therapy can be very helpful to improve strength, flexibility, and biomechanics, which supports healing and prevents future injuries.”

Patient:  
“Thank you, doctor. I’ll make sure to follow your advice.”

Doctor:  
“You’re welcome. If your symptoms worsen or don’t improve, please contact me. We’ll monitor your progress closely.”

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### **COMPRESSION FRACTURE**

**DEFINITION AND DESCRIPTION**

Compression fractures are small breaks or cracks in the vertebrae (the bones that make up your spinal column). The breaks happen in the vertebral body, which is the thick, rounded part on the front of each vertebra. Fractures in the bone cause your spine to weaken and collapse. Over time, these fractures can affect your posture.

Compression fractures can happen to any part of your spine, but they usually occur in the thoracic spine (middle section). Osteoporosis is a common cause of compression fractures, in addition to trauma (like after an accident) or tumors that weaken the bone.

A healthcare provider may treat these fractures with medications, a back brace or surgery, depending on the cause and severity of the bone break.

You may hear your provider refer to a compression fracture as:

* **A spinal compression fracture.**
* **A vertebral compression fracture.**

#### **Three types of compression fractures**

The types of spinal compression fractures include:

* **Wedge**: The fracture forms on the front of the vertebra. The broken bone collapses and takes on a wedge shape. More than half of all compression fractures are wedge-shaped.
* **Crush**: The break is in the entire vertebra, not just one side. The bone collapses on itself.
* **Burst**: The break causes bone pieces to spread in multiple directions when it breaks. This is a serious break that requires immediate medical attention.

Compression fractures are either:

* **Stable**: The fractured bone usually doesn’t move out of place.
* **Unstable**: The fracture moves bone pieces out of place. They may interfere with nearby nerves and tissue. This typically only occurs if there are other fractures or the spinal ligaments are injured as well.

Compression fractures are common. An estimated 1 to 1.5 million compression fractures happen every year in the United States.

## **Symptoms and Causes**

The symptoms of a compression fracture may include:

* Sudden back pain (pain may get better with rest and worse when you move).
* Limited mobility and flexibility (difficulty standing, walking, bending or twisting).
* Tingling or numbness in your back (pinched nerves).
* Tenderness at the fracture site.
* Muscle weakness or spasms.

Compression fracture symptoms range from mild to severe. You may not notice or feel symptoms with mild fractures.

A common sign of a compression fracture is a loss of height. The fracture causes the bone to collapse, which may affect how tall you are.

### **What causes a compression fracture?**

Pressure on or against the vertebrae in your spine may cause your spinal bones to break and collapse. Some of the most common causes of a compression fracture include:

* **Osteoporosis**: Your bones naturally weaken with age. Weakened bones are more likely to fracture. Severe osteoporosis fractures may happen while doing daily activities like getting out of a car, sneezing, coughing or twisting suddenly.
* **Injuries or accidents**: This could include falls, car accidents or other types of physical trauma.
* **Cancer**: Cancerous tumors can spread to your spine, weaken your vertebrae and cause the bones to break.

#### **Risk factors for a compression fracture**

You may be more at risk of a compression fracture if you:

* Are female and have been through menopause.
* Have a condition that affects the strength of your bones.
* Are 50 years of age or older.
* Had a compression fracture before.

Studies show that an estimated 40% to 50% of people aged 80 or over experienced a compression fracture before.

#### **Long-term effects of a compression fracture**

Long-term complications of a compression fracture may include:

* A forward-curving spine with a hunched-over appearance (kyphosis).
* Problems controlling your bladder or bowels.
* Chronic (long-lasting) pain.
* Future fractures.

**Diagnosis and Tests**

To diagnose a compression fracture, your provider will offer a physical exam to learn more about your symptoms. During the exam, your provider:

* Check your spine’s alignment and your height and posture.
* Gently press on different areas of your back to identify the source of pain.
* Looks for signs of nerve damage, which may include numbness, tingling or muscle weakness.

Your provider will also recommend imaging tests to see pictures of the bones, muscles and soft tissues in your back. These imaging studies include:

* A spine X-ray, CT scan or MRI to show images of your spine and look for fractures and other injuries.
* Dual-energy X-ray absorptiometry (DEXA) scan, which is a special type of X-ray that measures bone loss (bone density test).
* Myelogram, which is a procedure your provider uses along with an imaging test. Your provider injects a contrast dye into your spinal column before doing a CT scan or X-ray. The dye makes images clearer.
* Three-phase bone scan, which is an imaging test that takes three sets of pictures during three different visits.

In some cases, your provider may find a compression fracture while performing an imaging test for another reason.

## **Management and Treatment**

Compression fracture treatment focuses on:

* Relieving pain.
* Stabilizing the bones in your spine.
* Preventing another fracture.

Depending on the type and severity of the fracture, treatment may include:

* **Pain relief medication**: Your provider may recommend over-the-counter nonsteroidal anti-inflammatory drugs (NSAIDs). Or they may prescribe muscle relaxers or prescription drugs. Follow your provider’s instructions carefully when taking these medications.
* **Braces**: A special type of back brace can support your vertebrae. It can also relieve pain by reducing how much you move your spine. You may need to wear the brace for four to 12 weeks.
* **Medications to strengthen bones**: Medications called bisphosphonates can slow further bone loss, stabilize bones and prevent fractures if you have osteoporosis.
* **Physical therapy**: A physical therapist will teach you stretches and exercises to strengthen the muscles around your spine.
* **Surgery (vertebroplasty or kyphoplasty)**: These are minimally invasive outpatient procedures that stabilize and support your vertebra with bone cement.

Yes, some types of compression fractures can heal on their own. Healing can take several months. A healthcare provider may offer treatment options like a brace to make sure your spine heals as expected. Let your provider know if you have symptoms that interfere with your daily routine and mobility as you heal.

Mild pain medications can reduce inflammation and pain when taken properly. Medications will not stop degeneration, but they will help with pain control.

**Aspirin**

Aspirin compounds are over-the-counter pain relievers that can help relieve minor pain and back ache. The main potential side effect of aspirin is the development of stomach problems, particularly ulcers with or without bleeding. You should not take aspirin if you are pregnant. In fact, you should not take any medication unless you have discussed the medication with your obstetrician.

**NSAIDs (Non-Steroidal Anti-Inflammatory Drugs)**

NSAIDs include over-the-counter pain relievers such as ibuprofen or naproxen. These medications once were only available by prescription. NSAIDs are very effective in relieving the pain associated with muscle strain and inflammation. They block the inflammatory response in joints. However, be aware that NSAIDs can decrease renal function if you are an older patient. Excessive use can lead to kidney problems. Again, do not take them if you are pregnant.

**Non-narcotic Prescription Pain Medication**

Non-narcotic analgesics (the term analgesics means "pain relievers") address pain at the point of injury. Analgesics are ideal in the treatment of mild to moderate chronic pain. Tylenol and aspirin are the most widely used over-the-counter analgesics. Medications that are analgesics and require a prescription from the doctor include NSAIDs such as: carprofen, fenoprofen, ketoprofen, and sulindac. To reduce any side effects: do not lie down for 15 to 30 minutes after taking medication, avoid direct sunlight, wear protective clothing, and sunblock. Avoid using these medications if you are pregnant, have recurrent ulcers, or liver problems.

**Narcotic Pain Medications**

If you experience severe pain, your health provider might prescribe a narcotic pain medication such as codeine and morphine. Narcotics relieve pain by acting as a numbing anesthetic to the central nervous system. The strength and length of pain relief differs for each drug. Narcotics can cause related side effects such as nausea, vomiting, constipation, and sedation or drowsiness. These side effects are predictable and can often be prevented. Common preventative measures include: not taking sleeping aids or antidepressants in conjunction with narcotics, avoiding alcohol, increasing fluid intake, eating a high fiber diet, and using a fiber laxative or stool softener to treat constipation. Remember that narcotics can be addictive if used excessively or improperly.

**Muscle Relaxants**

If you are having muscle spasms, muscle relaxants can help relieve pain, but they are only shown to be marginally effective. They also have a significant risk of drowsiness and depression. Long-term use is not suggested; only three to four days is typically recommended.

**Antidepressants**

Back pain is actually a common symptom of depression and could be an indicator of its presence. Antidepressants can relieve emotional stress that leads to symptoms of back pain. An important fact to note - it seems that the same chemical reactions in the nerve cells that trigger depression also control the pain pathways in the brain. Some antidepressant medications seem to reduce pain, probably because they affect this chemical reaction in the nerve cells. Some types of antidepressants also make rather good sleeping medications. If you are having trouble sleeping due to your back pain, your doctor may prescribe an antidepressant to help you get back to a normal sleep routine. Antidepressants can have several side effects such as: drowsiness, loss of appetite, constipation, dry mouth, and fatigue.

## **Decreasing Activity**

You will most likely have to limit your normal activities. You should avoid any strenuous activity or exercise. You will definitely need to avoid heavy lifting and anything else that might place too much strain on your fractured vertebra. If you are elderly, your doctor might also put you on bed rest. Older bones take longer to heal and are typically thinner and weaker than younger bones. Treat this fracture as you would any other broken bone, carefully and seriously.

## **Bracing**

Another common form of treatment for some types of vertebral compression fractures is bracing. Your doctor may prescribe a back support (often officially called an orthosis). The brace supports the back and restricts movement; just as an arm brace would support a fracture of the arm. The brace is well molded to conform tightly to your body, like a cast for any other fracture. The brace used to treat a compression fracture of the spine is designed to keep you from bending forward. It holds the spine in hyperextension (meaning more extension, or straightening, than normal). This takes most of the pressure off the fractured vertebral body, and allows the vertebrae to heal. It also protects the vertebra and stops further collapse of the bone.

Vertebral fractures usually take about three months to fully heal. X-rays will probably be taken monthly to check on the healing progress.

## **Surgery**

Surgery to fix most spinal compression is rarely needed. With vertebral fractures, surgery, or internal fixation, is only considered if there is evidence of sudden and serious instability of the spine. For instance, if the fracture leads to a loss of 50% of the vertebral body's height, surgery might be necessary to prevent damage that is more serious to the spinal nerves.

If your doctor feels that surgery is necessary to treat your fracture, he or she will probably suggest using some type of internal fixation to hold the vertebrae in the proper position while the bone heals. If there are signs that there is too much pressure on the spinal cord, the bone fragments pushing into the spinal cord may also need to be removed.

## **Anterior Approach**

When surgery is necessary to remove pressure from the spinal cord, your surgeon may suggest an operation from the front of the spine. During an anterior approach an incision is made in the chest to allow the surgeon to see the front of the spine and locate the vertebra that has been crushed. Once the vertebra has been located, the bone fragments may be removed to remove the pressure from the spinal cord. Once this has been accomplished, a spine fusion is usually performed.

The anterior spine fusion is performed by replacing the crushed vertebra with bone graft to hold the vertebra above and below the fractured vertebra apart. The bone graft eventually grows together with the vertebra above and below, and fuses the vertebrae together into one bone. During the operation a combination of metal screws, metal plates and metal rods are used to hold the spine in the correct position to allow the fusion to occur over the next several months. These metal implants will remain in the body and will not be removed unless they contribute to the patients problems.

## **Posterior Approach**

In some cases, an operation to stabilize the fractured vertebra can be performed through an incision in the back. This type of procedure can allow the surgeon to use metal screws and metal rods to hold the vertebrae in the correct alignment while the fractured vertebrae heals. The posterior approach is more useful when there is not a great deal of pressure on the spinal cord and the surgeon is trying to prevent the fractured vertebra from collapsing more.

Spinal surgery is obviously a serious undertaking. Because of the risks and complications associated with spinal surgery, internal fixation is only done in serious cases

## **Complications**

With any surgery, there is a risk of complications. When surgery is done near the spine and spinal cord these complications (if they occur) can be very serious. Complications could involve subsequent pain and impairment and the need for additional surgery. You should discuss the complications associated with surgery with your doctor before surgery. The list of complications provided here is not intended to be a complete list of complications and is not a substitute for discussing the risks of surgery with your doctor. Only your doctor can evaluate your condition and inform you of the risks of any medical treatment he or she may recommend.

Several specific complications can occur with a vertebral compression fracture. If you notice or suspect a complication, please contact your doctor immediately.

## **Segmental Instability**

If a fracture leads to a vertebral body collapse of more than 50 percent, there is a risk of segmental instability. Each spinal segment is like a well-tuned part of a machine. All of the parts should work together to allow weight-bearing, movement, and support. A spinal segment is composed of two vertebrae attached together by ligaments, with a soft disc separating them. The facet joints fit between the two vertebrae, allowing for movement, and the foramen between the vertebrae allow space for the nerve roots to travel freely from the spinal cord to the body. When all the parts are functioning properly, all spinal segments join to make up a remarkably strong structure called the spine. When one segment deteriorates, or collapses, to the point of instability, it can lead to localized pain and difficulties. The instability eventually results in faster degeneration of the spine in this area.

## **Kyphotic Deformity**

Though the thoracic spine is supposed to be curved (or kyphotic), if the curve in a person's thoracic spine is more than 40 to 45 degrees, it is considered abnormal. Sometimes this deformity is described as "round back posture" or "hunchback". It is a common disorder in elderly women who have osteoporosis and frequent fractures. The front of the vertebrae will collapse and wedge due to the lack of normal vertebral space. This condition leads to a more rounded thoracic spine.

## **Neurologic Complications**

If the fracture causes part of the vertebral body to place pressure on the spinal cord, the nerves can be affected. There is some space between the spinal cord and the edges of the spinal canal. However, this space can be reduced if the pieces of the broken vertebral body push into the spinal canal. The bony tube of the spinal canal cannot expand if the spinal cord or nerves require more space. If anything begins to narrow the spinal canal - such as if the vertebrae protrude into its space, the risk of irritation and serious injury of the spinal cord or nerves increases.

The narrowing of the spinal canal due to a compression fracture can either lead to immediate injury to the nerves of the spine, or irritation of the nerves later. If the irritation on the spinal nerves comes later (even after the fracture has healed), it can cause pain and problems with the nerves not working right. The lack of space can also cause the supply of blood and oxygen to the spinal cord to be reduced. When the spine needs more blood flow during increased activity, the blood vessels may not be able to swell to get more blood to the spine. This can lead to numbness and pain in the nerves that are affected. The nerves also lose some of their mobility when the space available to them is reduced. This leads to irritation and inflammation of the nerves. This condition is called spinal stenosis.

All of these conditions may lead to the need for surgery in order to reduce pressure on the spinal cord, or to stabilize the spine. Surgery might also be necessary to reduce pain and/or the danger of neurological problems.

## **Diagnostic Considerations**

These include the following:

* Spinal malignancy resulting in fracture
* Renal failure
* Hemangioma of vertebral body
* Osteomyelitis
* Pott disease

## **Differential Diagnoses**

* Coccyx Pain
* Lumbar Degenerative Disk Disease
* Lumbar Facet Arthropathy
* Lumbar Spondylolysis and Spondylolisthesis
* Mechanical Low Back Pain
* Osteoporosis

## **Epidemiology**

### Frequency

*United States*

The number of vertebral compression fractures occurring in the United States is estimated to be 1-1.5 million annually. While 60-75% of such fractures reportedly occur in the spine’s T12-L2 region, the L2-L5 region is the site of another 30%.

### Mortality/Morbidity

Mortality from a lumbar fracture is rare; however, morbidity can be significant. In elderly patients with acute osteoporotic fractures, pain and prolonged bed rest can lead to multiple secondary medical complications.

In younger persons, neurologic damage from traumatic spine injuries can result in problems such as loss of lower extremity strength and sensation and loss of bowel and bladder control.

A study by Imai et al indicated that in patients with an osteoporotic hip fracture, the coexistence of a vertebral compression fracture significantly increases mortality risk. The study involved 182 patients with osteoporotic hip fracture (average age 85 years at the time of fracture), with lumbar spine radiographs revealing vertebral compression fracture in approximately 78% of these individuals. At 1-year following hip fracture, the investigators found the mortality rate to be significantly higher in patients with a coexistent vertebral compression fracture.

### Sex

Osteoporosis occurs primarily in postmenopausal women. Type 1 osteoporosis occurs in women aged 51-65 years and is associated with wrist and vertebral fractures. Estrogen deficiency is the main etiologic factor. Type 2 osteoporosis (senile type) is observed in women and men older than 75 years, in a 2:1 ratio of women to men.

### Age

In young and middle-aged adults, most lumbar fractures are traumatic in origin. High-velocity falls can cause burst fractures, and seat-belt injuries can cause wedge fractures. As stated above, women 51-65 years old develop type 1 osteoporosis. After age 75 years, men also begin to develop type 2 osteoporosis.

## **Outlook / Prognosis**

Your outlook after a compression fracture varies based on:

* The severity of the fracture.
* Your age.
* Your general health.
* Any underlying conditions you have.

Many compression fractures heal after a few months of rest and limited movement. If symptoms are bothersome, a healthcare provider may offer different treatment options to relieve pain.

If you have osteoporosis, you have a higher chance of having another compression fracture. Your provider can help you manage osteoporosis to prevent future fractures.

As your spine bones heal, you may notice symptoms like pain decrease after about four weeks. It should completely heal after 12 weeks. Your age and other factors may affect your healing time.

A compression fracture is only one factor that helps calculate your life expectancy and it isn’t the only thing your provider will consider. For example, a first-time vertebral compression fracture may indicate to a provider that osteoporosis is progressing and taking a greater toll on your body, even if you’re otherwise in good health.

Know that your situation may or may not fit statistics. Your provider can give you the best information about what you can expect.

## **Prevention**

You can’t prevent all causes of compression fractures.

One of the most common causes is osteoporosis. To reduce your risk of an osteoporosis-related compression fracture, you should:

* Protect yourself from injury and accidents (like removing tripping hazards and wearing a seatbelt).
* Eat balanced meals and get enough vitamin D and calcium to strengthen your bones.
* Quit smoking and using other tobacco products, as nicotine weakens bones.
* See your provider for regular checkups and take medications as prescribed to slow bone loss if you’re at risk of osteoporosis.

### **When should I see a healthcare provider?**

Visit a healthcare provider if you have sudden back pain or other symptoms of a compression fracture that doesn’t resolve in a couple of days. It’s especially important to stay regular with visits to see your provider if you have osteoporosis.

Contact emergency services or visit the emergency room if you have sudden, severe back pain and:

* Weakness or numbness.
* A loss of bladder or bowel control.
* A fever.

### **What questions should I ask my healthcare provider?**

## What type of fracture do I have?

Compression fractures are categorized mainly into three types:

* Wedge fracture: The front part of the vertebra collapses, creating a wedge shape; usually stable but can cause spinal deformity like kyphosis.
* Crush fracture: The entire vertebra collapses but is generally stable.
* Burst fracture: The vertebra breaks into multiple pieces and may damage the spinal cord; usually unstable and more serious.  
  Your doctor can specify which type you have based on imaging studies like X-rays, CT, or MRI

## 2. What treatment do you recommend?

Treatment depends on fracture type, severity, stability, and symptoms:

* Conservative treatment: Includes pain management, bracing, physical therapy, and activity modification for stable fractures.
* Medications: Pain relievers, osteoporosis drugs to strengthen bones, and sometimes calcitonin for pain relief.
* Surgical options: Considered for unstable burst fractures, severe deformity, or neurological compromise; procedures include vertebroplasty, kyphoplasty, or spinal fusion

## 3. Do I need surgery?

Surgery is usually reserved for:

* Unstable fractures (e.g., burst fractures with spinal canal compromise)
* Severe pain not controlled by conservative measures
* Neurological deficits due to spinal cord or nerve compression
* Progressive spinal deformity

Most compression fractures, especially wedge and crush types, are treated non-surgically.

## 4. Are there side effects of the treatment?

* Medications: NSAIDs can cause gastrointestinal upset; osteoporosis drugs may cause rare side effects like osteonecrosis of the jaw (bisphosphonates) or hypercalcemia (teriparatide).
* Bracing: May cause skin irritation or discomfort.
* Surgery: Risks include infection, bleeding, nerve injury, and complications related to anesthesia.  
  Discuss specific risks with your provider based on your treatment plan

## 5. How do I prevent future fractures?

* Bone health: Treat underlying osteoporosis with calcium, vitamin D, and medications like bisphosphonates or teriparatide.
* Lifestyle: Engage in weight-bearing exercises, avoid smoking and excessive alcohol, and maintain a balanced diet.
* Fall prevention: Home safety modifications, vision checks, and balance training reduce fall risk.
* Regular monitoring: Bone density scans (DEXA) and follow-up with your healthcare provider help track bone health

**Which factors frequently lead to compression fractures?**

The vertebra compression fractures can be brought forth by trauma from an accident or fall, or by certain medical conditions like osteoporosis, cancer, and spinal tumors that result in vertebral atrophy.

**What signs of a compression fracture are present?**

General symptoms could be sudden back pain, loss of height or spine problems, reduced movement, and in extreme cases, damage to nerves by numbness or tingling, and weakness in the legs.

**How are fractures from compression identified?**

Majorly, the diagnosis process is done through a thorough physical examination, history-taking, and imaging scan of the X-ray, MRI, and CT. They are comprehensive enough to confirm the presence and the extent of the fracture.

**What options are there for treating compression fractures?**

Treatment may involve bed rest, pain-killing medications, splinting applied to stabilize the spine, and physical therapy where the primary aim is to strengthen muscles and improve mobility. Sometimes minimally invasive procedures or surgery are conducted to prevent the spine from moving forward and pressing the nerves that are diseased will.

**DOCTOR PATIENT DE-IDENTIFIED CONVERSATION**

Doctor:

Hello, I’ve reviewed your imaging and it shows you have a compression fracture in one of your vertebrae. Do you know what that means?

Patient:

Not really. What exactly is a compression fracture?

Doctor:

It means that one of the bones in your spine has been crushed or compressed, usually due to trauma or weakened bones, such as from osteoporosis. This can cause back pain and sometimes limit your movement.

Patient:

How serious is it? What can be done to treat it?

Doctor:

Most compression fractures are stable and heal well without surgery. We typically start with pain management, rest, and sometimes a special back brace to support your spine and reduce pain. Physical therapy will help you regain strength and mobility as you heal.

Patient:

Will I need surgery?

Doctor:

Surgery is usually only needed if the fracture is unstable, causing nerve problems, or if pain is severe and not controlled with conservative treatment. Procedures like vertebroplasty or kyphoplasty can help in some cases by stabilizing the bone and relieving pain.

Patient:

What should I expect during recovery?

Doctor:

Healing usually takes about 6 to 8 weeks. During this time, you should avoid heavy lifting and strenuous activities but try to stay as active as you can tolerate. We’ll monitor your progress with follow-up visits and imaging if needed.

Patient:

Are there any side effects from the treatments?

Doctor:

Pain medications can cause side effects like stomach upset or drowsiness. Bracing might cause some discomfort or skin irritation. Surgery has its own risks, such as infection or bleeding, but these are relatively rare. We’ll discuss these in detail if surgery becomes necessary.

Patient:

How can I prevent this from happening again?

Doctor:

Preventing future fractures involves treating any underlying bone weakness, like osteoporosis, through medications, calcium and vitamin D supplements, and lifestyle changes such as weight-bearing exercise and fall prevention strategies.

Patient:

Thank you, doctor. That helps me understand what to expect.

Doctor:

You’re welcome. We’ll work together to manage your pain and help you recover safely.

REFERENCES

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[Compression Fracture: What It Is, Symptoms & Treatment](https://my.clevelandclinic.org/health/diseases/21950-compression-fractures#overview)

### **COMMINUTED FRACTURE**

**DEFINITION AND DESCRIPTION**

Comminuted (pronounced “kah-meh-noot-ed”) fractures are a type of broken bone. The term comminuted fracture refers to a bone that is broken in at least two places. These fractures can affect any large or long bone in your body. Some of the most common include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Humerus (upper arm).
* Radius and ulna (forearm).
* Clavicle (collarbone).
* Skull.

Comminuted fractures are almost always caused by serious traumas like car accidents or falls from a high place. They are very serious in large bones, and you will often need surgery to repair your bones. Sometimes, comminuted fractures happen to smaller bones and can heal without surgery. How long it takes to recover depends on which of your bones are fractured and what caused the breaks. Most people need up to a year to recover from a comminuted fracture if it involves one of the long or larger bones in your body, especially if it requires surgery.

### **Comminuted fractures vs. segmental fractures**

Comminuted fractures and segmental fractures are both serious types of bone fractures. They are different terms that tell your healthcare provider specific details about how your bones are broken, where they broke and what they look like inside your body right now.

If you have a comminuted fracture your bone is broken in two or more places. Usually, the trauma that causes comminuted fractures creates shatter-like breaks. If you’ve dropped a plate, the pieces are never uniformly broken. It’s the same with most comminuted fractures.

Segmental fractures happen when a bone is broken in two different places and a section of the bone has separated from the rest of the bone because of the fracture. Some segmental fractures are comminuted, and some are not.

No matter which names and terms end up applied to your fracture, the most important first step is getting your injury examined by a provider as soon as possible. If you have either a comminuted or segmental fracture, you’ve likely experienced a serious injury either way and getting your injuries assessed by a provider is the only way to determine which treatments you’ll need.

### **Who gets comminuted fractures?**

Comminuted fractures — like all bone fractures — can affect anyone. This is especially true because they’re caused by serious traumas. There’s no way to predict when or how someone will be in an accident, so everyone could experience a comminuted fracture.

Comminuted fractures are rare. This is because they’re caused by severe traumas that most people fortunately never experience.

## **Symptoms and Causes**

If you have a comminuted fracture, you’ll also likely experience serious symptoms of the trauma that caused it. Your symptoms will depend on the other injuries you have. But, in general, the symptoms of a comminuted fracture can include:

* Intense pain.
* Not being able to move a part of your body you normally can.
* A part of your body is noticeably different looking or out of its usual place.
* Seeing your bone through your skin.
* Swelling.
* Bruising.

#### **Open vs. closed comminuted fractures**

Your healthcare provider will classify your fracture as either open or closed. If you have an open fracture your bone breaks through your skin. Open fractures are sometimes also called compound fractures. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone does not push through your skin.

#### **Displaced comminuted fractures**

Displaced or nondisplaced are more words your provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair. Comminuted fractures are more likely to be displaced than other types of broken bones because they always have multiple broken pieces.

### **What causes comminuted fractures?**

Comminuted fractures are caused by trauma. Some of the most common causes are car accidents and falls from a great height, like off a ladder or roof.

Any impact to your bones can cause a comminuted fracture. However, slips, falls and other common causes of broken bones aren’t usually strong enough to damage your bones enough to cause a comminuted fracture.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a comminuted fracture with a physical exam and imaging tests. In some cases, this may be done in the emergency room if you’re admitted after trauma.

If you’re taken to an ER, a team of providers will work to stabilize you and treat your injuries in the order of severity, especially if some are life-threatening. After you’re stabilized, you will need imaging tests to confirm your fracture.

You’ll need at least one of a few imaging tests to take pictures of your fracture:

* **X-rays:** An X-ray will confirm any comminuted or other fractures, and show how damaged your bones are.
* **Magnetic Resonance Imaging (MRI):** Your provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This will show them tissue around your bones too. This is especially important to determine how your muscles, connective tissue and organs were affected by the trauma.
* **CT scan:** A CT scan will give your provider or surgeon a more detailed picture of your bones and the surrounding tissue than an X-ray.

## **Management and Treatment**

You’ll need surgery to repair a comminuted fracture if one of your long or large bones is broken. There are a few techniques used to repair comminuted fractures, and which one your surgeon uses will depend on your injuries, which bone is fractured and any other complications after your trauma.

Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. Internal fixation techniques include:

* **Rods:** A rod inserted through the center of your bone that runs from top-to-bottom.
* **Plates and screws:** Metal plates screwed into your bone to hold them in place.
* **Pins and wires:** Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates. You’ll probably need pins and wires to hold the pieces of your bone together after your comminuted fracture.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### **External fixation**

You might need an external fixation. This is often a temporary solution that stabilizes your fracture while your other injuries heal. Your surgeon will put screws on either side of the fracture inside your body then connect them to a brace or bracket around the bone outside your body.

Surgeons sometimes recommend external fixation as a first step before more invasive surgeries to fix your comminuted fracture. If you have lots of other injuries, your body might need time to regain its strength to be able to tolerate internal fixation surgeries.

#### **Bone grafting**

You might need bone grafting if your comminuted fracture is severely displaced or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to rejoin your fractured bone. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

* Internally from somewhere else in your body — usually the top of your hip bone.
* An external donor.
* An artificial replacement piece.

On their own, comminuted fracture surgeries are outpatient procedures, which means you might be able to go home the same day. However, it’s likely the trauma that led to your comminuted fracture caused other injuries that will require you to stay in the hospital to recover.

After your surgery, the part of your body with the fractured bone in it will be immobilized. Depending on where this is, you’ll need some combination of a brace, splint or cast before you can start putting any weight on it again or using it like you did before your injury.

### **What medications are used to treat comminuted fractures?**

Over-the-counter [NSAIDs](https://my.clevelandclinic.org/health/drugs/11086-non-steroidal-antiinflammatory-) like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

## 1. Pain Management Medications

* Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)
  + Examples: Ibuprofen, aspirin, naproxen
  + Use: Over-the-counter pain relief and inflammation reduction.
  + Side Effects: Increased risk of bleeding (especially post-surgery), gastrointestinal irritation or ulcers, kidney impairment, and cardiovascular risks. NSAIDs may also potentially delay bone healing, so their use is often carefully managed after surgery.
* Acetaminophen (Paracetamol)
  + Use: Mild to moderate pain relief, often preferred when NSAIDs are contraindicated.
  + Side Effects: Generally well tolerated; overdose can cause severe liver damage.
* Opioids
  + Examples: Morphine, oxycodone, tramadol
  + Use: Moderate to severe pain, especially immediately after surgery or trauma.
  + Side Effects: Sedation, constipation, nausea, risk of dependence, respiratory depression, especially in elderly or sensitive patients.

## 2. Antibiotics (for Open or Complicated Fractures)

* Use: To prevent or treat infections in open fractures or surgical sites.
* Common Choices: First-generation cephalosporins (e.g., cefazolin), clindamycin (if allergic), aminoglycosides (e.g., gentamicin) for severe contamination.
* Side Effects: Allergic reactions, gastrointestinal upset, nephrotoxicity (with aminoglycosides), antibiotic resistance concerns.

## 3. Bone Health Medications (Adjunctive Therapy)

* Bisphosphonates
  + Use: To improve bone density and reduce risk of future fractures, especially in osteoporotic patients.
  + Side Effects: Gastrointestinal irritation, esophagitis, rare osteonecrosis of the jaw, atypical femoral fractures.
* Teriparatide (Parathyroid Hormone Analog)
  + Use: Stimulates bone formation and may aid fracture healing.
  + Side Effects: Nausea, leg cramps, dizziness, hypercalcemia, rare risk of osteosarcoma (animal studies).

## 4. Other Considerations

* Low-Molecular-Weight Heparin (LMWH): Used for thromboprophylaxis post-surgery; generally safe but requires monitoring for bleeding risk.
* Nerve Blocks: Sometimes used adjunctively for pain control postoperatively; side effects depend on the agent used.

## **Comminuted Fractures: Procedures and Timelines**

## Diagnosis and Initial Management

Diagnosis is made by physical exam and imaging, primarily X-rays, with possible CT or MRI for complex cases or to evaluate soft tissue damage.

In emergency settings, initial stabilization of the patient and other life-threatening injuries takes priority before fracture management.

## Surgical Treatment

Comminuted fractures almost always require surgery due to the bone being broken into multiple fragments. The main surgical approaches include:

Open Reduction and Internal Fixation (ORIF)

The surgeon makes an incision to expose the fracture, realigns (sets) the bone fragments, and secures them with metal hardware such as:

Rods inserted inside the bone shaft

Plates and screws fixed along the bone surface

Pins and wires to hold small fragments together

Internal fixation stabilizes the bone fragments to promote proper healing. Some hardware may remain permanently; others may be removed later.

External Fixation

Used as a temporary or sometimes definitive treatment, especially if the patient has multiple injuries or the fracture site is too swollen or contaminated for immediate internal fixation.

Screws are placed into the bone fragments and connected to an external frame outside the body to stabilize the fracture.

Bone Grafting

May be necessary if the fracture is severely displaced or if bone healing is compromised.

Bone grafts can be taken from the patient’s own body (autograft), a donor (allograft), or synthetic materials.

Grafting is usually combined with internal fixation to hold the bone fragments in place.

## Postoperative Care and Immobilization

After surgery, the affected limb or area is immobilized using a cast, splint, or brace to protect the repair.

Weight-bearing or use of the limb is restricted based on fracture location and healing progress.

## Healing Timeline

Comminuted fractures take longer to heal than simple fractures due to the complexity and number of fragments.

Healing often requires several months to a year or more, depending on:

Severity of the fracture

Bone involved

Patient’s overall health and presence of complications

Follow-up includes regular clinical and imaging assessments to monitor healing.

## Rehabilitation

Physical therapy begins once the bone is stable enough, focusing on restoring range of motion, strength, and function.

Gradual return to weight-bearing and activities is guided by the surgeon and therapist.

## **Epidemiology of Comminuted Fractures**

## General Incidence and Distribution

Comminuted fractures, where the bone breaks into multiple fragments, are common in high-energy trauma and open fractures.

They are frequently seen in long bones such as the tibia, femur, and forearm bones.

According to several studies, comminuted fractures constitute a substantial proportion of open fractures:

One study found that 64.6% of open long bone fractures were comminuted (mostly tibia)

In tibia and fibula fractures, about 19% were comminuted

Tibia: The most commonly affected long bone in open fractures, with a high proportion being comminuted

Femur: Femoral shaft fractures have an incidence ranging from 9.5 to 18.9 per 100,000 annually [5](https://emedicine.medscape.com/article/90779-overview). Many femur shaft and distal femur fractures are comminuted, especially in high-energy trauma

Distal tibia and ankle: These sites have a high incidence of fractures, with a significant percentage being open and comminuted

Upper extremity: Comminuted fractures also occur but less frequently compared to lower limbs.

## Demographics

Incidence of fractures overall increases with age, with a mean age around 58 years and a higher proportion occurring in women (about 65%)

High-energy trauma causing comminuted fractures is more common in younger males, while fragility fractures (less often comminuted) are more frequent in elderly females.

Open fractures with comminution are more prevalent in trauma centers and urban settings with high rates of motor vehicle accidents and falls.

## Trauma and Mechanism

Comminuted fractures are often associated with high-energy trauma such as motor vehicle collisions, falls from height, and industrial accidents.

Open fractures with comminution have a higher risk of complications due to soft tissue damage.

## **Differential Diagnosis**

## 1. Simple Fractures

## 2. Greenstick Fractures

## 3. Stress Fractures

## 4. Segmental Fractures

## 5. Avulsion Fractures

#### **Complications of comminuted fracture treatment**

Comminuted fracture surgery complications include:

* **Acute compartment syndrome** (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.
* **Malunion**: This happens when your broken bones don't line up correctly while they heal.
* **Nonunion**: Your bones may not grow back together fully or at all.
* **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin) you have an increased risk of bacterial infection.
* **Other internal damage**: Fractures can damage the area around the injury including your muscles, nerves, blood vessels, tendons and ligaments.

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your comminuted fracture — and which bones were broken — you should be able to start moving again in a few weeks.

If you experience intense pain that doesn’t get better, contact your healthcare provider.

## Treatment Procedure

1. Initial Assessment and Imaging
   * X-rays are taken to identify the number and position of bone fragments.
   * CT or MRI may be ordered to assess soft tissue damage and complex fracture patterns.
2. Surgical Intervention
   * Most comminuted fractures require surgery to realign and stabilize the bone fragments.
   * Internal fixation is the most common surgical method, involving:
     + Rods inserted along the bone axis.
     + Plates and screws to hold bone pieces together.
     + Pins and wires for small fragments.
   * In some cases, external fixation is used temporarily or when internal fixation is not immediately possible. This involves screws inserted into bone connected to an external frame.
   * Bone grafting may be necessary if bone loss or poor healing is anticipated, using bone from the patient, donor, or artificial materials.
3. Post-Surgery Immobilization
   * The affected limb is immobilized with a cast, brace, or splint to prevent movement and allow healing.
   * Weight-bearing is restricted initially, depending on fracture location and stability.
4. Pain Management
   * Pain is managed with prescribed medications. Over-the-counter NSAIDs like ibuprofen or aspirin are generally avoided post-surgery due to bleeding risk.
5. Physical Therapy
   * After initial healing, physical therapy begins to restore strength, flexibility, and range of motion.

## **Outlook / Prognosis**

If you have a comminuted fracture, you’ll have a longer road to recovery than people who get other types of broken bones. It might take up to a year to heal, especially if you have other injuries from your original trauma.

You will need physical therapy to regain strength and range of motion in the part of your body that was injured. This therapy will be part of your larger recovery plan from other injuries.

Comminuted fractures take longer to heal than other kinds of broken bones. They’re also much more likely to involve complications.

Most comminuted fractures take around a year or longer to heal. The exact time it takes your bone(s) to heal will depend on the severity of your fracture and if you develop any complications.

If you experience a trauma, you will likely need to miss work or school while you recover. Your specific injuries and which bones are fractured will impact how long you’ll need to miss work, school and other activities.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### **Outlook for a comminuted fracture**

Comminuted fractures are very serious injuries. If you experienced other injuries during the original trauma, your life might be impacted forever. Because the traumas that cause comminuted fractures are often life-threatening accidents it’s tough to separate one from the other. Talk to your provider about your customized healing plan, and what to expect as you heal from your trauma.

## **Prevention**

Follow these steps to reduce your risk of injury throughout your daily routine:

* Always wear your seatbelt.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help you maintain good bone health.
* Talk to your provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

Because comminuted fractures happen suddenly, it’s often impossible to prevent them completely. You can’t predict when you’ll experience a trauma, so there isn’t anything you can do to prevent a comminuted fracture other than basic safety precautions. If you use a walker or a cane to help you walk, you should never walk without them and be very careful on uneven surfaces.

## **Living With**

If you think you have a comminuted fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body that you normally can.
* A part of your body is noticeably different looking or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

### **What questions should I ask my doctor?**

## Which bones are fractured?

Comminuted fractures most commonly occur in the long bones of the arms and legs, including:

* Femur (thigh bone)
* Tibia (shin bone)
* Fibula (calf bone)
* Humerus (upper arm bone)
* Radius and ulna (forearm bones)
* Clavicle (collarbone)
* Patella (kneecap)
* Less commonly, comminuted fractures can also affect the skull and other bones.  
  These fractures result from high-energy trauma such as car accidents, falls from heights, sports injuries, or gunshot

## 2. Which type of surgery will I need?

Surgery is typically required for comminuted fractures because the bone is broken into multiple fragments and needs precise realignment and stabilization. Common surgical procedures include:

* Open Reduction and Internal Fixation (ORIF): The surgeon makes an incision to access the fracture, realigns the bone fragments, and secures them with hardware such as rods, plates, screws, or pins. These implants usually remain in place permanently.
* External Fixation: In cases with severe soft tissue damage or when immediate internal fixation is not possible, an external frame stabilizes the bone fragments temporarily or definitively.
* Bone Grafting: May be performed if there is significant bone loss or to promote healing.  
  The exact type of surgery depends on the fracture location, severity, and associated injuries

## 3. Will I need follow-up operations?

* Follow-up surgeries may be necessary if complications arise, such as infection, nonunion (failure of bone healing), malunion (healing in a wrong position), or hardware problems.
* Sometimes, hardware removal is considered after healing if it causes discomfort or limits function.
* Regular follow-up visits with imaging are essential to monitor healing and address any issues promptly

**DOCTOR-PATIENT CONVERSATION**

Doctor: Hello, I’ve reviewed your X-rays and it shows you have a comminuted fracture. This means your bone has broken into three or more pieces.

Patient: That sounds serious. How did this happen?

Doctor: Comminuted fractures usually result from high-impact trauma, like a car accident or a severe fall. The force shatters the bone into multiple fragments, making the injury more complex.

Patient: What kind of treatment will I need?

Doctor: Because of the complexity, surgery is almost always necessary. We will perform an operation called open reduction and internal fixation, where we realign the bone fragments and secure them with metal plates, screws, or rods to hold everything in place while it heals.

Patient: Will I need more surgeries after that?

Doctor: Usually, one surgery is enough, but follow-up operations might be needed if there are complications like infection, delayed healing, or hardware issues. Sometimes, hardware removal is considered once the bone has healed.

Patient: How long will it take to recover?

Doctor: Recovery can take several months, often up to a year, depending on the severity of the fracture and if you have other injuries. Physical therapy will be important to regain strength and mobility.

Patient: What are the risks or complications I should be aware of?

Doctor: Potential complications include infection, delayed or improper healing, and stiffness. We’ll monitor you closely to manage these risks.

Patient: Is there anything I can do to help the healing process?

Doctor: Yes, following post-operative instructions carefully, attending physical therapy, maintaining good nutrition, and avoiding smoking will all help your recovery.

Patient: Thank you, doctor. This helps me understand what to expect.

Doctor: You’re welcome. We’ll support you throughout your treatment and recovery.

REFERENCES

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### **SEGMENTAL FRACTURE**

**DEFINITION AND DESCRIPTION**

Segmental fractures are a type of broken bone. They happen when one of your bones is broken in at least two places, leaving a segment of your bone totally separated by the breaks. These fractures can affect any long bone in your body. Some of the most common include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Humerus (upper arm).
* Radius and ulna (forearm).
* Clavicle (collarbone).

Segmental fractures are almost always caused by serious traumas like car accidents or falls from high places. They’re very serious, and you’ll likely need surgery to repair your bones. How long it takes to recover fully depends on which of your bones are fractured — and what caused the breaks. Most people need around a year to recover from a segmental fracture.

#### **Segmental fractures vs. comminuted fractures**

Segmental fractures and comminuted fractures are both serious types of bone fractures. They’re different terms that tell your healthcare provider specific details about how your bones are broken, where they broke and what they look like inside of your body right now.

Segmental fractures happen when your bone is broken in two different places and a section of your bone has separated from the rest of it because of the fracture. Comminuted fractures mean your bone is broken in three or more places. This means some segmental fractures can be comminuted, and some are not.

No matter which names and terms are applied to your fracture, the most important first step is getting your injury examined by a healthcare provider as soon as possible.

### **Who gets segmental fractures?**

Segmental fractures — like all bone fractures — can affect anyone. This is especially true because they’re caused by serious traumas. There’s no way to predict when or how someone will be in an accident, so everyone could experience a segmental fracture.

Segmental fractures are rare. This is because they’re caused by severe traumas that most people fortunately never experience.

## **Symptoms and Causes**

If you have a segmental fracture, you’ll also likely experience serious symptoms of the trauma that caused it. Your symptoms will depend on the other injuries you have. But in general, the symptoms of a segmental fracture can include:

* Intense pain.
* Not being able to move a part of your body that you normally can.
* A part of your body being noticeably different looking or out of its usual place.
* Seeing your bone through your skin.
* Swelling.
* Bruising.

#### **Open vs. closed fractures**

Your healthcare provider will classify your fracture as either open or closed. If you have an open fracture, your bone breaks through your skin. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone doesn’t push through your skin.

### **What causes segmental fractures?**

Segmental fractures are caused by trauma. Some of the most common causes are car accidents and falls from great heights, like off a ladder or roof.

Any impact to your bones can cause a segmental fracture. However, slips, falls and other common causes of broken bones aren’t usually strong enough damage to your bones to cause a segmental fracture.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a segmental fracture with a physical exam and imaging tests. In some cases, this may be done in the emergency room (ER) if you’re admitted after a trauma.

If you’re taken to an ER, a team of healthcare providers will work to stabilize you and treat your injuries in the order of severity, especially if some are life-threatening. After you’re stabilized, you’ll need imaging tests to confirm your fracture.

You’ll need at least one of a few imaging tests to take pictures of your fracture:

* **X-rays:** An X-ray will confirm any segmental or other fractures, and show how damaged your bones are.
* **Magnetic resonance imaging (MRI):** Your healthcare provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This’ll show them tissue around your bones, too. This is especially important to determine how your muscles, connective tissue and organs were affected by the trauma.
* **CT scan:** A CT scan will give your healthcare provider or surgeon a more detailed picture of your bones and the surrounding tissue than an X-ray.

## **Management and Treatment**

Almost all segmental fractures are treated with surgery. There are a few techniques used to repair segmental fractures, and which one your surgeon uses will depend on your injuries, which bone is fractured and any other complications after your trauma.

Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. Internal fixation techniques include:

* **Rods:** A rod inserted through the center of your bone that runs from top-to-bottom.
* **Plates and screws:** Metal plates screwed into your bone to hold them in place.
* **Pins and wires:** Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### **External fixation**

You might need an external fixation. This is often a temporary solution that stabilizes your fracture while your other injuries heal. Your surgeon will put screws on either side of the fracture inside your body, then connect them to a brace or bracket around your bone on the outside of your body.

Surgeons sometimes recommend external fixation as a first step before more invasive surgeries to fix your segmental fracture. If you have lots of other injuries, your body might need time to regain its strength to be able to tolerate internal fixation surgeries. Your surgeon might also use external fixation to stabilize your bone while they’re waiting for swelling inside your body to go down.

On their own, segmental fracture surgeries are outpatient procedures, which means you might be able to go home the same day. However, it’s likely the trauma that led to your segmental fracture caused other injuries that’ll require you to stay in the hospital to recover.

After your surgery, the part of your body with the fractured bone in it will be immobilized. Depending on where this is, you’ll need some combination of a brace, splint or cast before you can start putting any weight on it again or using it as you did before your injury.

### **What medications are used to treat segmental fractures?**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

#### **Complications of segmental fracture treatment**

Segmental fracture surgery complications include:

* **Acute compartment syndrome** (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.
* **Malunion**: This happens when your broken bones don’t line up correctly while they heal.
* **Nonunion**: Your bones may not grow back together fully or at all.
* **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin), you have an increased risk of bacterial infection.
* **Other internal damage**: Fractures can damage the area around your injury, including your muscles, nerves, blood vessels, tendons and ligaments.

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your segmental fracture — and which bones were broken — you should be able to start moving again in a few weeks.

If you experience intense pain that doesn’t get better, contact your healthcare provider.

## **Outlook / Prognosis**

If you have a segmental fracture, you’ll have a longer road to recovery than people who get other types of broken bones. It might take up to a year to heal, especially if you have other injuries from your original trauma.

You’ll need physical therapy to regain strength and range of motion in the part of your body that was injured. This therapy will be part of your larger recovery plan from other injuries.

Segmental fractures take longer to heal than other kinds of broken bones. They’re also much more likely to involve complications. You’ll likely need to work with healthcare providers at a trauma center or other specialized facility.

Most segmental fractures take around a year to heal. The exact time it takes your bone(s) to heal will depend on the severity of your fracture and if you develop any complications.

If you experience a trauma, you’ll likely need to miss work or school while you recover. Your specific injuries and which bones are fractured will impact how long you’ll need to miss work, school and other activities.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### **Outlook for a segmental fracture**

Segmental fractures are very serious injuries. If you experienced other injuries during the original trauma, your life might be impacted forever. Because the traumas that cause segmental fractures are often life-threatening accidents, it’s tough to separate one from the other. Talk to your healthcare provider about your customized healing plan, and what to expect as you heal from your trauma.

## **Prevention**

Follow these steps to reduce your risk of injury throughout your daily routine:

* Always wear your seatbelt.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help you maintain good bone health.
* Talk to your healthcare provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

Because segmental fractures happen suddenly, it’s often impossible to prevent them completely. You can’t predict when you’ll experience a trauma, so there isn’t anything you can do to prevent a segmental fracture.

## **Living With**

If you think you have a segmental fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

* Intense pain.
* You can’t move a part of your body that you normally can.
* A part of your body is noticeably different looking or out of its usual place.
* You can see your bone through your skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

### **What questions should I ask my doctor?**

**What causes segmental fractures?**

Segmental fractures are among the most prevalent kinds of high-energy trauma such as car accidents, falls from heights that are beyond the range of gravity, or sports injuries.

**How are segmental fractures diagnosed?**

The diagnostic process usually commences whereby a physical examination, X-rays, and advanced imaging such as a CT scan performed to determine the condition and the distinct location of the fractured segments.

**What are the treatment options for segmental fractures?**

Surgery might become treatment and it will be to put the segments of bones into proper alignment and then to stabilize them with plates, screws, or rods. For some other situations, traction devices or external fixators will be used.

**What is the recovery process for segmental fractures?**

How long the healing period differs from patient to patient is based on the condition of the break and the treatment type that the patient has been provided. Strength regrowth and, moreover, range of motion in the impaired limb is also achieved through physical therapy. Such review sessions and imaging might be required to determine the stage of the healing regime.

## **Doctor-Patient Conversation about a Segmental Fracture**

Doctor:

"Based on your X-rays and scans, you have a segmental fracture. This means your bone is broken in two separate places, creating a free segment between the breaks."

Patient:

"Is that serious? How did this happen?"

Doctor:

"Segmental fractures usually result from high-impact trauma, like a fall or a car accident. They are more complex than a simple fracture because the bone is broken in multiple places, which can make healing more challenging."

Patient:

"What kind of treatment will I need?"

Doctor:

"Treatment typically involves surgery to realign and stabilize the bone fragments using metal rods, plates, or screws. After surgery, you’ll need physical therapy and careful follow-up to ensure the bone heals properly."

Patient:

"How long will it take to heal?"

Doctor:

"Healing can take several months, often around six months or more, depending on the severity of the fracture and your overall health. We will monitor your progress with regular imaging and adjust your care as needed."

Patient:

"Are there any risks or complications I should be aware of?"

Doctor:

"Yes, segmental fractures carry a higher risk of delayed healing or nonunion, where the bone doesn’t heal as expected. There’s also a risk of infection, especially if the fracture was open. We’ll manage these risks closely throughout your recovery."

Patient:

"What can I do to help the healing process?"

Doctor:

"It’s important to follow your care plan strictly—this includes keeping weight off the injured limb as instructed, taking prescribed medications, attending all follow-up appointments, and doing physical therapy exercises. If you have any pain, swelling, or new symptoms, let us know immediately."

Patient:

"Will I be able to return to normal activities?"

Doctor:

"With proper treatment and rehabilitation, many patients regain good function. However, it may take time, and some limitations might persist depending on the injury’s severity. We’ll work together to maximize your recovery."

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### **AVULSION FRACTURE**

**DEFINITION AND DESCRIPTION**

An avulsion fracture is where a small piece of bone attached to a tendon or ligament gets pulled away from the main part of the bone. Ligaments hold your bones, joints and organs in place while tendons connect muscles and bones. In an avulsion fracture, your bone moves one way and your tendon or ligament moves in the opposite direction with a broken chunk of bone in tow. This most often happens when you suddenly change direction.

An avulsion fracture can happen to any bone that’s connected to a tendon or ligament. The bones that are most at-risk of an avulsion fracture include:

* Elbow bones.
* Ankle and foot bones.
* Knee bones.
* Finger and wrist bones.
* Pelvis and hip bones.
* Spine bones.

You might wonder if your injury is serious enough to go to the emergency department. It’s understandably difficult to figure out if your symptoms warrant urgent treatment. But any fracture is serious, including avulsion fractures. Take care of yourself by heading to the emergency department if you think you broke a bone. Professional medical treatment ensures that you'll heal safely and return to your regular routine.

People frequently incurring avulsion fractures are athletes and performers such as football players, ballet dancers, gymnasts and skiers. Their activities can involve a lot of sudden changes in direction, leaping and kicking.

However, avulsion fractures can occur in anyone, with injuries similar to sprains such as a twisted ankle.

Avulsion fractures are painful, and an inability to play your favorite sports or do another treasured activity can be painful as well. If you think you’re having issues with your mental or emotional health, let your healthcare provider know. Treatment can help you get through this difficult time.

## **Symptoms and Causes**

Playing sports comes with risks. Contact sports like lacrosse, boxing and football, for example, are the most common causes of avulsion fractures. It’s because contact sports involve movements that stress your limbs, such as:

* Suddenly changing direction.
* Sprinting.
* Kicking.
* Leaping.
* Falling on an outstretched hand.
* Suddenly accelerating (getting faster) or suddenly decelerating (going slower).
* Hitting, as in a boxer or a defensive lineman in a football game hitting an offensive lineman to protect the quarterback.
* Sliding, as in a baseball or softball player sliding into home base.

### **Symptoms of avulsion fractures**

After sudden, severe pain, the most common symptoms of avulsion fractures include:

* Bruising.
* Swelling.
* Muscle pain.
* A popping or cracking sound.
* Pain that spreads to nearby parts of your body.
* Limping or an inability to walk, if the broken bone is in or near your leg.
* Difficulty moving your limb.

Speak with your healthcare provider about all your symptoms. It’s helpful for them to know every detail. You can help them figure out the best treatment plan for you by providing as much information as possible.

## **Diagnosis and Tests**

Your healthcare providers at the emergency department will discuss your injury with you. They’ll ask you questions and perform tests to help diagnose your avulsion fracture. They'll look over the affected area and see if you can move your bones. After that, there might be imaging tests to get a closer look. Tests might include:

* X-rays to look at your bones and joints.
* Computed tomography (CT scan) to look at your soft tissues and organs and get a more precise view of your bones and joints. This is performed if X-rays are unclear.

Your healthcare providers in the emergency department should ask questions when you arrive. They want to fully understand what happened to you so that you receive the best care possible. Questions might include:

* When were you injured?
* How did you get injured?
* What are your symptoms?
* Did you hear something break?
* What medications do you take?

Tell your healthcare provider every detail. It might help with the diagnosis and treatment.

## **Management and Treatment**

Treatment depends on which bone broke and the type of avulsion fracture. Generally, treatment for an avulsion fracture includes:

* Immobilization in a cast or splint.
* Anti-inflammatory medications.
* Restriction of activity.
* Icing the area.
* Physical therapy with exercises.

After the pain subsides, your healthcare provider might recommend range-of-motion (ROM) exercises monitored by a physical therapist.

Surgery is occasionally required for severe injuries with joint instability.

### **How do bones heal?**

The stiff tissues that make up your bones begin to heal right after they break. That's why it's so important to immediately align and protect them (that's what a cast does). Your avulsion fracture should heal in just a couple of steps. The steps include:

* Your body creates a blood clot and callus around the fracture. A blood clot is a clump of blood that is more like a gel than a liquid. Firm collagen makes up a callus. The clot forms first, and then the callus replaces it. This protects the broken bones.
* Bone cells grow out of the bone that broke off and also from the main bone. The cells form “threads” that grow outward and towards each other like reaching hands. The threads absorb the callus. The chunk of bone that separated from the main bone gets reattached to its place.

### **Surgery for an avulsion fracture**

Most avulsion fractures don't require surgery. But suppose you have, for example, an injury where the bone attached to the tendon or ligament is more than 2 centimeters away from the main bone. Your surgeon should perform one of two procedures:

* **Open reduction:** The surgeon makes an incision (cut) in your body and then realigns your bones.
* **Internal fixation:** The surgeon uses metal hardware to align your bones permanently. Examples of hardware include pins, plates, screws and rods.

### **Will I be asleep during surgery?**

You may be asleep during your surgery. Your anesthesiologist will provide the most appropriate method such as general anesthesia or regional anesthesia such as an epidural. In either case, you won’t feel anything.

### **How long does it take to recover from avulsion fractures?**

You might need to wear a cast or splint for a few weeks. Fractures usually take about three to 12 weeks to heal completely.

For an avulsion fracture in your pelvis or anywhere else where your healthcare provider can’t apply a cast, a short period of rest followed by crutches is helpful. Your healthcare provider might allow you to apply weight after a few weeks and resume sports activities as tolerable.

Confirm with your healthcare provider about when you can return to sports. You could reinjure yourself if you go back too soon.

### **Do I need to follow up with a specialist?**

You may see an orthopedist after treatment at the emergency department. Orthopedists specialize in your skeletal and muscular system. Depending on your injury, you might need to go to an appointment as often as twice a week. Your orthopedist should monitor your healing and order more X-rays as needed.

## **Outlook / Prognosis**

Your avulsion fracture can get worse if you don’t follow your healthcare provider’s advice. Be very careful not to put weight on the fracture until your healthcare provider says it’s OK. You could reinjure yourself.

You could get another avulsion fracture in the same place. Take preventative steps to reduce your risk.

## **Prevention**

It’s difficult to prevent an avulsion fracture, but possible to reduce your risk. Athletes might reduce their risk of an avulsion fracture by taking some helpful steps, including:

* Take five to 10 minutes to stretch and warm up before you practice or play a game.
* Don’t push yourself to do something that might be too difficult for you. Being careful should help you avoid all types of injuries.

### **When should I see my healthcare provider?**

Go to the emergency department if you think you have a fracture. An avulsion fracture is a serious medical emergency that needs care.

**DIFFERENTIAL DIAGNOSIS**

* Simple dislocation
* Fracture with a different mechanism, not caused by avulsion or pull of soft tissue
* Hydroxyapatite deposition disease
* Accessory ossicles
* Apophysitis
* Posttraumatic or reactive bone lesions
* Chronic tendon abnormalities
* Exostosis
* Myositis ossificans
* Reactive bone lesion
* “Groin pull,” “torn hamstring” or “hip pointer,” muscle spasm, intra abdominal pathology, osteomyelitis, Ewing sarcoma
* Simple muscle strain, tendon tear, tendonitis
* Trochanteric bursitis, gluteus medius, and minimus tears, stress fractures, degenerative arthropathy, stress fracture, entrapment syndromes
* Jumper’s knee, Sinding-Larsen-Johansson syndrome, Osgood -Schlatter disease
* Sesamoid bones, cyamella, bipartite patella, synchondrosis, enthesopathy, benign avulsive cortical irregularity
* Compartment syndrome, hamstring syndrome, athletic pubalgia, Sever disease
* Pellegrini-Stieda lesion
* Os subfibulare
* Os trigonum, posterior ankle impingement

**EPIDEMIOLOGY**

Certain fracture types tend to be more common in adolescents, and tend to be associated with sports-related injuries. Adolescent avulsions most often involve a secondary apophysis, which is a growth plate that does not contribute to longitudinal growth and has been described as similar to a “transitional fracture” of the lower extremity.

Adults avulsion fractures, on the other hand, tend to have a higher association with traumatic injuries.

The true prevalence or incidence of many avulsion fractures is not known. Accurate incidence is difficult to know because most of the literature regarding avulsion fractures consists of case reports and case series. This is not only due to a lack of well-defined population-based cohort studies, but also the fact that many people who sustain these injuries may not seek treatment, and many of these injuries can be subtle or missed. Failure to diagnose subtle avulsion fractures is reported with polytrauma patients as well. Incidence is likely underestimated due to these factors.

Epidemiologic information varies entirely based on anatomic location and age. Avulsion fractures in certain anatomic areas can be quite common.Overall, the prevalence seems to be highest among adolescents. For example, a recent study found the incidence of Segond fractures in patients with anterior cruciate ligament (ACL) injury was 7.4% but stated the true rate might be as high as 15% due to a high incidence of healed Segond fractures that were also seen.Similarly, current literature shows an incidence of syndesmotic avulsion fracture injuries in 10% to 23% of all ankle fractures and up to 25.8% in ankle fractures that require surgery.

It is generally agreed that the prevalence may be increasing due to earlier and more frequent participation in sporting and other athletic activities in young people, with higher demands on growing body parts. Increasing awareness and better imaging techniques such as more widespread use of MRI could be other reasons for the perceived increase in the prevalence of avulsion fractures.

In pediatric and adolescent age groups, males are 3 to 5 times more likely than girls to sustain an avulsion fracture.

While the prevalence of avulsion fractures is difficult to know, avulsion fractures overall do have a very high prevalence of associated soft tissue injuries that occur in conjunction with them

### **What questions should I ask my healthcare provider about avulsion fractures?**

You might find yourself with questions about avulsion fractures and your specific situation. Asking questions can help you understand what happened to you and what happens next. You could ask some of the following questions when you see your healthcare providers:

**Do I need to see a physical therapist?**  
Yes, physical therapy is often recommended after the initial healing phase to restore strength, range of motion, proprioception, and function, especially if the fracture involved a joint or if you want to return to sports or high-level activities

**Do I need to see another type of specialist?**  
You may need to see an orthopaedist, who specializes in bones and musculoskeletal injuries, for diagnosis, treatment planning, and follow-up. If surgery is needed or if healing is complicated, an orthopaedic surgeon will be involved

**How long should I rest?**  
Rest is important during the acute phase, usually the first 2 to 6 weeks. This involves limiting weight-bearing and activity on the affected limb to allow the bone to heal

**How long do I have to wear a cast?**  
If a cast or walking boot is used, it is typically worn for about 4 to 6 weeks. Sometimes the boot is for comfort and protection rather than strictly for healing

**When can I start using crutches?**  
Crutches are usually used in the early stages after injury to reduce weight-bearing and are gradually discontinued as comfort and healing improve, often within 2 to 6 weeks

**When can I play sports again?**  
Return to sports depends on healing and rehabilitation progress. Generally, you can resume sports activities after about 6 to 12 weeks, but you should be guided by pain and your healthcare provider’s advice to avoid reinjury

**When can I ski again?**  
Skiing is a high-impact activity, so it is best to wait until full healing and strength recovery, often around 3 months or more, depending on your specific injury and rehabilitation progress

**When can I perform again?**  
If you mean performing in activities like dancing or stage performance, the timeline is similar to sports—generally after 6 to 12 weeks once strength, balance, and range of motion are restored. Follow your therapist’s guidance closely

**How long does an avulsion fracture take to heal?**

The recovery time for an avulsion fracture can be anywhere from 3 to 12 weeks. It depends on which bone is broken, whether you had to have surgery, and things such as your age and physical condition.

**How serious is an avulsion fracture?**

An avulsion fracture can be very serious. If you don't get treatment right away, or if you don't let it heal completely before you go back to your normal activities, you could have long-term pain, loss of function, and other complications. Some avulsion fractures need surgery.

**Can I walk on an avulsion fracture?**

If you have a fracture in your pelvis, leg, or foot, walking will be painful, if not impossible, at first. You may be on crutches for 1-2 weeks. But bearing weight helps bones heal, so your doctor will probably have you start walking as soon as it's safe.

## **Doctor-Patient Conversation: Avulsion Fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays, and it looks like you have an avulsion fracture. This means a small piece of bone has been pulled off by a tendon or ligament.”

Patient:  
“Oh, I didn’t realize that. How did this happen?”

Doctor:  
“Avulsion fractures usually happen when a sudden forceful muscle contraction or trauma pulls on the tendon or ligament attached to the bone, causing a small fragment to break away. It’s common in sports injuries or accidents.”

Patient:  
“What symptoms should I expect?”

Doctor:  
“You may feel localized pain, swelling, and tenderness at the injury site. Sometimes there’s bruising and difficulty moving the affected area, depending on the location.”

Patient:  
“How is it treated? Do I need surgery?”

Doctor:  
“Most avulsion fractures heal well with conservative treatment. This includes rest, ice, compression, and elevation (RICE), along with immobilization using a cast, brace, or sling to protect the area. Surgery is rarely needed unless the bone fragment is large or displaced.”

Patient:  
“How long will it take to heal?”

Doctor:  
“Healing usually takes about 4 to 8 weeks, but it depends on the bone involved and your overall health. We’ll monitor your progress with follow-up visits and possibly repeat imaging.”

Patient:  
“When can I start moving or using the injured part again?”

Doctor:  
“Initially, you’ll need to limit movement to allow healing. After a few weeks, we’ll gradually introduce gentle movement and physical therapy to restore strength and flexibility.”

Patient:  
“Will I be able to return to sports or my normal activities?”

Doctor:  
“Yes, most people return to their usual activities once fully healed. We’ll guide you on when it’s safe to resume sports to prevent reinjury.”

Patient:  
“Is there anything I can do to help the healing?”

Doctor:  
“Follow the treatment plan carefully, avoid putting weight or stress on the injured area, and attend all follow-up appointments. Proper nutrition, including adequate calcium and vitamin D, also supports bone healing.”

Patient:  
“Thank you, doctor. I feel better knowing what to expect.”

Doctor:  
“You’re welcome. If you notice increased pain, swelling, or any new symptoms, please contact me immediately. We’re here to help you recover fully.”

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**BUCKLE FRACTURE**

**DEFINITION AND DESCRIPTION**

Buckle fractures are a type of broken bone that almost always affects kids. They’re an incomplete fracture, which means the break doesn’t go all the way through the bone. You might see buckle fractures referred to as impacted fractures or torus fractures.

Buckle fractures get their name from how they happen. They’re a compression fracture, which means the break is caused by sudden pressure on a bone. This pressure — usually caused by a fall — pushes on your child’s bone hard enough to bulge it out of place. The pressure “buckles” the bone without snapping it. Picture crushing an aluminum soda can. Pressure forces the can to bulge and collapse in on itself, but it’s still in one piece.

Buckle fractures commonly affect the radius and ulna (the bones that connect your forearm to your wrist), but they can happen to any long bone. Other bones susceptible to buckle fractures include:

* Femur (thigh).
* Tibia (shin).
* Fibula (calf).
* Humerus (upper arm).

Buckle fractures are usually caused by kids falling onto their outstretched arms. They’re very common in children under 12 and can almost always be treated with a splint or cast. Your child will not need surgery, but they will need some form of protection while the bone heals.

#### **Buckle fractures vs. greenstick fractures**

Buckle fractures (also known as impacted fractures) and greenstick fractures are different types of incomplete bone fractures. They are different terms that tell your healthcare provider specific details about how your child’s bones are broken, where they broke and what they look like inside their body right now.

Buckle fractures happen when a bone is pressed to the point of bulging out of place. The fracture looks like a bump on a bone.

Greenstick fractures happen when a child’s bone is bent to the point that it cracks but doesn’t break all the way through. If you’ve ever tried to break a green or young stick with your hands, it cracks but doesn’t break cleanly like a dry twig would. That cracking without snapping completely is the difference between greenstick fractures and complete fractures.

Both buckle and greenstick fractures are much more common in children because kids’ bones are softer and more flexible than adults, more like plastic instead of glass or ceramic. That’s why they tend to bend and buckle rather than break.

No matter which names and terms end up applied to your child’s fracture, the most important first step is getting their injury examined by a healthcare provider as soon as possible.

#### **Buckle fractures in hands, fingers and thumbs**

Buckle fractures (impacted fractures) almost always affect longer bones in kids’ bodies. They don’t usually affect the small bones in the hands, fingers or thumbs. If your child experiences pain or other symptoms in their hands they might have a sprained or broken finger. Talk to your healthcare provider about any new symptoms.

Buckle fractures are very common with 1 in 4 kids who break a bone having a buckle fracture. Half of all pediatric broken wrists are buckle fractures.

### **Who gets buckle fractures?**

Buckle fractures (impacted fractures) almost always affect kids under 12. Kids have softer and more flexible bones than adults because their bodies are still growing and changing. Your bones naturally lose some of that flexibility as you get older. Because kids’ bones are softer than adults', they’re more likely to experience buckle fractures (and other incomplete breaks).

It’s still possible for adults to experience a buckle fracture, it’s just very rare. Adults can get buckle fractures in flat bones like their ribs. People with osteoporosis also have an increased risk for all types of broken bones, including buckle fractures.

## **Symptoms and Causes**

Symptoms of a buckle fracture (impacted fracture) include:

* Pain.
* Swelling.
* Tenderness.
* Bruising or discoloration.
* A deformity or bump that’s not usually on your child’s body.
* In young children, favoring one extremity over another (such as playing with toys with only one hand) or not wanting to use the injured body part (such as not moving a leg or wanting to walk) can sometimes be seen with an injured bone.

### **What causes buckle fractures?**

Buckle fractures are most commonly caused by kids catching themselves with outstretched arms after falling. The force of the fall compresses their bone and causes buckle fractures. This is why most buckle fractures (impacted fractures) affect kids’ forearm bones (their radius and ulna).

### **infectious/Environmental Causes**

While buckle fractures are primarily mechanical injuries resulting from trauma, certain environmental factors can contribute to the risk of fractures. For instance, engaging in high-impact sports or activities without proper protective gear can increase the likelihood of falls and injuries. However, there are no specific infectious agents associated with buckle fractures.

### **Genetic/Autoimmune Causes**

There are no known genetic or autoimmune causes specifically linked to buckle fractures. However, certain genetic conditions that affect bone density and strength, such as osteogenesis imperfecta, may predispose individuals to fractures in general. These conditions can make bones more fragile, increasing the risk of injuries like buckle fractures.

### **Lifestyle and Dietary Factors**

Lifestyle choices and dietary habits can influence bone health. A diet low in calcium and vitamin D can weaken bones, making them more susceptible to fractures. Regular physical activity is essential for maintaining bone strength, and a sedentary lifestyle can contribute to weaker bones. Additionally, excessive consumption of caffeine or alcohol may negatively impact bone density.

### **Key Risk Factors**

* **Age:** Buckle fractures are most common in children aged 5 to 10 years, as their bones are still developing.
* **Gender:** Boys are generally at a higher risk due to higher activity levels and participation in contact sports.
* **Geographic Location:** Areas with limited access to healthcare or where children engage in high-risk activities may see higher rates of buckle fractures.
* **Underlying Conditions:** Conditions that affect bone health, such as osteoporosis or certain metabolic disorders, can increase the risk of fractures.

### **Differential Diagnosis**

It is essential to differentiate buckle fractures from other types of injuries, such as:

* **Complete Fractures:** Where the bone is broken into two or more pieces.
* **Growth Plate Injuries:** Injuries that affect the growth plates in children, which can impact future bone growth.
* **Soft Tissue Injuries:** Such as sprains or strains that may present with similar symptoms.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a buckle fracture with a physical exam and imaging tests.

After a physical exam, your child will likely need an X-ray to confirm any buckle or other fractures and show how damaged their bones are.

## **Management and Treatment**

Buckle fractures (**also known as impacted fractures**) are usually treated with a splint. You might see this referred to as immobilization. In some cases, kids may need to wear a cast. Talk to your healthcare provider about which treatment is best for your child. These not only protect your child from reinjury but also can make them more comfortable and relieve their pain.

Most children need to wear a splint for two to three weeks. How long they need a splint depends on how long it takes for their symptoms to improve.

### **Non-Pharmacological Treatments**

* **Rest:** Encouraging rest and avoiding activities that may stress the injured area is crucial for recovery.
* **Physical Therapy:** Once the fracture has healed, physical therapy may be recommended to restore strength and mobility to the affected limb.
* **Dietary Changes:** Ensuring adequate intake of calcium and vitamin D can support bone health and aid in recovery.

### **Special Considerations for Different Populations**

* **Pediatric Patients:** Children typically heal faster than adults, and treatment focuses on ensuring proper bone alignment and minimizing discomfort.
* **Geriatric Patients:** Older adults may require more comprehensive management due to potential underlying conditions like osteoporosis, which can complicate healing.

### **What medications are used to treat buckle fractures?**

Over-the-counter NSAIDs like aspirin or ibuprofen are typically all you’ll need to reduce your child’s pain. Your healthcare provider will tell you which medications you can give your child while they heal.

Even if they’re not as severe as other types of fractures, never ignore symptoms like pain, swelling or tenderness. If your child has an untreated buckle fracture, they might face more serious complications later including:

* **Malunion**: This happens when broken bones don't line up correctly while they heal.
* **Nonunion**: Your child’s bones may not grow back together fully or at all.
* **Worsening symptoms**: If a buckle fracture isn’t treated by a healthcare provider, your child’s symptoms like pain can get worse over time. This will also make it take longer for them to heal.

#### **Complications of buckle fracture treatment**

Buckle fracture complications include:

* **Reinjury:** If your child resumes activities like sports too soon they can reinjure their bone or experience a more serious injury or fracture.
* **Other internal damage**: Fractures can damage the area around the injury including your muscles, nerves, blood vessels, tendons and ligaments.

Side effects of NSAIDs include:

* Bleeding.
* Ulcers.
* Stomach pain.
* Bowel complications.

### **How soon after treatment will my child feel better?**

Most kids feel better right away after they start using their splint, but it usually takes a few weeks for symptoms to improve completely. Immobilization will hold their bone in place and reduce their pain.

If your child is in intense pain that doesn’t get better contact your healthcare provider right away.

## **Outlook / Prognosis**

You should expect your child to make a full recovery. Buckle fractures are a temporary issue, and your child shouldn’t have any long-term consequences after a buckle fracture.

Buckle fractures (impacted fractures) heal very quickly, especially compared to other types of broken bones. Usually, kids only need to wear a splint for 2 to 3 weeks. If their symptoms like pain and tenderness go away, there’s usually no additional treatment or follow up needed.

Your child shouldn’t need to miss any school while they heal from their buckle fracture. They should avoid intense physical activities (like sports) for two weeks after their symptoms have completely gone away.

Most kids can resume all their sports and activities in a month. Your healthcare provider will tell you how long your child should avoid certain activities.

The outlook for buckle fractures is very positive. Your child should make a full recovery and have no long-lasting pain or other symptoms.

## **Prevention**

Follow these general safety tips to reduce your child’s risk of an injury:

* Always wear seatbelts.
* Wear the right protective equipment for all activities and sports.
* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Follow a diet and exercise plan that will help them maintain good bone health.

Buckle fractures are usually caused by falls or other accidents, so there’s not much you can do to prevent them.

Adults should talk to their provider about a bone density test if they’re older than 50 or if they have a family history of osteoporosis.

## **Living With**

If you think your child has a buckle fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if they experience any of the following:

* Intense pain.
* They can’t move a part of their body they usually can.
* A part of their body is noticeably different looking or out of its usual place.
* You can see their bone through their skin.
* Swelling.
* New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced trauma.

## **Epidemiology of Buckle (Torus) Fractures**

* Prevalence: Buckle fractures are among the most common fractures in children, especially in the distal radius (wrist area). They represent a large proportion of pediatric fractures presenting to emergency departments.
* Incidence: The estimated annual incidence of distal radius buckle fractures is approximately 17.3 per 100,000 people in the general population, with pediatric orthopedic surgeons treating up to 26.5% of such cases
* Age Group: These fractures predominantly occur in children aged 5 to 10 years, due to the elasticity and flexibility of their growing bones, which tend to buckle rather than break completely
* Gender: Boys are more commonly affected than girls, consistent with general fracture epidemiology in children
* Mechanism: Buckle fractures usually result from a fall onto an outstretched hand, causing axial loading that compresses the bone and causes the characteristic cortical buckling without full cortical disruption
* Sites: The distal radius metaphysis is the most frequent site, but buckle fractures can also occur in other long bones, though less commonly
* Treatment Trends: Recent studies and trials show a shift towards less rigid immobilization (e.g., soft bandages or splints) with early discharge and minimal follow-up, reflecting the benign nature and excellent prognosis of these fractures
* Impact of COVID-19: The pandemic influenced treatment patterns, with increased adherence to best practice guidelines emphasizing minimal immobilization and follow-up for buckle fractures

## 

## **Differential Diagnosis of Buckle (Torus) Fractures**

* Greenstick Fracture:
* Plastic Deformation:  
  .
* Salter-Harris Fractures:
* Other Incomplete Fractures:
* Underlying Bone Pathology:
* Non-accidental Injury:

### **What questions should I ask my doctor**

* **What is a buckle fracture?** A buckle fracture is an incomplete fracture commonly seen in children, where one side of the bone buckles or compresses without breaking completely. It usually occurs in the forearm and is less severe than complete fractures.
* **What causes a buckle fracture?** Buckle fractures are typically caused by falls or direct trauma to the bone. Children are particularly susceptible due to their active lifestyles and the flexibility of their developing bones.
* **What are the symptoms of a buckle fracture?** Common symptoms include localized pain, swelling, bruising, and limited mobility of the affected limb. If you notice severe pain or deformity, seek medical attention immediately.
* **How is a buckle fracture diagnosed?** Diagnosis involves a clinical evaluation, including patient history and physical examination, followed by imaging studies like X-rays to confirm the fracture.
* **What treatment options are available for buckle fractures?** Treatment typically involves immobilization with a splint or cast, pain management, and follow-up care to monitor healing. Physical therapy may be recommended after the fracture heals.
* **Can buckle fractures lead to complications?** If left untreated, buckle fractures can lead to delayed healing, recurrent fractures, or growth disturbances in children. However, with proper management, complications are rare.
* **How can buckle fractures be prevented?** Preventive measures include using protective gear during sports, ensuring safe play environments, promoting a healthy diet, and encouraging regular exercise to strengthen bones.
* **What is the recovery time for a buckle fracture?** Recovery time varies but is generally around 3 to 6 weeks for children, depending on the severity of the fracture and adherence to treatment.
* **When should I seek medical attention for a buckle fracture?** Seek immediate medical attention if you notice severe pain, deformity, numbness, or persistent swelling in the affected area.
* **Are there any long-term effects of a buckle fracture?** Most individuals recover fully from buckle fractures without long-term effects. However, factors like age, overall health, and adherence to treatment can influence recovery.

**DOCTOR PATIENT CONVERSATION**

Doctor:  
“Hello, I’ve looked at your child’s X-rays, and they have what’s called a buckle fracture of the wrist. This is a very common type of fracture in children.”

Parent/Patient:  
“What exactly is a buckle fracture?”

Doctor:  
“A buckle fracture happens when one side of the bone buckles or bulges due to pressure, but it doesn’t break all the way through. Children’s bones are softer and more flexible than adults’, so instead of a clean break, the bone bends and forms this kind of fracture.”

Parent/Patient:  
“Is it serious? Will it cause long-term problems?”

Doctor:  
“This type of fracture is not serious and usually heals very well without complications. It’s treated similarly to a sprain and doesn’t cause permanent deformity.”

Parent/Patient:  
“What treatment does my child need?”

Doctor:  
“Your child will need to wear a splint or soft brace for about 3 weeks to protect the wrist and keep it still. Unlike a hard cast, a splint can be removed for washing. It’s important to keep the fingers moving while in the splint to avoid stiffness.”

Parent/Patient:  
“How long before my child can go back to normal activities or sports?”

Doctor:  
“We recommend avoiding sports, rough play, and physical education for about 6 weeks to prevent further injury. After that, your child can gradually return to normal activities.”

Parent/Patient:  
“What about pain? How can I help with that?”

Doctor:  
“There may be some pain and swelling initially. You can give your child simple painkillers like paracetamol or ibuprofen to help. The pain usually settles within a few days.”

Parent/Patient:  
“Will we need to come back for follow-up visits?”

Doctor:  
“No routine follow-up is usually needed for buckle fractures because they heal so well. However, if your child still has significant pain or isn’t using their wrist normally after a few weeks, please contact the emergency department.”

Parent/Patient:  
“Thank you, doctor. That makes me feel better.”

Doctor:  
“You’re welcome. If you have any concerns or questions, don’t hesitate to reach out.”

This conversation reflects current best practices: explaining the nature of buckle fractures, reassuring about prognosis, emphasizing simple splint treatment, pain management, activity restrictions, and follow-up guidance.

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### **COMPOUND FRACTURE**

**DEFINITION AND DESCRIPTION**

A compound fracture is a break or crack in your bone that is visible through your skin. Generally, bones break as a result of force and/or trauma like a car crash. Fractures can also be caused by less traumatic but repeated force. For example, if a soldier frequently marches with a heavy pack on their back, the repeated force on their leg could cause a crack in their fibula.

What makes a fracture “compound” or “open” is when the broken bone pierces your skin. If you happen to fall from a ladder and land on your arm, breaking it, you’ll know it’s a compound fracture if you can see the bone. “Simple” or “closed” fractures don’t break through your skin.

Compound fractures are extremely painful. It may also be frightening to see your bone exposed. A fracture is a serious injury, and you should immediately go to the emergency department for help.

### **Which bones can fracture?**

Any bone in your body can break, but compound fractures most commonly occur in your limbs (arms, hands, legs and feet). Less commonly broken bones include:

* Ribs.
* Collar bone.
* Eye bones.
* Pelvis.
* Skull bones.
* Face bones.
* Spine or vertebrae.

## **Symptoms and Causes**

### **What causes compound fractures?**

Severe trauma causes compound fractures. Examples of events that can cause this type of severe trauma include a:

* Car crash.
* Fall from a significant height.
* Contact sport like football.

### **Symptoms of a compound fracture**

A broken bone is a compound fracture if it breaks through your skin. You can see the broken bone. Additional symptoms include:

* Severe, sharp pain.
* Tenderness to touch.
* Swelling.
* Bruising.
* Bleeding.
* Nerve damage, which may make the pain less or more severe than expected.

## **Diagnosis and Tests**

A compound/open fracture is more obvious to a healthcare provider than a simple/closed fracture because your bone has broken through your skin. The healthcare provider will do a physical examination and then order X-rays to see exactly how the bones are broken and how they need to be aligned. Sometimes healthcare providers require a more sensitive test, like an MRI (magnetic resonance images) or a CT scan (computed tomography) to fully assess the damage from the fracture.

Your healthcare provider will check for complications in addition to diagnosing the compound fracture itself. They’ll do the following:

* Check the color and temperature of your skin.
* Check your pulse and blood pressure to be sure there is no significant bleeding.
* Check for nerve damage by examining the area around and beyond your injury.

Compound fractures are obvious fractures. If you’re taken to the hospital by ambulance after the fracture, the healthcare providers in the ambulance will be able to diagnose it. Whether or not you need an ambulance, you should always go to the nearest emergency department where healthcare providers will diagnose the compound fracture and plan your treatment.

## **Management and Treatment**

When you get to the emergency department you’ll get one or more pain relief options, including:

* Multiple possible pain medications by mouth, or directly into a vein for faster relief.
* Nerve block. A nerve block is a numbing medicine that’s injected straight into the nerves around the area.

You might also get a tetanus vaccine and antibiotics, depending on what caused your injury and/or the location and severity of the fracture.

Treatment for your compound fracture is summed up by the acronym P.R.I.C.E.:

* **Protection:** Before you go to the hospital, you should cover the open fracture with a clean, wet towel to avoid getting dirt inside it. You should also avoid using any of the joints near the break unless absolutely necessary to get help.
* **Rest:** You’ll heal faster and be less likely to cause more injury if you rest the body parts.
* **Ice:** You should ice above and around the compound fracture as soon as the injury occurs, but be careful not to contaminate the actual wound.
* **Compression:** Your limb or other body part will be held in place for healing with a cast or other device.
* **Elevation:** Elevate (raise) the injury above your heart to reduce the swelling. You may need to wait until after being seen in the emergency department to do this, depending on where the broken bone is located. Check with your healthcare provider.

You’ll then need to see a surgeon, who will need to move each of the fractured bones back into a regular, more normal position. This is called reduction of the fracture. You’ll get pain relievers, sedatives and/or anesthesia before the procedure.

During surgery your bones may be aligned using hardware devices, including:

* Pins.
* Rods.
* Plates.
* Screws.

Your bones will then be immobilized in a cast or other device.

### **How do compound fractures heal?**

Your bones heal by creating new bone tissue. The new bone is called the external callus. This callus begins to form shortly after the bone is broken. At first it’s not like normal bone — it’s soft and does not provide any protection for the underlying break. But it grows stronger as it calcifies and develops into normal bones over weeks to months.

Compound fractures heal in three stages:

* Inflammation.
* Repair.
* Remodeling.

**Inflammation stage**: Your body starts to heal right after the fracture. The cells of your immune system rush to the injured area instantly. One of the things they do is increase blood flow to the area, and that can cause the skin around the compound fracture to swell and turn red. This swelling and redness can continue for some time as your body tries to ensure healing.

**Repair stage**: During this stage — which can last from weeks to months — your fractured bone will be kept still (immobilized) in a cast. It’s vital that your broken bones don’t move while they heal. Your body will create new bone tissue during this stage. The external callus (the new bone) can be easily damaged, so it needs protection.

**Remodeling stage**: The remodeling stage can take several months. During this time, the external callus gets stronger because it grows thicker and calcifies. As your bones remodel, they become a more normal shape and are less fragile.

### **Is a compound fracture curable?**

Compound fractures can often be fully repaired through surgical correction of the deformity, along with care for the broken bone and the wound that it caused.

### **Complications of a compound fracture**

Compound fractures are complicated injuries, but not all of them cause long-term complications aside from the actual broken bone. Your healthcare providers will check for them when you’re in the emergency department and in surgery, and also during your recovery process. Complications that may occur after a compound fracture include:

* **Skin damage:** The compound fracture injures your skin when it pierces it. Your skin will heal while the bones heal. Skin under the cast doesn’t require special treatment while the cast is on, but may need some care after the cast comes off.
* **Joint damage:** If your compound fracture is close to a joint, it can impact that joint’s ability to move properly. The break can damage the cartilage at the ends of your bones and joints can also become stiff when bones are immobilized. You will need to do physical therapy to get the joint moving properly and surgery is sometimes necessary to get the joint back to normal movement.
* **Nerve damage:** A compound fracture can crush, bruise, tear or stretch your nerves and it’s likely that you will have some mild nerve injury. These may completely heal, but it can take months (and sometimes years). Depending on the amount of damage, there are some nerve injuries that can’t heal, but these are less common than milder injuries.
* **Healing problems:** In some instances the bones don’t grow back together (nonunion). Sometimes they grow back slower than normal (delayed union) and sometimes they grow back in the wrong position (malunion). Your healthcare providers will take X-rays to check on how well you’re healing and let you know whether other treatment is necessary.
* **Uneven limbs:** Kids’ bones are still growing until their teen years. There are portions of the bones, near the ends, that are called growth plates. This is where kids’ bones get longer. If a growth plate in your child’s arm or leg is damaged, that bone may not grow normally and end up shorter than the other side. Your healthcare provider will tell if you if a growth plate has been damaged.
* **Shock:** You may lose a lot of blood when you experience a compound fracture, which can be very scary. The blood loss might be external or internal, meaning that you may see blood from the injury or you may just see swelling as the blood is trapped under the skin. Blood loss can drop your blood pressure suddenly and severely, sending you into shock.

More severe complications include:

* **Infection:** If you have a fever or there’s a strong smell coming from your cast, you might have an infection. You should treat any possible infection after a compound fracture like an emergency and get care immediately.
* **Pulmonary embolism:** A pulmonary embolism is a blood clot in a vein near the fracture area, which can travel to an artery in your lung, and block it. This happens most often after a compound fracture in the pelvis or hip. If you feel suddenly short of breath after a significant fracture you need to get treatment emergently because pulmonary embolism can be fatal.
* **Osteonecrosis:** Osteonecrosis is when your bone dies because of interrupted blood flow. If this happens, your provider will find it on X-ray and tell you how it needs to be treated.
* **Compartment syndrome:** Any significant swelling of muscle or other tissue around the bone can press against your blood vessels. This pressure can slow or stop the blood from flowing in and out of the area. Tissues get damaged or may die, which can lead to the need for amputation of the dead tissue. Infections can set in if you develop a compartment syndrome. This infection should be treated quickly and appropriately or they can be very dangerous and possibly even fatal. Always tell your healthcare provider if you see any unusual swelling or notice an unexpected loss of sensation — or anything that concerns you after treatment for a compound fracture.

**Compound Fracture Treatment: Drug Information and Their Side Effects**

Compound fractures (open fractures) require urgent and comprehensive treatment including surgery, antibiotics, pain management, and sometimes tetanus prophylaxis.

1. Antibiotics

Purpose:

Prevent or treat infection due to the open wound and contamination.

Early administration (ideally within 3 hours of injury) significantly reduces infection risk

Common Antibiotics Used:

First-generation cephalosporins (e.g., cefazolin, cefuroxime):

Coverage: Gram-positive bacteria including Staphylococcus aureus.

Side effects: Allergic reactions (rash, anaphylaxis), gastrointestinal upset, possible Clostridium difficile infection.

Aminoglycosides (e.g., gentamicin, tobramycin):

Added for severe contamination (Type III fractures) to cover Gram-negative bacteria.

Side effects: Nephrotoxicity (kidney damage), ototoxicity (hearing loss), neuromuscular blockade.

Penicillin or ampicillin:

Used for high risk of anaerobic infection (e.g., Clostridium perfringens in farm injuries).

Side effects: Allergic reactions, gastrointestinal upset.

Clindamycin:

Alternative for patients allergic to penicillin or cephalosporins.

Side effects: Diarrhea, risk of Clostridium difficile colitis.

Vancomycin or teicoplanin:

Used preoperatively in severe cases or MRSA coverage.

Side effects: Nephrotoxicity, “red man syndrome” (flushing), allergic reactions

Topical Antibiotics:

Aminoglycoside-eluting beads (e.g., tobramycin beads) may be placed in the wound to provide high local antibiotic concentrations with fewer systemic side effects.

## 2. Pain Management

### Non-opioid analgesics:

### Paracetamol (acetaminophen) for mild pain.

### NSAIDs (e.g., ibuprofen) are used cautiously as they may impair bone healing.

### Opioids:

### Morphine (IV or oral) for moderate to severe pain.

### Side effects: Respiratory depression, constipation, nausea, sedation, risk of dependence.

### Adjuncts:

### Nerve blocks or regional anesthesia may be used in some cases for pain control.

## 3. Tetanus Prophylaxis

### Given as vaccine or immunoglobulin depending on vaccination status and wound contamination.

## **Procedures for Compound Fracture Treatment**

## 1. Emergency Care and Initial Management

### Pain control: Administer analgesics immediately upon presentation.

### Tetanus prophylaxis: Given based on vaccination status and wound contamination.

### Intravenous antibiotics: Start as soon as possible (ideally within 60 minutes of hospital arrival) to reduce infection risk. Choice depends on fracture severity and contamination (e.g., first-generation cephalosporins for mild cases, plus aminoglycosides for severe contamination)

### Wound care: Cover the wound with sterile dressing to reduce contamination.

## 2. Surgical Intervention

### Debridement and irrigation: Surgical cleaning of the wound and removal of dead tissue, ideally within 24 hours rather than the previously recommended 6 hour

### Reduction: Realignment of bone fragments under anesthesia (closed or open reduction).

### Internal fixation: Stabilization using hardware such as plates, screws, rods, or pins to hold bone fragments in place

### External fixation: May be used temporarily in severe cases with soft tissue damage.

### Bone grafting: Used if there is bone loss or poor healing potential

### Soft tissue repair: Repair of damaged blood vessels and surrounding tissues during surgery.

## 3. Postoperative Care

### Immobilization with a cast, splint, or brace to protect the repair.

### Pain management with appropriate medications.

### Continued antibiotics typically for 24 to 72 hours after surgery depending on contamination severity

### Monitoring for infection and complications.

### **How long does it take to recover from a compound fracture?**

Compound fracture recovery time can be several to many months. It’s important to be patient during the healing time.

A number of factors affect how quickly you may recover from a compound fracture. Factors include:

* The severity of your injury.
* Your age. Children, for example, heal quicker than adults.
* Complications after treatment.
* Other health issues. If you have a disorder that interferes with blood flow, you may heal slower. Examples of such disorders include diabetes and peripheral arterial disease.

### **What happens if I don’t get treatment for a compound fracture?**

A compound fracture is a very serious injury. It’s not something you should ever try to fix on your own. See a healthcare provider at an emergency department as soon as possible for the best care. If you wait too long to get treatment then there’s a higher likelihood of complications.

## **Outlook / Prognosis**

This depends on the actual injury. After your compound fracture heals it will still be seen on X-rays, but you may not be able to tell just by looking at the area. The bone tissues often meld together pretty well. Your bones’ abilities to function should return to their normal usage like before your injury, depending on the severity of the break. You may need a lot of physical therapy to get back to your normal activities.

## **Prevention**

Accidents can happen to anyone. It’s scary to think you could break a bone by falling off a ladder, getting into a car crash or slipping on a wet floor. You can reduce your risk by taking simple precautions such as:

* Avoiding heights.
* Doing yoga or other exercises to improve strength and balance.
* Holding on to safety bars when you get in and out of the bathtub if you don’t have great balance.
* Driving safely and defensively.
* Not playing contact sports like football.
* Being careful if the ground is slippery, and wearing the proper shoes for the surfaces you’re walking on.
* Using a cane or walker if recommended by your healthcare provider.

## **Living With**

Taking proper care of the cast immobilizing your bones is vital for the healing process. Keep the following tips in mind for proper cast care:

* Don’t let your cast get wet unless your provider says it’s OK. If the cast isn’t waterproof, it’s difficult to get it dry again. A wet cast can lead to sores or infection, so use a plastic bag or waterproof cover made to protect casts. Sometimes the cast can fall apart — if this happens it should be replaced immediately.
* Check the skin around your cast often. If you see redness or drainage, or if your skin is sore, contact your healthcare provider.
* Keep the cast elevated above your heart if possible during the first 24 to 48 hours (one to two days). Put it on top of a pillow.
* The skin under your cast may itch. This is an uncomfortable sensation, but you have to leave it alone. Never insert anything into your cast to scratch the itch.
* Wiggle your toes or fingers if it’s safe to do so (check with your healthcare provider). This can help prevent swelling.
* Check the edges of the cast to see if they’re rough or sharp. If they are, use tape and gauze or another thin, soft material to prevent the rough or sharp edges from hurting your skin.:

You should never hesitate to go see a healthcare provider when there’s an emergency. If you have a cast on, you need to keep an eye out for the following symptoms:

* The cast causes numbness.
* The cast causes weakness.
* The cast causes continuous or worsening pain.
* The cast feels too tight.
* There’s a strong odor from the cast.
* You have a fever.

Go to the emergency room if you experience any of those symptoms.

## **Common Questions**

What is a compound fracture?  
A compound fracture is a broken bone that pierces through the skin, creating an open wound. This increases the risk of infection and requires urgent medical treatment.

2. How does a compound fracture happen?  
Usually from high-energy trauma such as car accidents, falls, or sports injuries where the bone breaks and punctures the skin.

3. What are the symptoms?

* Visible bone protruding through the skin or an open wound over the fracture site
* Severe pain, swelling, and bleeding
* Possible deformity or inability to move the affected limb

4. How is a compound fracture treated?

* Emergency care includes pain control, cleaning and covering the wound, and tetanus vaccination if needed.
* Immediate intravenous antibiotics to prevent infection.
* Surgery to clean (debride) the wound, realign the bone (reduction), and stabilize it with hardware (internal or external fixation).
* Follow-up care includes wound monitoring, antibiotics, immobilization, and physical therapy.

5. How long does it take to heal?  
Healing can take several months, often longer than closed fractures, due to the severity and infection risk. Typical bone healing phases last from weeks to months, followed by rehabilitation.

6. What are the risks or complications?

* Infection (including osteomyelitis)
* Delayed healing or nonunion
* Damage to blood vessels or nerves
* Scarring and soft tissue damage
* Possible need for multiple surgeries

7. Will I need surgery?  
Almost always, yes. Surgery is required to clean the wound and stabilize the bone to promote healing and prevent infection.

8. Can I prevent infection?  
Early antibiotic treatment, proper wound care, and surgical debridement significantly reduce infection risk.

9. What kind of pain management is used?  
Pain is managed with medications ranging from NSAIDs and acetaminophen to stronger opioids, depending on severity.

10. What is the prognosis?  
With prompt treatment, many patients recover well, but healing is slower and more complex than closed fractures. Long-term function depends on injury severity and rehabilitation.

### **Is it possible to leave a cast on too long?**

Yes, there are consequences if the immobilization lasts too long, including:

* Joint stiffness.
* Shortened muscles.
* Blood clots.

Be sure to clarify the length of immobilization with your healthcare provider. Attend all follow-up appointments when they’re scheduled.

### **Do I need to go to physical therapy?**

Your healthcare provider may want you to go to physical therapy during and/or after immobilization in a cast. Your therapist will help you with stretches and exercises to improve your:

* Strength.
* General functions.
* Range of motion.

### **How is a cast applied?**

Once your bones are lined up correctly, your healthcare provider will wrap the area in cloth and cotton material to protect your skin. Next, they’ll wrap your injury in bandages that are wet with plaster or fiberglass strips. The bandages and strips will harden when they dry.

## **Epidemiology of Compound (Open) Fractures**

Incidence: Compound fractures account for approximately 5% to 10% of all fractures seen in clinical practice[7](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/open-fracture).

Demographics:

More common in males than females, with a ratio of about 7:3

Mean age varies by gender, approximately 40.8 years in males and 56 years in females

Causes:

The leading cause is traffic accidents, including car and motorcycle crashes, accounting for 33% to 88% of open fractures in various studies

Other causes include falls, sports injuries, and industrial accidents.

Patient Profile:

In one study of 124 patients with open fractures, 88% were men, with a mean age of 43 years (range 18–101 years)

The most affected age group in absolute numbers was 51 to 60 years old

Socioeconomic factors such as lower education and non-white ethnicity were noted in some populations.

Anatomical Distribution:

Lower extremity fractures, especially tibia fractures, are common sites for compound fractures

Upper extremity and spinal fractures also occur but less frequently.

Complications:

Compound fractures have a high risk of infection, with some reports indicating infection rates up to 90% in certain populations

Other complications include delayed healing, nonunion, and malunion.

Trends:

Road traffic accidents remain a major cause of compound fractures worldwide, especially in urban populations

Surgical intervention is required in the majority of cases (e.g., 69% in tibia fractures)

## **Doctor-Patient Conversation: Compound Fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays and examined your injury. You have a compound fracture, which means your bone has broken and pierced through the skin, creating an open wound.”

Patient:  
“That sounds serious. What does this mean for me?”

Doctor:  
“It is a serious injury because the open wound increases the risk of infection and requires urgent treatment. But with prompt care, we can manage it effectively.”

Patient:  
“What kind of treatment will I need?”

Doctor:  
“We will start by giving you antibiotics right away to prevent infection. You’ll also receive a tetanus shot if needed. Then, you’ll have surgery to clean the wound thoroughly, remove any debris, and fix the broken bone with hardware like plates or rods.”

Patient:  
“How long will the surgery take? Will I be in the hospital long?”

Doctor:  
“The surgery usually takes a couple of hours. Afterward, you’ll stay in the hospital for monitoring, especially to watch for signs of infection. The length of stay depends on how severe the injury is and how well you heal.”

Patient:  
“What about pain? Will it be very painful?”

Doctor:  
“We’ll manage your pain with medications. Initially, you may need stronger painkillers, but we’ll adjust as you recover.”

Patient:  
“How long will it take to heal? Will I be able to use my limb again?”

Doctor:  
“Compound fractures take longer to heal than simple fractures because of the wound and infection risk. Healing can take several months, and you’ll need physical therapy to regain strength and function. Most patients recover well with proper treatment and rehab.”

Patient:  
“Are there risks or complications I should know about?”

Doctor:  
“Yes, infection is the biggest risk, which is why early antibiotics and surgery are critical. Other risks include delayed healing or the need for additional surgeries. We’ll monitor you closely to catch any problems early.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Follow all treatment instructions carefully, keep the wound clean, attend all follow-up appointments, and do the physical therapy exercises when you start them. Also, avoid smoking as it can slow healing.”

Patient:  
“Thank you, doctor. I’m glad to know what to expect.”

Doctor:  
“You’re welcome. We’ll work together to get you through this and back to your normal activities as soon as possible. If you have any concerns or new symptoms, please contact us immediately.”

References

<https://my.clevelandclinic.org/health/diseases/21843-compound-fracture>

<https://emedicine.medscape.com/article/1270717-treatment>

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# **Closed Fracture**

## **Disease description/overview**

A closed fracture is a broken bone that does not penetrate the skin. This is an important distinction because when a broken bone penetrates the skin (an open fracture), urgent treatment is needed, and an operation is often required to clean the area of the fracture.

Closed fractures may still require surgery for proper treatment, but surgery is often not as urgent and can be performed in the days or weeks following the injury. Whether the fracture is closed or open, if you suspect you have a fracture, seek medical care.

This article will explain the signs and symptoms of a closed fracture, describe several types, and address diagnostic and treatment options.

## **Signs of a Closed Fracture**

There are several signs and symptoms that you might have a closed fracture. Signs of a fracture include:

· Swelling

· Pain

· Bruising

· Deformity

· Lack of movement

Generally, there is pain around the injury, and you may be unable to move the affected area. The injury may also appear crooked and out of place. If the skin is broken over the injury, the fracture may be an open fracture, which carries a greater risk of infection

## **Causes of Closed Fractures**

Closed fractures can occur from a variety of different causes. The main causes are trauma, overuse injuries, osteoporosis, and pathological fractures.3

### **Trauma**

Fractures most often occur due to trauma or injury to the bone, such as a fall, motor vehicle collision, or sports injury.

### **Overuse**

Fractures can also occur as a result of overuse. Overuse fractures are also known as stress fractures and occur due to excessive, repetitive use of the bone. They are common in athletes.

### **Osteoporosis**

Osteoporosis weakens bones. Individuals with osteoporosis are more likely to experience a fragility fracture or an insufficiency fracture. A fragility fracture occurs with a low-impact activity that would typically not induce a fracture. An insufficiency fracture is a type of stress fracture.

## **Pathological**

Weakening of the bone from various illnesses and disease states can cause fractures. These types of injuries are called pathologic fractures and typically result in a closed fracture pattern. Pathologic fractures occur when a bone weakens, typically from tumors or various cancers.

## **Types of Closed Fractures**

There are several different types of fractures that can cause a closed fracture. The type of closed fracture you experience significantly affects how the fracture is treated. The types of closed fractures include:

**Stable:** The bones are barely out of place in a stable fracture.

**Transverse:** In a transverse fracture, there's a horizontal fracture line.

**Oblique:** In an oblique fracture, there's an angled fracture line.

**Comminuted:** In a comminuted fracture, the bone is shattered in several places.

Fracture types can be mixed. For example, you might have a stable transverse or oblique fracture.

You may also hear your healthcare provider use the terms "displaced" and "non-displaced" fracture. A displaced fracture means the bones are out of alignment. This type of fracture is more likely to require surgery. In a non-displaced fracture, the broken bones remain aligned. This type of injury is more likely to recover with a cast and immobilization and less likely to require surgery.

## **Locations of Closed Fractures**

Fractures can happen throughout the body. Common locations of fractures can include bones of the wrist, hips, ankles, spine, and clavicle (collarbone).

### **Broken Wrist**

A wrist fracture is one of the most common fractures in the United States.Closed wrist fractures can often be treated with a cast to hold the healing bones in the proper position. More severe wrist fractures may require surgery, even when the injury is closed. In these cases, pins, plates, and screws are commonly used for treatment.

### **Hip Fracture**

A broken hip is usually a closed fracture and is common in individuals aged 80 and older. These are often closed fractures, as open hip fractures are exceedingly rare injuries. In older patients, osteoporosis causes hip fractures. Trauma, such as from a car accident, is usually the cause of hip fractures in other populations. Despite being a closed fracture, broken hips almost always require surgical treatment.

### **Ankle Fracture**

Stress fractures are one of the more common ankle fracture types. Runners and athletes involved in sports that involve a lot of running (e.g., soccer and basketball) are especially susceptible to stress-related ankle fractures.

Trauma, such as from a car crash or fall, is another cause of ankle fractures. Other causes include twisting or rolling the ankle. Surgery may be needed depending on the type and severity of the injury.

### **Vertebral Compression Fracture**

The spinal column is made of vertebrae stacked up upon each other. Osteoporosis can weaken the bones in the spinal column. Spinal compression fractures are most common in older individuals and often occur with relatively minor injuries or even no known injury at all. They are one of the most common complications of osteoporosis. Healthcare providers typically suggest nonsurgical treatments first before considering surgical intervention.

### **Clavicle Fracture**

Clavicle fractures are another common fracture type. They occur in all age groups. In kids and adults, clavicle fractures are typically the result of a fall or accident. In babies, clavicle fractures can happen during childbirth. Most clavicle fractures can heal without surgery unless the bones have significantly shifted.

## **When to see an orthopaedic?**

* **Moderate to severe pain** at the site of injury, especially if it persists or worsens.
* **Swelling**, **bruising**, or discoloration around the injured area.
* **Inability to move or use the affected limb normally**, or if movement causes significant pain.
* **Deformity** if the limb looks bent, distorted, or out of place.
* **Weakness** or **immobility** in the injured part.
* **Numbness** or abnormal sensations, which may indicate nerve involvement.
* **Symptoms that do not improve** or mild pain that persists beyond a few hours after injury

## **Diagnosing a Closed Fracture**

A healthcare provider will do a physical exam and also likely order X-rays to diagnose a fracture. If a healthcare provider suspects a fracture but does not see one on an X-ray, they may order additional imaging, such as an MRI or CT scan.

A CT scan can provide more detailed pictures than an X-ray and may pick up small fractures more easily.

An MRI can show changes to the soft tissues as well as injury within the bone. Sometimes very small fractures do not show up on X-rays until the injury begins to heal. MRIs can show injury to surrounding structures that indicate there's a fracture, even if it is not easily detectable on an X-ray.

If a healthcare provider is concerned about additional injuries, such as blood vessel or nerve damage or an infection, they may order additional tests. Angiography is imaging, such as an X-ray or a CT scan, that is done after a contrast dye is injected. Angiography can show damage to blood vessels from a fracture.

A healthcare provider may order nerve conduction tests to assess for damage to nerves from a fracture.

## **Differential diagnosis**

## Differential Diagnoses for Closed Fractures:

* Soft tissue injuries:
  + Muscle contusion
  + Muscle strain
  + Ligament sprain or tear
  + Hematoma formation
* Joint injuries:
  + Dislocations (e.g., hip dislocation mimicking femur fracture)
  + Subluxations
* Stress injuries:
  + Stress fractures (hairline fractures often missed initially)
  + Bone bruises
* Bone conditions:
  + Osteomyelitis (bone infection) presenting with pain and swelling
  + Bone tumors or cysts causing pathological fractures
  + Avascular necrosis (e.g., femoral head avascular necrosis mimicking hip fracture)
* Compartment syndrome:
  + Can occur after trauma and mimic severe injury symptoms

## Specific Examples from Common Fracture Sites:

## Femur and Hip Region

* Femoral neck fracture vs. femoral head avascular necrosis
* Femoral neck stress fracture
* Hip dislocation
* Muscle contusion or strain around the hip
* Chronic exertional compartment syndrome in the thigh

## Wrist (e.g., Colles Fracture)

* Scaphoid fracture
* Ulnar styloid fracture
* Triangular fibrocartilage complex (TFCC) injury
* Carpal ligament injuries (scapholunate or lunotriquetral ligament tears)
* Carpal tunnel syndrome
* Complex regional pain syndrome (CRPS)

## Forearm

* Galeazzi fracture (distal radius fracture with distal radioulnar joint disruption)
* Other distal radius fractures (Smith fracture, Barton fracture)

## **Treating a Closed Fracture**

Fracture treatment is highly dependent on several different factors. Factors such as patient age, patient preference, and surgeon preference play a role. Some of the treatments used for closed fractures include:

· **Immobilization Without a Cast**: Not every fracture requires significant intervention. Some broken bones are stable injuries that can be managed without a cast or surgery. Durable medical equipment such as a boot, sling, or simply taping (e.g., buddy taping a broken toe to the toe next to it) might be enough.

· **Cast Immobilization**: Casts are often used to treat many types of fractures. They help hold bones in proper alignment and protect the healing bone. Casts are used when bone immobilization is needed for several weeks.

· **Functional Cast**: A functional cast is a special cast that immobilizes the injury while still allowing joint movement of nearby joints.

· **Internal Fixation**: Internal fixation is a surgical procedure used to realign broken bones and then hold the healing bones in position with metal plates, pins, rods, or screws.

· **External Fixation**: External fixation holds bones securely with metal screws or plates above and below the fracture. External fixation is used in situations where surgery is not an option

· **Pain management** through over-the-counter medications when necessary.

· In some cases, **physical therapy** may be recommended after the bone begins to heal to restore strength and mobility

## **Prognosis, Risk Factors, Complications, and Prevention of Closed Fractures**

### **Prognosis**

· **Generally favorable** if properly diagnosed and treated.

· Healing time varies by **fracture location, severity, patient age, and overall health**, typically ranging from 6 to 12 weeks.

· Most closed fractures heal without significant long-term disability when immobilized and managed appropriately.

· **Good prognosis** is associated with:

· Proper alignment and stabilization of the fracture.

· Adequate blood supply to the fractured bone.

· Absence of infection or other complications.

· **Poor prognosis** may result from:

· Delayed or inadequate treatment.

· Complex fractures involving joints.

· Underlying bone diseases (e.g., osteoporosis).

· Poor patient compliance with immobilization or rehabilitation.

### **Risk Factors**

· **Age:** Older adults, especially postmenopausal women, have increased risk due to osteoporosis.

· **Bone health:** Osteopenia, osteoporosis, or other metabolic bone diseases.

· **Trauma:** Falls, sports injuries, motor vehicle accidents.

· **Lifestyle factors:** Sedentary lifestyle, smoking, excessive alcohol use, poor nutrition (low calcium and vitamin D).

· **Medical conditions:** Diabetes, rheumatoid arthritis, cancer metastases to bone.

· **Medications:** Long-term corticosteroid use can weaken bones.

· **Genetics:** Family history of fractures or bone disorders.

### **Complications**

· **Delayed union or non-union:** Fracture fails to heal in expected time.

· **Malunion:** Healing with bone deformity or improper alignment.

· **Joint stiffness and decreased mobility:** Especially if fracture involves or is near a joint.

· **Muscle atrophy and weakness:** Due to immobilization.

· **Compartment syndrome:** Though more common in open fractures, can occur in closed fractures causing increased pressure in muscle compartments.

· **Deep vein thrombosis (DVT):** Due to immobilization.

· **Post-traumatic arthritis:** If fracture involves joint surfaces.

· **Infection:** Rare in closed fractures but possible if skin integrity is compromised during treatment.

Prevention

· **Fall prevention:** Especially in elderly—home safety modifications, balance training, and physical therapy.

· **Bone health optimization:**

· Adequate intake of calcium and vitamin D.

· Weight-bearing and muscle-strengthening exercises.

· Avoidance of smoking and excessive alcohol.

· **Management of underlying conditions:** Osteoporosis screening and treatment.

· **Protective gear:** Use of helmets, pads, and appropriate footwear during sports or high-risk activities.

· **Medication review:** Minimize use of drugs that weaken bones when possible.

**Epidemiology of Closed Fractures**

* Incidence and Prevalence:  
  Closed fractures are common injuries worldwide, with millions occurring annually. A large retrospective study of adult fractures over 5 years found that among 5324 patients with fractures, the most frequent fracture sites were the hand (19.6%), distal forearm (12.1%), and foot (11.8%). Globally, there were approximately 178 million new fractures in 2019, with a notable increase over the past decades due to aging populations and other factors.
* Age and Gender Distribution:  
  Fracture incidence increases with age, especially in older adults due to osteoporosis and falls. For example, the mean age of fracture patients in one large study was about 58 years, and about 64.5% of fractures occurred in women, reflecting higher osteoporosis rates among females. Incidence peaks in the elderly, with very high rates in those aged 95 and above. Some fractures, such as distal radius fractures, are common across all adult age groups.
* Common Fracture Sites:  
  The most common closed fractures include:
  + Distal radius (wrist)
  + Proximal femur (hip)
  + Ankle
  + Proximal humerus
  + Metacarpal bones  
    These five sites account for over 50% of adult fractures. Lower leg fractures (patella, tibia, fibula, ankle) are also among the most frequent and burdensome fractures globally.
* Mechanism and Seasonal Variation:  
  Fractures commonly result from falls, traffic accidents, or sports injuries. Some studies note seasonal variation, with higher fracture rates in winter and fall, possibly due to slippery conditions and reduced daylight.
* Treatment and Outcomes:  
  About half of fractures are treated non-surgically, and the other half surgically, depending on fracture type and severity. Mortality related to fractures is low overall (~0.4%) but higher in elderly patients with hip fractures.
* Trends:  
  Despite increasing absolute numbers of fractures due to population growth and aging, age-standardized fracture rates have decreased slightly in some regions, likely reflecting improved prevention and treatment

**Doctor-patient conversation about a closed fracture**

Doctor:  
“Thank you for coming in. Based on your exam and the X-rays, you have a closed fracture, which means the bone is broken but the skin over it is intact. This is good because it lowers the risk of infection.”

Patient:  
“What does this mean for me? How serious is it?”

Doctor:  
“The severity depends on the bone involved and the type of fracture. Your fracture is [describe type, e.g., a simple transverse fracture of the distal radius], which is common and usually heals well with proper treatment. We’ll make sure it heals correctly to restore function and reduce pain.”

Patient:  
“What are my treatment options?”

Doctor:  
“For most closed fractures like yours, treatment includes:

* Immobilization with a cast or splint to keep the bone stable while it heals.
* Pain management with medications as needed.
* Sometimes, if the fracture is displaced or unstable, we might need to realign the bone or perform surgery to fix it with plates, screws, or rods.”

Patient:  
“How long will it take to heal? Will I be able to use my arm normally again?”

Doctor:  
“Bone healing usually takes about 6 to 8 weeks, but it can vary. During this time, you’ll need to keep the limb immobilized and avoid putting stress on it. After the cast comes off, physical therapy may help restore strength and mobility. Most people regain full function, but it depends on the injury and your overall health.”

Patient:  
“What signs should I watch for that might mean something’s wrong?”

Doctor:  
“If you notice increasing pain, swelling, numbness, tingling, changes in skin color, or inability to move fingers or toes, please contact us immediately. These could be signs of complications like poor blood flow or nerve injury.”

Patient:  
“Will I be able to work or do my daily activities while healing?”

Doctor:  
“This depends on your job and the fracture location. You may need to take some time off or modify activities to avoid strain. We can discuss a plan that fits your situation.”

Patient:  
“Is there anything I can do to help the healing process?”

Doctor:  
“Eating a balanced diet rich in calcium and vitamin D, avoiding smoking, and following your treatment plan will support healing. Also, attend all follow-up appointments so we can monitor progress.”

Patient:  
“Thank you. I feel better knowing what to expect.”

Doctor:  
“You’re welcome. We’re here to support you through your recovery. Please call us if you have any questions or concerns.”

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<https://www.who.int/news-room/fact-sheets/detail/fragility-fractures>

# **Colles fracture**

A Colles fracture is a type of broken wrist (fracture). It’s also called a distal (away from the center of the body) fracture with dorsal angulation (an upward angle). A Colles fracture is a very painful and serious injury. Go to your nearest emergency department if you suspect you have any type of wrist fracture.

Colles fractures usually occur after a fall on an outstretched hand. When you reach your hand out to catch yourself in a fall, you might land on the small bones that make up your hand and wrist — especially two bones called the lunate and scaphoid. This contact transfers energy to your radius, one of your two arm bones. The end of the radius near your wrist, called the dorsal end, breaks. This fracture, which typically happens about an inch away from the end of your radius, causes the broken bone to tilt upward.

### **Who gets a Colles fracture?**

Women aged 60 and older with osteoporosis are most likely to get a Colles fracture from a fall. Osteoporosis is a disease that weakens your bones. You might have osteoporosis and not know it, because the disease is often painless. Speak with your healthcare provider about treatments and prevention for osteoporosis.

Other people of all ages might get a Colles fracture not only from a fall but also from trauma sustained from a car crash, skiing, skating, horseback riding, bike riding or contact sports. Take some precautions to protect your wrists, such as wearing a wrist guard.

Colles fractures are very common: They are among the most common breaks that healthcare providers encounter. The radius is the most commonly broken arm bone.

### **Colles fracture and a Smith fracture**

A Smith fracture is a reverse Colles fracture. This type of broken wrist has volar angulation (angled to the side) instead of dorsal angulation (angled upwards).

### **Is a Colles fracture associated with osteoporosis?**

You’re more prone to a Colles fracture if you have osteoporosis. If you break your wrist, it might be a sign that you have osteoporosis. Talk to your healthcare provider about whether or not osteoporosis testing is right for you. Treatments can help.

## **Symptoms and Causes**

You might get a Colles fracture if you stretch out your hand to catch yourself in a fall. It can also happen if you experience trauma like a car accident.

A physical trauma might cause mental or emotional trauma as well. Talk with your healthcare provider about any mental or emotional issues — help is available.

### **What are the symptoms of a Colles fracture?**

Breaking your wrist will cause you a great deal of pain and other symptoms, including:

· Bruising.

· Swelling.

· Your wrist might hang at an odd angle.

· Decreased range of motion (you can’t rotate your wrist as far as usual).

### **How does a Colles fracture look and feel?**

When you break your wrist, you’ll feel pain and might notice swelling and bruising. Your wrist might also look bent in an unusual way.

### **Complications of a Colles fracture**

Wrist stiffness is the most common complication. It should get better after your cast has been off for one to two months. Other complications include:

· **Compartment syndrome** is a painful condition where there’s too much pressure in and around your muscles.

· **Malunion** is where the bones fail to fuse (come together).

· **Median nerve palsy** is where the muscles in your hand get paralyzed, and you can no longer flex your thumb or touch it to your fingers.

· **Carpal tunnel syndrome**, which is a compression of the nerves in your wrist. Symptoms include pain, numbness and weakness in your wrist and hand.

· **Reflex sympathetic dystrophy** causes burning pain in your arms, legs, hands or feet.

· **Secondary osteoarthritis** might develop in your wrist. Symptoms include pain and swelling of a deformed joint.

· **EPL** (the extensor pollicis longus) **tendon tear**. The EPL tendon stops your thumb from falling against your palm.

## **Diagnosis and Tests**

Your healthcare providers at the emergency department will take X-rays of your wrist. The X-rays will show any broken bones.

### **What questions might a healthcare provider ask to assess your injury?**

Your healthcare providers will talk to you to get more information about the nature of your injury. They might ask questions like:

· Where is your pain?

· What does your pain feel like?

· How did you injure your wrist?

· What are your symptoms?

· What medications are you on?

· Have you taken any medications yet for the pain?

## **Management and Treatment**

After diagnosis, your healthcare provider should realign and immobilize your broken bones. They’ll move (reset) the broken bones back into their natural positions and use a cast, brace or splint to hold them in place. The plaster cast starts below your elbow and extends to the middle of your fingers. It’s important to keep your cast dry.

You might need surgery if your bones are too out of place. In this procedure, your orthopaedic surgeon moves the bones into the correct position and then uses one or more of the following to keep the bones in place:

· Metal pins.

· Plates.

· Screws.

· An external fixator (a stabilizing frame that’s outside of your body).

Your orthopaedic surgeon will then wrap your arm in a cast.

### **Are there any at-home treatments for a Colles fracture?**

You should go to the emergency department if you think you’ve broken your wrist. You can’t treat a wrist injury like a Colles fracture at home.

### **Do I need to see a specialist?**

After you visit the emergency department, you'll need to follow up with an orthopaedist. An orthopaedist is a healthcare provider who specializes in your bones, ligaments, joints, muscles and tendons. They’ll take more X-rays as necessary and monitor your healing. Report any symptoms so that you get the best treatment.

### **How long does it take for a Colles fracture to heal?**

You’ll wear a cast for about six weeks. Healing time varies from individual to individual; it's a shorter time for some patients and a longer time for others. It might be a year before your wrist is completely back to the way it was before the fracture.

You might be able to swim and exercise your lower body about one to two months after your healthcare provider removes your cast. Your provider might recommend waiting three to six months before you do anything vigorous like football or skiing.

### **Can a Colles fracture heal on its own?**

A Colles fracture can’t heal correctly without treatment. The bones need realignment and immobilization so that they can heal properly. See a healthcare provider if you suspect that your wrist is broken.

**Differential Diagnosis**

The differential diagnosis for Colles fractures includes other types of distal radius fractures, as well as other forearm fractures, each of which can be differentiated with radiographic imaging.

**Smith fracture:** Often referred to as a “reverse Colles,” the Smith fracture involves volar (rather than dorsal) angulation of the distal radial fragment and is usually caused by a FOOSH in supination rather than in pronation.

**Barton fracture:** A Barton fracture is another type of distal radius fracture that involves the dorsal rim of the distal radius, in which an oblique intra-articular fracture occurs.

**Hutchinson or Chauffeur fracture:** Intra-articular radial styloid fractures are also known as Hutchinson or Chauffeur fractures and usually present as oblique or transverse fractures to the radial styloid caused by direct trauma.

**Galeazzi fracture:** Fracture of the medial or distal radius with associated dislocations of the distal radioulnar joint.

**Monteggia fracture:** Ulnar shaft fracture with associated radial head dislocation.

**Essex Lopresti lesion:** This is a rare combination of Galeazzi and Monteggia fractures involving a radial head fracture at the elbow with associated DRUJ disruption at the wrist and interosseous membrane disruption throughout the forearm.

## **Outlook / Prognosis**

You’ll likely return to your regular activities after a Colles fracture, but it might be a year before you’re back to the way you were before the fracture. Follow your healthcare provider’s instructions so that you can return to that state safely.

### **What are Colles fracture rehabilitation exercises?**

Your healthcare provider might suggest physical therapy. Physical therapists help people manage pain, strengthen their bodies and improve movement. They’ll teach you rehabilitation exercises such as:

· Stretching exercises.

· Strengthening exercises.

### **Can Colles fractures come back after they’re treated?**

You could break your wrist bone again. You could have another fall or another type of trauma. Try your best to prevent additional wrist injuries so that you don’t have to endure the pain and healing process again.

## **Prevention**

Preventing a Colles fracture might not be possible, but you can take certain safety precautions to lower your risk of injury, including:

· Wear a wrist guard when you skate.

· Wear wrist armor when you’re on a motorcycle.

· Stay off ladders and avoid other heights.

· Rearrange your home so that there’s nothing to trip over like rugs or small tables.

Falls aren’t always preventable. Do what you can to protect yourself.

## **Living With**

Several steps can help you manage your pain, including:

· **Elevation** where you prop your wrist up above your heart.

· **Apply ice,** but make sure you have a cloth barrier like a towel or bandana between the ice pack and your skin.

· **Take over-the-counter pain medications** like ibuprofen (Advil®, Motrin®) and acetaminophen (Tylenol®). Talk to your healthcare provider about the correct dosage to take. Be sure to let your provider know if your pain isn’t tolerable.

### **When should I see my orthopaedic?**

Talk to your healthcare provider about when you should return for more X-rays. You should also see them if:

· You can’t move your fingers.

· Your pain gets too severe.

· Your fingers or nails look discolored.

· You feel numbness or tingling in your fingers.

· The range of motion in your fingers has gotten worse.

### **What questions should I ask my healthcare provider about my Colles fracture?**

Try not to leave the emergency department before you get answers to the following questions:

## How long do I have to wear a splint or cast?

You will typically wear a cast or splint for about 6 weeks. This immobilization period allows the bone to start healing properly. Healing times can vary between individuals, with some needing a shorter or longer duration. After cast removal, full recovery of wrist strength and motion may take several more weeks to months.

## Do I need more X-rays?

Yes, follow-up X-rays are important to monitor the healing and alignment of the fracture. Usually, X-rays are taken:

* Soon after initial treatment or reduction to confirm alignment
* At 1 week to ensure the fracture position is maintained
* At 4 to 6 weeks before cast removal to assess healing progress  
  More frequent X-rays may be needed if the fracture is unstable or displaced.

## Do I need physical therapy?

Physical therapy is often recommended after the cast is removed to help restore wrist range of motion, strength, and function. Exercises typically start with gentle movements like wrist flexion, extension, and rotation, progressing to strengthening over several weeks.

## What pain relief medications do you recommend?

* Over-the-counter acetaminophen (paracetamol) or NSAIDs (e.g., ibuprofen) are commonly used for pain control.
* Your doctor may prescribe stronger pain medications if needed, but these are usually short-term.
* Always follow dosing instructions and discuss any contraindications with your provider.

## When should I follow up with an orthopaedist?

* You should see an orthopaedist within a few days (ideally within 1 week) after your injury or initial treatment to evaluate the fracture and plan management.
* Additional follow-ups are typically scheduled at 1 week, 4-6 weeks, and after cast removal.
* Further visits depend on healing progress and any complications.

## **Initial Management and Procedures**

1. Emergency Department Visit:
   * If you suspect a broken wrist, seek emergency care promptly.
   * Initial evaluation includes a physical exam and X-rays to confirm the fracture.
   * If the bone fragments are displaced, a closed reduction (non-surgical realignment) is usually performed under local or regional anesthesia to restore proper bone position.
2. Immobilization:
   * After reduction, your wrist will be immobilized with a splint or cast to keep the bones stable.
   * For stable, nondisplaced fractures, a splint may be used initially, followed by a cast.
   * Casts typically extend from below the elbow to the hand, sometimes above the elbow for extra stability.
3. Surgical Intervention:
   * Surgery may be needed if the fracture is unstable, severely displaced, involves the joint surface, or if closed reduction fails.
   * Common surgical methods include open reduction and internal fixation (ORIF) with plates and screws, usually placed on the volar (palm) side.
   * Surgery allows earlier mobilization and better alignment, especially in younger or active patients.

## **Timeline of Healing and Recovery**

| **Timeframe** | **Procedure/Activity** | **Notes** |
| --- | --- | --- |
| 0–1 week | Emergency care, reduction, splint/cast applied | Initial immobilization; swelling monitored |
| 1 week | Follow-up X-ray | Check fracture alignment and cast fit |
| 4–6 weeks | Cast or splint removal | Bone healing sufficient to allow movement |
| 6–8 weeks | Start physical therapy (PT) | Focus on restoring wrist range of motion (ROM) |
| 8+ weeks | Gradual strengthening exercises | After surgeon clearance; improves function |
| 3–6 months | Return to vigorous activities | Sports or heavy lifting delayed until healed |
| Up to 1 year | Full recovery of strength and function | Some patients may take longer to regain full use |

**EPIDEMIOLOGY**

Distal radius fractures occur in people of all ages and, more often, in females. Distal radius fracture has a bimodal distribution in young athletes from high-energy injuries, as in sporting activities and motor vehicle accidents, and the elderly from low-energy trauma. In pediatrics, fractures often occur around the time of puberty due to low bone mineralization. Interestingly, ages 19 to 49 years old make up the least common age group for these injuries.

Osteoporosis associated with aging increases the risk of these fractures in elderly individuals and also increases the risk in women, who are more commonly affected by osteoporosis.Osteoporosis is a predictor of subsequent fragility fractures, especially in women older than 50 years old. Ideally, a distal radius fracture in women older than 50 years of age should indicate a DEXA scan to assess bone quality.

**Doctor-patient conversation about a Colles fracture**,

Doctor:  
“Hello, I’ve reviewed your X-rays and exam, and you have a Colles fracture, which is a break near the wrist end of your radius bone. This type of fracture usually happens when someone falls onto an outstretched hand.”

Patient:  
“What does that mean for me? How serious is it?”

Doctor:  
“It’s a common wrist fracture. The good news is that it’s treatable, but it does need proper care to heal well and prevent long-term problems. Your bone is displaced, which means the broken ends are out of alignment, so we’ll need to realign them to help it heal correctly.”

Patient:  
“How will you treat it? Will I need surgery?”

Doctor:  
“For displaced Colles fractures, we usually try a closed reduction, which means we gently manipulate the bone back into place without surgery, then put your wrist in a cast or splint. Sometimes, if the fracture is unstable or the bones don’t stay aligned, surgery may be recommended to fix the bones with plates and screws. Surgery can help avoid multiple cast changes and may improve healing, but it also carries some risks.”

Patient:  
“How long will I have to wear the cast? Will I need physical therapy?”

Doctor:  
“You’ll wear the cast for about 6 weeks. After the cast comes off, we usually recommend physical therapy to help restore your wrist’s strength and motion. Therapy is important because after immobilization, stiffness and weakness are common.”

Patient:  
“Will I need more X-rays? How often will I see you?”

Doctor:  
“Yes, we’ll take follow-up X-rays about a week after your initial treatment to make sure the bones are still aligned. Then again around 4 to 6 weeks before removing the cast. We’ll schedule follow-ups accordingly to monitor healing.”

Patient:  
“What about pain? What can I take?”

Doctor:  
“Over-the-counter pain relievers like acetaminophen or ibuprofen usually work well. If you need stronger pain control, we can discuss that, but most patients manage with these.”

Patient:  
“How long before I can use my hand normally again?”

Doctor:  
“Bone healing takes about 6 weeks, but full recovery of strength and function may take several months. You can usually start gentle movements once the cast is off, and gradually return to normal activities as your wrist improves.”

Patient:  
“Is there anything I can do to help the healing process?”

Doctor:  
“Eating a balanced diet rich in calcium and vitamin D, avoiding smoking, and following your treatment plan will help. Also, keep your follow-up appointments and do the exercises your therapist recommends.”

Patient:  
“Thank you, that helps me understand what to expect.”

Doctor:  
“You’re welcome. If you have any new symptoms like increased pain, numbness, or swelling, or if you have questions, please contact us right away. We’re here to support you through your recovery.”

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# **Smith fracture**

## **Disease Description/Overview**

A Smith fracture is a specific type of broken wrist. It’s caused by falling or experiencing another trauma while your wrist is bent or flexed.

There are lots of different bone fractures, and it’s easy for the different names to sound confusing. For example, you may see Smith fractures referred to as a type of distal radius fracture. The radius is one of the bones in your forearm, and its distal end is toward your wrist.

Each of the specific details you might read or hear about tells your healthcare provider which bones are broken, where they’re broken, how they broke and what they look like inside of your wrist right now. Think about all these names for fractures like the magnification settings on a microscope that helps your healthcare provider zoom in on your specific injury. No matter which names and terms are applied to your injury, the most important first step is getting your wrist examined by your healthcare provider as soon as possible.

### Smith fracture and other wrist fractures

The type of wrist fracture you have depends on how your bones broke and what the break itself looks like. Smith fractures usually come from falling with your wrist closed or flexed inward, or from a direct blow to the back of your hand.

#### Smith fracture vs. Colles fracture

If you’re diagnosed with a Colles fracture, the broken piece of your wrist bone (radius) points backward. Smith fractures are the opposite: The broken end of your bone points forward.

#### Smith fracture vs. Barton fracture

Barton fractures are similar to Smith fractures — they both usually come from falling on your wrist when it’s closed or flexed in. But with Barton fractures, your broken bones angle up or away from your palm.

Smith fractures can happen to anyone because they’re usually caused by an accident or trauma.

One important risk factor is osteoporosis. If you have osteoporosis, your bones are more susceptible to fractures. Anyone can develop it, but women are four times more likely than men. People older than 50 are also at an increased risk of osteoporosis.

Wrist fractures, in general, are 20% of all broken bones treated in emergency rooms, and the second most common broken bone in adults older than 50.

Compared to other types of wrist breaks, Smith fractures are rare. They’re only around 5% of all broken wrists.

## **Symptoms and Causes**

Symptoms of Smith fracture include:

· Wrist pain.

· Swelling.

· Tenderness.

· Inability to move your wrist without pain.

· Bruising or discoloration around your wrist.

· Unusual deformity or bump on your wrist that’s not usually there.

### **What causes a Smith fracture?**

Falls are by far the most common cause. Most people diagnosed with a Smith fracture landed on the back of their wrist with their hand flexed or bent in toward their body.

Car accidents, sports injuries and other significant traumas also cause Smith fractures.

You might see the cause of your broken wrist referred to as the “mechanism for injury.” This is just the medical term for “cause” and helps your healthcare provider know how you were hurt.

## **Diagnosis and Tests**

A Smith fracture is diagnosed with an X-ray. This tells your healthcare provider which of your bones are broken and which type of fracture you have. All broken wrists require an X-ray.

In addition to confirming your broken wrist, the X-ray will give your healthcare provider important information such as how clean the break is or how many pieces there are, how much space there is between your bones and whether other bones are damaged, too.

In some cases, you might need other imaging tests like a CT scan or MRI to confirm or rule out damage to other parts of your wrist, like muscles, tendons and ligaments.

Which tests you’ll need will depend on the cause and severity of your injury. You’re more likely to need extra imaging if your wrist was fractured in a more dangerous trauma like a car accident or falling off a ladder.

## **Management and Treatment**

How your Smith fracture is treated depends on the severity of the original break. Your broken bones need to heal back together, and there are several ways to make sure they’re repaired correctly.

#### Immobilization

If your break is mild and your bones didn’t move far out of place, you might only need a splint or cast. Splinting usually lasts for three to five weeks. If you need a cast, it’ll likely be longer, typically six to eight weeks. You’ll also likely need follow-up X-rays to make sure your bones are healing correctly.

#### Closed reduction

More severe breaks require a closed reduction to set (realign) your bones. During this nonsurgical procedure, your healthcare provider will physically push and pull your arm and wrist to line up your broken bones. To prevent you from feeling pain during the procedure, you’ll receive one of the following:

· Local anesthetic to numb your wrist and arm.

· Sedatives to relax your whole body.

· General anesthesia to make you sleep through the procedure.

After the closed reduction, your healthcare provider will put your wrist in a cast or splint, and you’ll need a follow-up appointment with a specialist to discuss your treatment options.

#### **Smith fracture surgery**

The most intense fractures require surgery. Your surgeon will repair your broken bones and insert a metal plate and screws into your wrist to hold it together.

Recovery time for surgery is longer than other methods. You’ll need a splint following surgery to help protect your bones and help them heal. You’ll also require physical therapy to help you regain your strength and mobility.

### **What medications/treatments are used?**

Talk to your healthcare provider before taking any medications to reduce pain after any treatment. Over-the-counter pain relievers (such as ibuprofen or acetaminophen) may reduce pain and swelling.

## **Differential Diagnosis**

* Colles Fracture - *extra-articular* distal radius fracture with *dorsal* displacement/angulation
* Barton Fracture - *intra-articular* distal radius fracture with *dorsal* displacement/angulation
* Reverse Barton Fracture - *intra-articular* distal radius fracture with *volar* displacement/angulation
* Die-Punch Fracture - fracture of the articular surface with depression of the lunate facet
* Chauffeur's Fracture - avulsion fracture of the radial styloid
* Distal Radioulnar Joint (DRUJ) disruption- injury to the sigmoid notch of the radius and the lunate facet
* Triangular Fibrocartilage Complex (TFCC) tear - damage to the cartilaginous structure on the ulnar aspect of the wrist
* Galeazzi Fracture - fracture to the distal third of the radius with disruption of the DRUJ

## **Outlook / Prognosis**

Healing time depends on the severity of your fracture and which treatments you need. It can take anywhere from a few months to more than a year to recover.

· Splinting and casting: Around six weeks.

· Closed reduction: You’ll be able to go home the same day you have the procedure and will need a splint/cast for at least six to eight weeks if you don’t need surgery.

· Surgery: It’ll take between one and three months to recover from surgery. You’ll also need four to six weeks of rehab.

Many people will experience stiffness and pain in their wrist that can last for months or even years after their fracture heals.

### **When can I go back to work/school?**

Regardless of which kind of treatment you need, a Smith fracture will impact your life while you heal:

· It may be hard to read, write or use a computer, especially if you broke the wrist on your dominant side.

· If you had surgery, you’ll need physical therapy before regaining your strength.

· Even if you don’t need surgery, your healthcare provider will give you an exercise routine to help you maintain your hand and wrist’s range of motion and flexibility.

Your healthcare provider will also help you understand how long you’ll need to miss work, school or other activities while you heal.

Most people can return to light exercise (walking, jogging, lower body workouts) a month or two after having their cast removed or after surgery. It can take as long as six months before you’re able to resume intense activity like heavy workouts or contact sports, though.

### **Complications of Smith fractures**

Smith fracture complications can include:

· Acute compartment syndrome (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.

· Malunion: This happens when your broken bones don’t line up correctly while they heal.

· Carpal tunnel syndrome: A broken wrist that doesn’t heal properly may lead to carpal tunnel syndrome, which causes pain, numbness and weakness in the affected hand.

· Bone infection (osteomyelitis): If you have an open wrist fracture (the bone breaks through your skin), you have an increased risk of bacterial infection.

· Other internal damage: Fractures can damage the area around your injury, including your muscles, nerves, blood vessels, tendons and ligaments.

## **Prevention**

Breaking your wrist almost always happens accidentally. Because falls are by far the most common cause of wrist fractures, make sure your home and workspace are free from clutter that could trip you or others. Make sure the adults older than 50 in your life practice good fall prevention, too.

Talk to your healthcare provider about osteoporosis and how you can prevent bone loss with the right diet, exercise routine and regular bone density screening, as well.

### **When should I see my healthcare provider**

If you think you have a wrist fracture, get help right away. Go to the emergency room if you’ve experienced a trauma and have any of the following symptoms:

· Intense pain.

· Swelling.

· Tenderness.

· You can’t move your wrist.

Make sure you tell your healthcare provider or the emergency responders everything that happened.

**EPIDEMIOLOGY**

The distal radius is the most commonly fractured site in the upper extremity. With over 600,000 cases annually in the United States alone, distal radial fractures account for more than 16% of all adult fractures and 75% of forearm fractures.Distal radial fractures are the second most common fractures in older adults, next only to hip fractures. However, most distal radial fractures in this population are Colles fractures. Smith fractures comprise approximately 5% of all radial and ulnar fractures combined, with the highest incidence in young men and older women. Almost all distal radius fractures arise in children sustaining high-energy falls or seniors with osteoporosis who suffer low-energy falls.

Between the ages of 64 to 94, women are 6 times more likely than men to sustain a distal radial fracture.Current evidence supports a direct correlation between low-energy, trauma-induced distal radius fracture and decreased bone mineral density.

The Danish National Patient Registry records show a 31% increase in fractures among adult males from 1997 to 2018, mostly driven by the increasing population of older individuals. Increased surgical fixation rates have also been observed within this period, also attributed to the growing number of older patients

### **What questions should I ask my healthcare provider?**

## What kind of fracture do I have?

**You have a Smith fracture, which is a break in the distal radius bone near the wrist with the broken fragment displaced toward the palm (volar displacement). This is sometimes called a “reverse Colles fracture.” It usually happens from a fall onto a flexed wrist or direct trauma to the back of the wrist.**

## Will I need to wear a splint or cast?

**Yes, most Smith fractures require immobilization.**

* **If your fracture is stable and nondisplaced, you may be treated with a splint or cast for 4 to 8 weeks.**
* **The cast is usually a long arm cast initially, keeping the forearm in supination and wrist in neutral or slight extension.**
* **After the initial immobilization, a removable wrist brace may be used for support during rehabilitation.**

## Do I need surgery?

* **Surgery is needed if the fracture is unstable, significantly displaced, comminuted, involves the joint surface, or fails closed reduction.**
* **Surgical treatment usually involves open reduction and internal fixation (ORIF) with plates and screws to realign and stabilize the bone.**
* **Surgery allows earlier movement but requires a longer overall recovery period.**

## Will I require physical therapy?

* **Yes, physical therapy is important after immobilization or surgery to restore wrist range of motion, strength, and function.**
* **Therapy usually starts after cast removal, around 6 to 8 weeks post-injury, and may continue for several weeks to months depending on progress.**

## How soon can I use my broken wrist?

* **Light use of the wrist generally begins after cast removal at about 4 to 8 weeks, depending on healing and stability.**
* **Gentle movements may be encouraged during immobilization for fingers, elbow, and shoulder to maintain mobility.**
* **Full functional use takes longer and depends on healing and rehabilitation.**

## When can I play sports or work out?

* **Return to sports or heavy activities is usually delayed until 3 to 6 months after injury, allowing sufficient bone healing and strength recovery.**
* **Your doctor and therapist will guide you based on your progress and fracture stability.**

## When will my wrist be completely healed?

* **Bone healing typically takes about 6 to 12 weeks, but full recovery of strength, flexibility, and function may take several months to a year.**
* **Some patients experience residual stiffness or weakness longer term, especially if surgery was required.**

**Doctor-patient conversation about a Smith fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam, and you have a Smith fracture, which is a break in the distal radius bone near your wrist. This fracture typically happens when you fall onto a flexed wrist or get a direct blow to the back of your wrist.”

Patient:  
“What does that mean for me? Is it serious?”

Doctor:  
“It’s a type of wrist fracture where the broken bone fragment is displaced toward the palm side of your wrist. It’s less common than the typical Colles fracture but requires careful treatment to ensure proper healing and to avoid long-term stiffness or weakness.”

Patient:  
“How will you treat it? Will I need surgery?”

Doctor:  
“Most Smith fractures need to be realigned, which we usually do with a procedure called closed reduction. This means we gently manipulate the bone back into place, often under local anesthesia or sedation. After that, we immobilize your wrist with a below-elbow cast or splint. We’ll monitor the fracture with X-rays to make sure it stays in the right position. Surgery is sometimes necessary if the fracture is unstable or if we can’t maintain alignment with casting alone.”

Patient:  
“How long will I need to wear the cast? What about physical therapy?”

Doctor:  
“You’ll typically wear the cast for about 4 to 8 weeks, depending on how your bone heals. After the cast is removed, you’ll likely need physical therapy to restore wrist motion, strength, and function. Therapy usually starts with gentle exercises and progresses as you improve.”

Patient:  
“When can I start using my wrist again? When can I get back to sports or working out?”

Doctor:  
“Light use of your wrist can usually begin after the cast is off, but full return to sports or heavy activities generally takes 3 to 6 months. It’s important not to rush, as the bone and soft tissues need time to heal fully to avoid re-injury.”

Patient:  
“What kind of pain relief can I expect?”

Doctor:  
“Pain is usually managed with over-the-counter medications like acetaminophen or ibuprofen. If you need stronger pain relief, we can discuss that. Elevating your arm and applying ice during the first few days can also help reduce pain and swelling.”

Patient:  
“How often will I need X-rays and follow-up visits?”

Doctor:  
“We’ll take X-rays shortly after the reduction to confirm alignment, then again about a week later to ensure the fracture hasn’t shifted. Further X-rays are usually done before cast removal around 4 to 6 weeks. You’ll have regular follow-ups with the orthopedic team to monitor healing.”

Patient:  
“Is there anything I can do at home to help my recovery?”

Doctor:  
“Yes, keep your arm elevated when possible, avoid putting weight on the wrist, and move your fingers, elbow, and shoulder to maintain mobility. Follow all instructions carefully, attend your therapy sessions, and eat a balanced diet rich in calcium and vitamin D to support bone healing.”

Patient:  
“Thank you for explaining everything. It helps to know what to expect.”

Doctor:  
“You’re welcome. If you notice increased pain, numbness, swelling, or any new symptoms, please contact us immediately. We’re here to support you throughout your recovery.”

**Reference**

**Smith Fracture (Distal Radius Fracture): Definition & Treatment**

[**https://www.physio-pedia.com/Smith's\_Fracture**](https://www.physio-pedia.com/Smith's_Fracture)

[**https://www.ncbi.nlm.nih.gov/books/NBK547714/#article-29158.s4**](https://www.ncbi.nlm.nih.gov/books/NBK547714/#article-29158.s4)

# **Scaphoid Fracture**

## **Disease Description/Overview**

Scaphoid fractures are a type of broken wrist. They happen when you break your scaphoid bone — a small bone near the base of your thumb. Your scaphoid is one of your carpal bones, the collection of bones that makes up your wrist.

Scaphoid fractures are almost always caused by catching yourself with outstretched arms after a fall. Car accidents and other traumas can also cause them. You might need surgery to repair your bone. Most people need around three months to recover from a scaphoid fracture.

#### Distal scaphoid fracture vs. proximal scaphoid fracture

Your scaphoid has three parts, all three of which can be broken. Sections of your scaphoid include:

· Distal pole: The end of your scaphoid closest to your hand and fingers (pointing away from your forearm).

· Waist of the scaphoid: The middle part of your scaphoid. More than 70% of scaphoid fractures occur in the waist.

· Proximal pole: The end of your scaphoid closest to your forearm (pointing in toward your body).

These different terms tell your healthcare provider specific details about how your wrist is broken, where your scaphoid broke and what the bone looks like inside of your body right now.

No matter which names and terms are applied to your fracture, the most important first step is getting your injury examined by your healthcare provider as soon as possible.

Scaphoid fractures are the most common carpal bone fracture and make up 15% of wrist injuries.

Scaphoid fractures — like all bone fractures— can affect anyone. This is especially true because they’re caused by falls or other accidents. Scaphoid fractures are most common in teens and young adults under 30. If you’re at risk for falls, you might be more likely to experience a scaphoid fracture. People with osteoporosis have an increased risk for all types of broken bone, including scaphoid fractures.

## **Symptoms and Causes**

Symptoms of a scaphoid fracture include:

· Pain.

· Swelling.

· Tenderness.

· Inability to move your wrist.

· Bruising or discoloration.

· A deformity or bump that’s not usually on your wrist.

#### Displaced scaphoid fractures

Displaced or nondisplaced are more terms your healthcare provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair.

### **What causes scaphoid fractures?**

Any impact to your wrist can cause scaphoid fractures. The most common causes include:

· Falls: Catching yourself with outstretched arms.

· Sports injuries.

· Car accidents.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a scaphoid fracture with a physical exam and imaging tests.

### What tests are done to diagnose a scaphoid fracture?

After a physical exam, you’ll likely need at least one of a few imaging tests:

· X-rays: An X-ray will confirm any scaphoid or other fractures and show how damaged your bones are.

· Magnetic resonance imaging (MRI): Your healthcare provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This’ll show them tissue around your bones, too. This is especially important to determine if your muscles and connective tissue were injured.

· CT scan: If you need surgery, your healthcare provider or surgeon needs to know exactly how damaged your bones are. A CT scan will give them a more detailed picture of your bones and the surrounding tissue than an X-ray.

#### Occult scaphoid fractures

Scaphoid fractures sometimes don’t show up well (or at all) on X-rays. These are called occult scaphoid fractures. Your healthcare provider might need you to get an MRI or CT scan in addition to X-rays. Your healthcare provider will let you know what other imaging tests you’ll need.

Make sure you tell your healthcare provider exactly where you’re feeling any pain or tenderness. If your discomfort is centered right above your scaphoid and doesn’t get better after a day or two, you may have an occult scaphoid fracture. Occult fractures don’t need any different treatment or have any risks.

## **Management and Treatment**

How your scaphoid fracture is treated depends on the severity of the original break. Your broken bone needs to heal back together. Depending on how damaged it is or what caused the break, there are a few treatments your healthcare provider might use.

#### Immobilization

If your break is mild and your scaphoid didn’t move far out of place (if it’s non-displaced), you might only need a splint or cast. Splinting usually lasts for three to five weeks. If you need a cast, it’ll likely be for longer, typically six to eight weeks. In both cases, you’ll likely need follow-up X-rays to make sure your bone is healing correctly.

#### Closed reduction

More severe breaks require a closed reduction to set (realign) your scaphoid. During this nonsurgical procedure, your healthcare provider will physically push and pull your body on the outside to line up your broken bone on the inside. To prevent you from feeling pain during the procedure, you’ll receive one of the following:

· Local anesthetic to numb the area around your fracture.

· Sedatives to relax your whole body.

· General anesthesia to make you sleep through the procedure.

After the closed reduction, your healthcare provider will put you in a splint or cast.

### **Scaphoid fracture surgery**

#### Internal fixation

The most intense fractures require surgery. Your surgeon will realign (set) your scaphoid to its correct position and then secure it in place so it can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. Internal fixation techniques include:

· Plates and screws: Metal plates screwed into your bone to hold the pieces together in place.

· Pins and wires: Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### Bone grafting

You might need bone grafting if your scaphoid fracture is severely displaced or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to rejoin your fractured bone. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

· Internally from somewhere else in your body — usually the top of your hip bone.

· An external donor.

· An artificial replacement piece.

Scaphoid fracture surgeries are usually outpatient procedures, and you should be able to go home the same day.

After your surgery, your wrist will be immobilized. You’ll need a splint or cast before you can start using it as you did before your fracture.

### **What medications are used to treat scaphoid fractures?**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

Side effects of NSAIDs include:

· Bleeding.

· Ulcers.

· Stomach pain.

· Bowel complications.

#### **Can a scaphoid fracture heal on its own?**

Never ignore symptoms like pain, swelling or tenderness. Even if your symptoms aren’t severe, you need treatment. If you have an untreated scaphoid fracture, you might face more serious complications later, including:

· Acute compartment syndrome (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.

· Malunion: This happens when your broken bones don’t line up correctly while they heal.

· Nonunion: Your bones may not grow back together fully or at all.

· Avascular necrosis (osteonecrosis): This is a painful bone condition that gets worse over time and can affect your mobility. It occurs when something cuts off blood flow to one of your bones.

· Arthritis of the hand: Nonunion and avascular necrosis can lead to arthritis in your hand and wrist. Arthritis of the hand causes pain and swelling, stiffness and deformity.

#### **How soon after treatment will I feel better?**

It might take a few weeks for your symptoms to improve. Depending on which type of surgery you had to repair your scaphoid fracture, you should be able to start moving again in a few weeks.

If you experience intense pain that doesn’t get better, contact your healthcare provider right away.

## **Differential Diagnoses**

**·**  Distal Radius Fracture (DRF) Imaging : Diagnosis primarily relies on physical examination and plain radiography (X-rays) to identify fracture location, displacement, and angulation, commonly dorsal angulation of the distal fragment

· Physical Medicine and Rehabilitation for De Quervain Tenosynovitis : De Quervain tenosynovitis involves inflammation of the first dorsal compartment tendons.

· Rehabilitation for Osteoarthritis

· Tendonitis and Tenosynovitis: Both conditions involve inflammation—tendonitis is inflammation of the tendon itself, while tenosynovitis affects the tendon sheath.

· Wrist Dislocation in Sports Medicine

## **Outlook / Prognosis**

If you have a scaphoid fracture, you should expect to make a full recovery.

You’ll need physical therapy to regain strength and range of motion in your wrist.

#### How long does it take a scaphoid fracture to heal?

How long it takes you to heal depends on the severity of your fracture and which treatments you need. Most people need around three months to recover from a scaphoid fracture.

There are lots of factors that can affect how long it takes your body to heal. Talk to your healthcare provider or surgeon about a timeline that fits your specific situation.

#### Will I need to miss work or school?

If you can do your job or schoolwork with your wrist immobilized, you shouldn’t need to miss work or school.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### Outlook for a scaphoid fracture

The outlook for scaphoid fractures is positive. Even if you need surgery, you should make a full recovery and shouldn’t have any long-term effects from your fracture.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

· Always wear your seatbelt.

· Wear the right protective equipment for all activities and sports.

· Make sure your home and workspace are free from clutter that could trip you or others.

· Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.

· Follow a diet and exercise plan that’ll help you maintain good bone health.

· Talk to your healthcare provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

· If you use a cane or walker to help walk, always use it and be careful on uneven surfaces.

### How can I prevent a scaphoid fracture?

Scaphoid fractures are usually caused by falls or other accidents, so there’s not much you can do to prevent them other than safety precautions while walking (use your cane or walker if you have one) and being careful on uneven surfaces.

If you think you have a scaphoid fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

· Intense pain.

· You can’t move a part of your body that you normally can.

· A part of your body is noticeably different looking or out of its usual place.

· You can see your bone through your skin.

· Swelling.

· New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

## **Epidemiology**

### Frequency

*United States*

Scaphoid fracture has been reported in people aged 10-70 years, although it is most common in young adult men following a fall, athletic injury, or motor vehicle accident.

Using the National Trauma Data Bank, a study by Wells et al indicated that 286 scaphoid fractures per 100,000 person-years present at US trauma centers.

### Mortality/Morbidity

The scaphoid has no ligamentous or tendinous attachments, but joint compressive forces, trapezial-scaphoid shear stress, and capitolunate rotation moments exert control on the scaphoid. Therefore, scaphoid fractures have a high incidence of nonunion (8-10%), frequent malunion, and late sequelae of carpal instability and posttraumatic arthritis.

* A higher incidence of aseptic necrosis and nonunion is noted with fractures of the proximal pole of the scaphoid, due to the blood supply (as detailed above).
* A scaphoid fracture can present as a nondisplaced, stable fracture or as a displaced, unstable fracture. Displaced fractures frequently are associated with ligament tears in the wrist and require thorough evaluation and follow-up.

A study by Williams et al using the National Trauma Data Bank found a relatively high rate of concomitant scaphoid and proximal radius fractures in young males. The investigators reported that out of 11,309 patients with proximal radius fracture and an injury severity score of below 15 (with the latter providing a proxy for low-energy injury), 3% had scaphoid fractures. In men aged 18-30 years, however, the incidence of concomitant fractures was 10%.

The aforementioned study by Wells and colleagues indicated that the injuries most commonly associated with scaphoid fractures, as presented at US trauma centers, include distal radius fractures, distal ulnar fractures, and non scaphoid carpal bone fractures.

### Race

No known correlation exists between race and scaphoid fracture.

### Sex

Scaphoid injuries are more common in men than in women.

### Age

Scaphoid fracture is uncommon in children because the physis of the distal radius usually fails first, resulting in Salter type I or II fractures of the distal radius. Similarly, in elderly patients, the distal radial metaphysis usually fails before the scaphoid can fracture.

## **Procedures for Scaphoid Fracture**

## 1. Non-Surgical Treatment (Conservative Management)

* Indication:  
  Stable, non-displaced fractures with good alignment and blood supply.
* Procedure:  
  Immobilization in a cast or splint, often including the thumb and wrist.  
  Cast types vary, but commonly a below-elbow cast with thumb immobilization is used.
* Duration:  
  Immobilization typically lasts 6 to 12 weeks, depending on fracture location and healing progress.
* Follow-up:  
  Regular X-rays or MRI to monitor healing and ensure no displacement occurs.
* Additional:  
  Bone stimulators may be used in some cases to enhance healing.

## 2. Closed Reduction

* Indication:  
  Displaced fractures where the bone ends can be realigned without surgery.
* Procedure:  
  Manual manipulation under sedation or anesthesia to realign the bone, followed by casting.

## 3. Surgical Treatment (Internal Fixation)

* Indication:
  + Displaced or unstable fractures
  + Fractures with poor blood supply (especially proximal pole fractures)
  + Non-union or delayed union after conservative treatment
* Procedure:
  + Open Reduction and Internal Fixation (ORIF): Surgical exposure of the fracture, realignment, and fixation with screws or pins.
  + Percutaneous Fixation: Minimally invasive screw insertion guided by imaging, often used for acute non-displaced fractures.
  + Bone Grafting: Used if bone healing is poor or in non-union cases, where bone tissue (autograft) is transplanted to stimulate healing.
  + Arthroscopic Fixation: Minimally invasive technique using a small camera to assist fixation and bone grafting.
  + Microsurgical Bone Flap: Complex procedure using vascularized bone grafts for difficult non-unions.

## **Timeline for Healing and Recovery**

| **Timeframe** | **Procedure/Activity** | **Notes** |
| --- | --- | --- |
| 0–1 week | Diagnosis, possible closed reduction, casting or surgery | Initial immobilization or surgical fixation |
| 6–12 weeks | Cast immobilization period for non-surgical cases | Healing monitored with X-rays or MRI |
| 6–8 weeks post-surgery | Begin gentle wrist motion (if surgery performed) | Early mobilization possible with stable fixation |
| 3–6 months | Progressive strengthening and functional use | Gradual return to normal activities |
| 6+ months | Full healing and return to sports or heavy use | Healing can be prolonged, especially for proximal fractures |

**Doctor-patient conversation about a suspected or confirmed scaphoid fracture**

“Hello, I’ve reviewed your wrist injury and your X-rays. The scaphoid bone, one of the small bones in your wrist, is the most commonly fractured carpal bone. Sometimes, a scaphoid fracture doesn’t show up on initial X-rays, so even if your first X-ray looks normal, we treat it as a fracture if you have tenderness in the anatomical snuffbox.”

Patient:  
“So, does that mean I have a fracture even if the X-ray is clear?”

Doctor:  
“It’s possible. Between 10% and 20% of scaphoid fractures don’t appear on X-rays right away because the fracture line can be very fine. We usually immobilize your wrist with a thumb brace called a ‘Futura splint’ or a cast to protect the bone while it starts healing. Then, we repeat the X-rays in 10 to 14 days, or sometimes we might order an MRI to get a clearer picture.”

Patient:  
“What happens if the fracture is confirmed?”

Doctor:  
“If the fracture is confirmed and it’s not displaced, we treat it with a cast to immobilize the wrist and thumb for about 6 to 12 weeks. The exact duration depends on the fracture location and how well it’s healing. Fractures near the thumb tend to heal faster because they have a better blood supply.”

Patient:  
“Will I need surgery?”

Doctor:  
“Surgery is usually recommended if the fracture is displaced, unstable, or if it’s located near the forearm end of the scaphoid, where blood supply is poorer. Surgery involves fixing the bone with screws or wires to hold it in place. Sometimes, bone grafts are needed if the fracture is complex or healing is delayed.”

Patient:  
“How long will it take to recover? When can I use my wrist again?”

Doctor:  
“Bone healing can take 6 to 12 weeks or longer. You’ll wear a cast or splint during this time, and after it’s removed, physical therapy will help you regain strength and motion. It’s important to avoid heavy lifting or sports until your wrist is fully healed, which can take several months.”

Patient:  
“What should I watch out for during recovery?”

Doctor:  
“Watch for increasing pain, swelling, numbness, or changes in skin color, as these could signal complications like poor blood flow or nerve issues. If you notice any of these, contact us immediately.”

Patient:  
“Is there anything I can do to help the healing process?”

Doctor:  
“Keep your wrist elevated when possible, avoid using the injured hand, and follow your treatment plan carefully. A balanced diet rich in calcium and vitamin D supports bone healing. Also, attend all follow-up appointments so we can monitor your progress.”

Patient:  
“Thank you. I feel better knowing what to expect.”

Doctor:  
“You’re welcome. We’re here to support you every step of the way. If you have any questions or new symptoms, please don’t hesitate to reach out.”

### **What questions should I ask my doctor?**

## **Do I have a scaphoid fracture or another type of break?**

You may have a scaphoid fracture if you have pain, swelling, and tenderness at the base of your thumb, especially in the anatomical snuffbox (the hollow on the thumb side of your wrist). However, initial X-rays may not always show the fracture clearly. If pain persists despite normal X-rays, further imaging like an MRI or CT scan may be needed to confirm the diagnosis. Other wrist fractures or ligament injuries can cause similar symptoms, so careful evaluation is important.

## **Which part of my scaphoid is broken?**

The scaphoid bone is divided into three parts:

* Distal pole (near the thumb): Fractures here usually heal faster because this area has a good blood supply.
* Waist (middle part): This is the most common fracture site and has a moderate risk of healing complications.
* Proximal pole (near the forearm): Fractures here are less common but more serious due to poor blood supply, increasing the risk of complications like avascular necrosis (bone death) and delayed healing.

Your doctor will determine the fracture location based on imaging, which influences treatment and prognosis.

## Will I need surgery?

* If the fracture is nondisplaced and stable, it is usually treated with immobilization in a cast or splint for 6 to 12 weeks.
* If the fracture is displaced, unstable, or involves the proximal pole, surgery is often recommended to realign and stabilize the bone using screws or pins. Surgery may also be needed if the fracture does not heal properly with conservative treatment.

## How long will it take to recover?

* Healing time varies by fracture location and treatment but generally takes 6 to 12 weeks or longer.
* Proximal pole fractures and displaced fractures may take longer to heal and require closer monitoring.
* Full recovery, including regaining strength and motion, may take several months.

## When can I resume physical activities?

* Light activities and gentle wrist movements usually begin after cast removal, around 6 to 12 weeks, depending on healing.
* Return to sports or heavy manual work is typically delayed until 3 to 6 months post-injury to ensure full healing and prevent re-injury.
* Your healthcare provider and physical therapist will guide you on a safe timeline based on your progress.

**References**

**Scaphoid Fracture: Symptoms, Causes & Treatment**

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**Barton Fracture**

**Disease Description/Overview**

A Barton fracture is a type of wrist fracture where there is a break in the distal radius, the long bone on the outer forearm.

In most cases, a triangular portion of bone breaks off the distal radius.

It is an intra-articular fracture, meaning it involves the joint surface where the radius bone meets the wrist at the radiocarpal joint. Unlike some other wrist fractures, with a Barton wrist fracture there is also dislocation of the radiocarpal joint, but the wrist ligaments usually remain intact.

This type of distal radius fracture is named after Dr. John Rhea Barton, an American surgeon who first described this injury in the early 19th century. Dr. Barton was a pioneering orthopedic surgeon, and his work laid the foundation for understanding and treating wrist fractures effectively.

### **Types of Barton Fracture**

There are two main types of Barton fractures:

**Dorsal Barton Fracture:** backwards displacement of the broken fragment, resulting in a lump on the back (dorsal aspect) of the wrist

**Volar Barton Fracture:** forward displacement of the broken fragment, resulting in a lump on the palm (volar) side of the wrist. AKA reverse Barton Fracture. Most common type

Both types typically result in severe wrist instability and require immediate attention.

## **Barton Fracture Causes**

A Barton fracture is usually caused by high-energy direct trauma to the wrist, such as:

· **Sports Injuries:** High-impact sports like football, basketball, or snowboarding can lead to wrist fractures.

· **Motor Vehicle Accidents:** Sudden, forceful impact during a collision can cause this type of injury.

· **Industrial Accidents:** Falling or being struck by heavy equipment can also result in a Barton fracture.

· **Falls:** Landing on an outstretched hand, particularly with the palm facing down, is a common cause, particularly in the elderly

· Risk Factors

· Certain factors can increase the likelihood of a Barton fracture, including:

· **Osteoporosis:** Weak, brittle bones are more prone to fractures from even minor trauma.

· **Age:** Older adults are at higher risk due to decreased bone density.

· **Gender:** Women, particularly post-menopausal women, are more likely to develop fractures because of bone loss.

· **High-Risk Activities:** Participation in contact sports or activities with a high risk of falling increases the chance of injury.

## **Symptoms of Barton Fractures**

The symptoms of a Barton fracture are similar to other wrist fractures and may include:

· **Immediate Pain:** around the wrist joint at the time of injury, often severe

· **Swelling and Bruising:** at the wrist and forearm

· **Deformity:** A noticeable change in the shape of the wrist

· **Limited Mobility:** Difficulty or inability to move the wrist or hand

· **Tingling or Numbness:** If the fracture affects nearby nerves

## **Diagnosing Barton Fracture Wrist**

Diagnosing a Barton fracture typically involves the following steps:

**History:** Your doctor will ask you about the mechanism of your injury, when and how it occurred and what symptoms you have had

**Physical Examination:** They will assess your wrist for deformity, swelling, and range of motion.

**X-Rays:** Standard imaging to identify the type and extent of the fracture.

**CT Scan or MRI:** In some cases, advanced imaging may be used to assess joint involvement and soft tissue damage.

## **Differential Diagnosis**

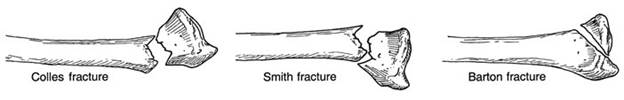
A Barton fracture can sometimes be mistaken for other wrist injuries, especially other wrist fractures. Conditions that need to be ruled out include:

Colles Fracture**:** A fracture of the distal radius with dorsal (backwards) displacement without joint dislocation.

Smith's Fracture**:** A fracture of the distal radius with volar (forwards) displacement but without the dislocation seen in Barton fractures.

Scaphoid Fracture**:** A break in one of the small wrist bones, which may present with similar pain but different imaging findings.

**Wrist Sprain:** Soft tissue injuries can mimic the symptoms of a fracture but lack the bone involvement visible on imaging.



A thorough examination and appropriate imaging are crucial for an accurate diagnosis and effective treatment plan. Check out our wrist pain charts if you want help working out what is wrong.

## **When to See a Doctor**

If you experience severe pain, visible deformity, or loss of function in your wrist after a trauma, seek medical attention immediately. Delaying treatment with a Barton Fracture can lead to complications such as permanent wrist instability or arthritis.

## **Barton Wrist Fracture Treatment**

The aim of Barton fracture treatment is to regain a full, pain-free range of motion and strength in the wrist so that you can return to all your usual activities. The treatment for a Barton wrist fracture depends on the severity of the injury:

### **Non-Surgical Treatment**

· **Immobilization:** Initially, a splint or cast is applied to stabilize the wrist. In minor cases with no displacement, a cast may be sufficient, and will need to be worn for at least 6 weeks while the fracture heals.

· **Pain Management:** Anti-inflammatory medications e.g. ibuprofen can help reduce pain and swelling.

· Surgical Treatment

· In most cases, Barton fractures are extremely unstable, so they usually require surgery:

· **Open Reduction and Internal Fixation (ORIF):** Surgery starts with realigning the bone fragments and then securing them in place with plates and screws. Following surgery, the wrist is immobilised in a splint for 5-10 days. Success rate of 90-95%

· **External Fixation:** For severe fractures, an external frame may be used to stabilize the wrist. Success rate of 80-85%

· Post-treatment, physical therapy is essential to regain strength and range of motion in the wrist.

## **Prognosis**

With proper treatment, most people recover well from a Barton fracture. Recovery time varies depending on the severity of the injury and whether surgery was required. Mild cases may heal within 6–8 weeks, while more severe fractures can take several months of rehabilitation.

Early diagnosis and treatment are key to avoiding long-term complications like arthritis or chronic pain. Most people return to their usual activities.

## **Prevention**

· While accidents can’t always be avoided, you can reduce your risk of a Barton fracture by:

· Wearing Protective Gear: Use wrist guards during high-risk sports or activities.

· Improving Bone Health: Maintain a diet rich in calcium and vitamin D to keep your bones strong.

· Preventing Falls: Use handrails, wear non-slip footwear, and keep walkways clear of hazards.

## **Complications of Barton Fractures**

Some of the complications of Barton’s fracture include:

· **Stiffness of the Joint:** Stiffness and pain reduction after treatment and recovery period; however, in some cases, the fracture can lead to permanent stiffness in the joint. Continuation of physical exercises would help in this regard.

· **Post-traumatic Arthritis:** It is a common complication in fractures that extend into the joint due to failure of reduction or incomplete alignment of the joint surface.

· **Damage to the Nerve or Blood Vessels:** High-velocity injuries may usually result in trauma to the surrounding nerves and blood vessels, resulting in numbness or circulation problems.

· **Osteomyelitis:** High risk for bone infections in case of open wrist injuries.

· **Malunion:** Failure in the proper alignment of the bones after surgery and rehabilitation.

· **Carpal Tunnel Syndrome:** It is characterized by pain, tingling sensation, or numbness in the arm and joints.

· **Acute Compartment Syndrome:** Inadequate blood supply can damage the nerves and muscles, and other organs leading to this syndrome.

· **Complex Regional Pain Syndrome:** Severe pain due to the irritation of the nerves following injury.

**EPIDEMIOLOGY**

The recent increase in distal radius fractures in patients of all ages is attributed to a variety of factors. Fractures in pediatric patients are most common around the time of puberty, with boys tending to suffer the injury more often than girls. The young adult population (ages 19 to 49) is the least affected by Barton fractures, with a greater predilection for males than females. In the elderly, women are more likely to be diagnosed with a Barton fracture than their male counterparts due to higher rates of osteoporosis. Volar Barton fractures make about 1.3 percent of distal radius fracture

**STAGING**

Morphological classification:

1. Typical Barton
2. Radial Barton
3. Ulnar Barton
4. Comminuted Barton

**Doctor-patient conversation about a Barton fracture,**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam. You have a Barton fracture, which is a break in the distal radius bone near your wrist that also involves a dislocation of the wrist joint itself. This type of fracture usually happens when someone falls onto a bent wrist or sustains a direct blow.”

Patient:  
“That sounds serious. What does it mean for my wrist?”

Doctor:  
“A Barton fracture is different from more common wrist fractures like Colles or Smith fractures because it involves the joint surface and the wrist bones are partially dislocated. This makes the injury less stable and more complex. It’s important to treat it properly to restore wrist alignment and function and to reduce the risk of arthritis later on.”

Patient:  
“How will you treat it? Will I need surgery?”

Doctor:  
“Most Barton fractures require surgery because the fracture and joint dislocation need to be realigned and stabilized. The procedure is called open reduction and internal fixation (ORIF). During surgery, we make a small incision, reposition the broken bone fragments, and fix them in place using plates and screws. This helps the wrist heal in the correct position and allows for earlier movement.”

Patient:  
“What if I don’t have surgery? Can it heal with a cast?”

Doctor:  
“In some cases where the fracture is stable after closed reduction, we might try immobilization with a cast or splint for about 6 weeks. However, Barton fractures are often unstable, and casting alone may not keep the bones aligned, which can lead to poor healing and wrist problems.”

Patient:  
“How long will it take to recover? Will I need physical therapy?”

Doctor:  
“After surgery or casting, your wrist will be immobilized for about 6 weeks. Once the bone starts healing and the cast or splint is removed, you’ll begin physical therapy to regain strength, flexibility, and function. Full recovery can take several months, and physical therapy is key to getting your wrist back to normal.”

Patient:  
“What kind of pain or complications should I expect?”

Doctor:  
“Pain is common initially but can be managed with medications like acetaminophen or ibuprofen. Surgery has risks like infection or nerve irritation, but these are uncommon. Because the fracture involves the joint, there is a risk of developing arthritis later on, which is why proper treatment and follow-up are important.”

Patient:  
“When can I return to normal activities or sports?”

Doctor:  
“Light activities usually resume after cast removal and during physical therapy. Return to sports or heavy manual work typically takes 3 months or longer, depending on your healing and rehabilitation progress. We will guide you on when it’s safe to resume specific activities.”

Patient:  
“Is there anything I can do at home to help my recovery?”

Doctor:  
“Yes, keep your wrist elevated to reduce swelling, follow your immobilization instructions, attend all follow-up appointments, and complete your physical therapy exercises. Eating a healthy diet with adequate calcium and vitamin D also supports bone healing.”

Patient:  
“Thank you. This helps me understand what to expect and how to prepare.”

Doctor:  
“You’re welcome. We’ll be here to support you throughout your recovery. Please contact us if you experience increased pain, numbness, or any new symptoms.”

### **What questions should I ask my healthcare provider?**

## Do I need surgery?

Most Barton fractures are unstable and displaced, involving the wrist joint surface and often radiocarpal dislocation. Because of this instability, surgery is usually recommended to realign and stabilize the fracture. The common surgical procedure is open reduction and internal fixation (ORIF), where plates and screws are used to hold the bone fragments in place. Surgery helps ensure proper healing, restores wrist function, and reduces the risk of arthritis.

In some rare cases where the fracture is stable after closed reduction, casting might be attempted, but this is uncommon due to the high risk of displacement.

## What kind of broken bone do I have?

You have a Barton fracture, which is an intra-articular fracture of the distal radius involving a fragment of the wrist joint surface that is displaced along with partial dislocation of the wrist joint (radiocarpal joint). This differs from more common wrist fractures like Colles or Smith fractures because it affects the joint and is more unstable.

## When can I get my cast off?

After surgery, your wrist will typically be immobilized in a cast or splint for about 4 to 6 weeks to allow initial healing. If treated non-surgically (less common), casting usually lasts about 6 weeks. Your surgeon will monitor healing with follow-up X-rays and decide the best time to remove the cast based on your progress.

## When can I get back to my usual activities?

* Light daily activities can often resume after cast removal and once your surgeon clears you, usually around 6 weeks post-treatment.
* Physical therapy will help restore strength and motion after immobilization.
* Return to sports or heavy manual labor typically takes 3 months or longer, depending on healing and rehabilitation progress.
* Full recovery may take several months, and your doctor will guide you on safely increasing activity levels.

REFERENCES

[Barton Fracture: Symptoms, Causes & Treatment](https://my.clevelandclinic.org/health/diseases/22236-barton-fracture#outlook-prognosis)

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# **Radial Styloid Fracture (Chauffeur Fracture )**

## **Disease Description/Overview**

A **radial styloid fracture**, also known as a **chauffeur fracture** is a broken bone near your wrist. There are two long bones in your forearm: the radius and the ulna. A chauffeur fracture occurs when the pointed tip at the end of your radius (radial styloid process) breaks.

A chauffeur fracture is a type of distal radius fracture, which means the break is at the end of the radius bone. A chauffeur fracture also extends into your wrist joint. When a fracture crosses into a joint, providers call it an intrarticular fracture.

Chauffeur fractures have many names, including radial styloid fractures, Hutchinson fractures and backfire fractures.

### **Who might get a chauffeur fracture?**

Anyone can get a chauffeur fracture, but most people with distal radius fractures are either active younger people or people over age 65. Older people with osteoporosis are at higher risk.

Distal radius fractures are the most common fractures treated by U.S. healthcare providers. This type of fracture makes up nearly 17% of all fractures treated in emergency rooms. More than 450,000 people in the U.S. have distal radius fractures each year.

### **Why is it called a “chauffeur fracture”?**

French orthopaedic surgeon Just Lucas-Championnière named this fracture after the many chauffeurs who started cars in the early 20th century. At the time, people started cars by vigorously turning a crank-handle clockwise. Sometimes the start of the motor caused the crank handle to jerk back. This led to a person’s hand twisting backward at the wrist and breaking the tip of the radial bone.

## **Symptoms and Causes**

### **What causes a chauffeur fracture?**

Trauma to your wrist causes a chauffeur fracture. This trauma may result from a:

· Fall onto an outstretched hand.

· Blow to the back of your wrist.

· Car accident.

· Sports injury.

### **Symptoms of a Chauffeur fracture**

If you have a chauffeur fracture, you may experience the following symptoms in your wrist:

· Bruising.

· Limited motion.

· Pain.

· Swelling.

· Tenderness.

· Unusual bend, bump or twist to your wrist.

## **Diagnosis and Tests**

Your healthcare provider will ask about symptoms and examine your wrist and other parts of your body for signs of trauma. They’ll also do a neurologic assessment to check for nerve function in your arm and hand. They may also do the following:

· **X-ray:** This diagnostic imaging test shows the location of the fracture, as well as the number of pieces of broken bone. Your provider will also look at radial length, often comparing both of your wrists.

· **CT (computed tomography) scan or magnetic resonance imaging (MRI):** These noninvasive tests can confirm fractures and show related damage to tendons, ligaments or soft tissue.

## **Management and Treatment**

Providers aim to put the broken bones back into their original place and keep them there while they heal. Treatment for a chauffeur fracture depends on:

· Severity of the fracture.

· Whether the injury happened in the hand you use most (dominant hand).

· Whether your bones have shifted (displaced).

· Your activity level.

· Your age.

· Other injuries to your arms or legs that may affect ability to function or bear weight.

Treatments for chauffeur fractures can be nonsurgical, though many of these fractures require surgery to heal. Treatments include:

**Closed reduction and casting:** Your provider will move your bones back into place if needed. This happens without making an incision into your skin. They will place a splint over your fracture for several days and then replace it with a plaster cast. Your provider may change your cast after two to three weeks and check X-rays along the way to ensure your fracture hasn’t changed. They usually fully remove your cast after about six weeks.

**External fixation:** Your provider places an external fixation (stabilizer) device across your wrist joint, attached by metal pins. They may use this treatment if bones fail to stay in place with a cast or you have multiple areas of trauma.

**Limited open reduction:** Your provider uses a small incision to move your bones back into their original place. Then, they use an external fixation device to maintain the position. Your provider may use this technique when your bones have shifted more than 2 millimeters.

**Open reduction and internal fixation (ORIF):** Your surgeon makes an incision in the volar part of your wrist (the front part, or the area where you feel your pulse). They reattach the pieces of your bone and hold them in place with a plate and screws. Some surgeons are now using 3D printing to create models of the area to increase accuracy.

## **complications/side effects of treatment**

Complications of treatment vary from person to person. The most common complication is when a fracture heals in a less than optimal position (malunion). This can result in a bone that’s shorter, twisted or bent. Other complications may include:

· Arthritis.

· Bones that fail to heal (nonunion).

· Compartment syndrome, when muscle pressure reaches dangerous levels.

· Complex regional pain syndrome (CRPS), which causes pain and swelling.

· Infection.

· Joint or tendon injuries.

· Neurologic injuries, such as carpal tunnel syndrome.

· Pain, stiffness or loss of motion.

· Ulnar wrist pain.

### **How soon after treatment will I feel better?**

Healing time after treatment varies from person to person. You may heal more slowly if you’re older or have other conditions such as osteoporosis or diabetes.

## **Outlook / Prognosis**

If you have surgery for a chauffeur fracture, your surgeon will place a splint on your wrist for about two weeks. During your follow-up visit, they’ll give you a removable splint to wear for about four weeks.

A chauffeur fracture may cause pain for a few days to a few weeks. Your provider may recommend pain relief, such as ibuprofen and acetaminophen. They may prescribe a stronger medication for severe pain.

Your provider will also show you gentle exercises to keep your wrist and fingers moving. They may recommend physical therapy to build up strength and movement in your wrist.

### **Are there long-term effects from it?**

You may have stiffness and pain in your wrist for up to two years. Physical therapy can help you regain motion in your wrist.

You can usually start light activities, such as swimming, about one to two months after cast removal or surgery. You can begin more energetic activities such as rugby or snowboarding about three to six months after cast removal or surgery.

Full recovery can take at least one year. Some people may experience permanent aching or stiffness, especially if:

· The injury was severe.

· They’re older than 50.

· They have osteoarthritis.

## **Prevention**

You can reduce your risk of developing a chauffeur fracture by:

· Doing weight-bearing exercises, such as walking, jogging and dancing, and doing resistance exercises, such as lifting weights.

· Eating a healthy diet with enough calcium and vitamin D.

· Preventing or managing osteoporosis through diet, exercise and medication.

· Quitting smoking and using tobacco products.

· Talking to your doctor about medications you currently take that may negatively affect your body’s use of calcium and vitamins.

· Trying to prevent falls at home by installing handrails near your stairs or grab bars in your bathroom.

· Wearing wrist guards and protective gear if you play high-impact sports such as football or rugby or do activities such as in-line skating or snowboarding.

### **When should I see my healthcare provider?**

See your provider if you’re not able to move your fingers within 24 hours after you get a cast or have surgery due to swelling or pain. You should try to regain the full motion of your fingers as soon as possible.

**DIFFERENTIAL DIAGNOSIS**

* Colles’ fracture
* Smith’s fracture
* Barton fracture
* Chauffeur’s fracture/radial styloid fracture
* Isolated distal radial fracture
* Both bone/radial and ulnar fracture
* Scaphoid/carpal bone fracture
* Scaphoid/carpal bone dislocation
* Distal radioulnar joint dislocation
* Carpal ligamentous disruption/TFCC injury
* Die-punch fracture
* Proximal metacarpal fracture
* Monteggia fracture
* Galeazzi fracture
* Greenstick fracture
* Torus/Buckle fracture
* Salter-Harris/growth plate fracture of radius (pediatric)

**EPIDEMIOLOGY**

Distal radial fractures are very common either in isolation or in concert with other fractures and injuries. For example, in the United States, there is an incidence of around 67 upper extremity fractures per 10,000 people annually. Distal radial and ulnar fractures account for approximately 25% of these fractures. With the exception of the 18 to 34-year-old age group, DR fractures are the most common upper extremity fracture. The overall incidence of DR fractures occurring each year is increasing worldwide. For example, a 1998 study by Melton et al., from Rochester, Minnesota in the United States documented a 17% increase in DR fractures between 1945-1994. Another 2017 study by Jerrhag et al., from Sweden showed a 2.0% increase in DR fractures per annum in men and a 3.4% increase in women aged 50-59 between 1999-2010. This study also showed statistically significant increases for the 17-64 year age group.

It is difficult to attribute the growing incidence of DR fractures to any single cause. However, the general thinking is that increased childhood obesity and the overall potential for people to live more years with comorbidities such as osteoporosis have primarily contributed to this problem. Another theory advanced is that increased participation in organized sports has led to more childhood DR fractures. It is also possible that increased access to care has led to an apparent increase in fractures while the true incidence has remained stable.

DR fractures can occur at any age. However, there is largely a bimodal distribution of these injuries based on age and sex. The two most common age groups are children less than 18 years old, and adults greater than 50 years old.

In children, the peak incidence of DR fractures is 12-14 years old in boys and 10-12 years old in girls. These peaks relate to the decreased level of skeletal mineralization and density that exist during pubertal growth spurts. During these times the rate of bone lengthening exceeds the rate of mineralization, which leaves these children more susceptible to fracture with even minor trauma. The majority (64%) of these fractures occur in males, primarily in the spring. “Fall” was listed as the primary mechanism in one large retrospective study by Ryan et al. Older adolescent athletes can also experience DR fractures. However, these patients have greater bone strength than younger, older, or more sedentary populations. There is usually a higher energy mechanism for these fractures that can lead to more severe injuries. Interestingly, the location of pediatric radial shaft fractures tends to occur more distally with increasing age.

The second peak for DR fractures occurs in adults greater than 50 years old. After the hip, they are the second most common fracture in the elderly. Peak incidence is in Caucasian women who are greater than 65 years of age. Osteoporosis is a common risk factor and occurs in 40% of postmenopausal women. The “T-score” is a measure of bone mineral density (BMD) that compares a patient’s BMD relative to that of a healthy 30-year old. The definition of osteoporosis is a T-score of less than -2.5. A T-score of less than -2.5 conveys a 10-year fragility fracture risk of around 15%. Other significant risk factors for DR fractures in patients older than 50 include prior falls, prior fragility fractures after 50 years of age, corticosteroid use, and advanced age. Dementia is also a risk factor in patients greater than 75 years of age. In older patients, each additional risk factor conveys increased probability of suffering a DR fracture. DR fractures extending into a joint space are twice as common in women with diabetes.

**Doctor-patient conversation about a Chauffeur fracture (radial styloid fracture)**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam, and you have a Chauffeur fracture, which is a break in the radial styloid — that’s the bony prominence on the thumb side of your wrist.”

Patient:  
“What caused this kind of fracture? Is it serious?”

Doctor:  
“This fracture usually happens due to a direct blow to the wrist or a fall where your wrist was bent in a certain way, like forced bending or twisting. It’s an intra-articular fracture, meaning it involves the joint surface, so it needs careful treatment to ensure proper healing and to prevent arthritis or wrist instability later on.”

Patient:  
“How will you treat it? Will I need surgery?”

Doctor:  
“If the fracture is small and the bone fragments are well aligned, we can treat it with immobilization — a cast or splint — for about 4 to 6 weeks. However, if the fracture is displaced or unstable, surgery may be necessary to realign and fix the bone fragments using plates or screws. Surgery helps restore wrist function and reduces the risk of long-term problems.”

Patient:  
“How long will it take to heal? When can I start using my wrist again?”

Doctor:  
“Bone healing usually takes about 6 weeks, but full recovery, including regaining strength and motion, may take a few months. You’ll wear a cast or splint during the initial healing phase, and once it’s removed, physical therapy can help you regain wrist movement and strength.”

Patient:  
“What kind of pain or complications should I expect?”

Doctor:  
“You’ll have some pain and swelling initially, which we can manage with pain relievers like acetaminophen or ibuprofen. Complications are rare but can include stiffness, arthritis, or nerve irritation if the fracture affects nearby structures. That’s why follow-up visits and therapy are important.”

Patient:  
“When can I return to normal activities or sports?”

Doctor:  
“Light activities can usually resume after the cast is removed and with your therapist’s guidance. Return to sports or heavy manual work typically takes 2 to 3 months, depending on how well you heal.”

Patient:  
“Is there anything I can do at home to help recovery?”

Doctor:  
“Yes, keep your wrist elevated to reduce swelling, avoid putting weight on it, follow your immobilization instructions, and attend all follow-ups and therapy sessions. Eating a healthy diet with enough calcium and vitamin D also supports bone healing.”

Patient:  
“Thank you for explaining everything. It helps me know what to expect.”

Doctor:  
“You’re welcome. If you notice increased pain, numbness, or swelling, or have any concerns, please contact us immediately. We’re here to support you throughout your recovery.”

### **References**

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# **Metacarpal Fracture**

A metacarpal fracture is a type of bone fracture (broken bone). Your metacarpals are the bones in your hand that connect your thumb and finger bones (your phalanges) to your wrist. You can feel your metacarpals by pressing on the back of your hand.

Metacarpal fractures are common injuries. They’re usually caused by falling onto your hand or sports injuries.

You might only need to wear a splint or cast while your bone heals after a metacarpal fracture. Some fractures require surgery to repair.

### **Metacarpal bones**

Each of your hands has five metacarpal bones that connect your wrist to your thumb and fingers. They’re labeled as your first metacarpal through your fifth metacarpal, starting at your thumb and working toward your pinkie.

· **First metacarpal**: The bone that connects your wrist to your thumb.

· **Second metacarpal**: The bone that connects your wrist to your index finger.

· **Third metacarpal**: The bone that connects your wrist to your middle finger.

· **Fourth metacarpal**: The bone that connects your wrist to your ring finger.

· **Fifth metacarpal**: The bone that connects your wrist to your pinkie finger.

#### **How is a metacarpal fracture classified?**

A healthcare provider will assign your fracture a type or classification depending on which bone was broken, the shape of the fracture or how it happened, and whether it’s open or closed.

### **Types of fractures**

Some fractures are classified by the shape or pattern of the break line:

· Transverse fracture.

· Oblique fracture.

· Spiral fracture.

· Segmental fracture.

· Comminuted fracture.

· Buckle fracture.

· Hairline fracture.

Some types of fractures are classified by how they happen:

· Compound fracture.

· Stress fracture.

· Avulsion fracture.

#### **Open vs. closed fractures**

A healthcare provider will classify your fracture as either open or closed. If you have an open fracture, your bone breaks through your skin. Open fractures usually take longer to heal and have an increased risk of infections and other complications. Closed fractures are still serious, but your bone doesn’t push through your skin.

#### **Displaced metacarpal fractures**

“Displaced” or “nondisplaced” are more words your provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke. Nondisplaced fractures are still broken bones, but the pieces weren’t moved far enough during the break to be out of alignment. Displaced fractures are much more likely to require surgery to repair.

#### **Metacarpal fracture locations and anatomy**

Any part of your metacarpal can be fractured. Parts of your metacarpals include the:

· **Base:** The end of your metacarpal furthest away from your fingers that meets your wrist bones. The end of the base forms a joint where the metacarpal connects to your wrist.

· **Shaft:** The long middle of your metacarpal.

· **Neck:** The part that joins the shaft and head.

· **Head:** The end of your metacarpal that connects to your finger bones. The end of the head forms a joint with your finger bones.

#### **Boxer’s fractures**

Fracturing the neck of the metacarpal that connects to your pinkie finger (your fifth metacarpal) is sometimes referred to as a boxer’s fracture. It’s the most common metacarpal fracture, making up 1 in every 4 metacarpal fractures.

Boxer’s fractures are usually caused by punching or hitting something hard with a closed fist (like punching a wall in frustration).

#### **Bennett and Rolando fractures**

Bennet and Rolando fractures are fractures that affect the joint at the base of your thumb metacarpal (the first metacarpal). They almost always require surgery.

## **Who do metacarpal fractures affect?**

Anyone can break a metacarpal bone. Some groups of people are more likely to experience a metacarpal fracture than others, including:

· People ages 10 to 40.

· Men.

· Women older than 50.

### **How common are metacarpal fractures?**

Metacarpal fractures are very common. They’re the third most common fracture. One in 10 of all broken bones is a metacarpal fracture.

Broken metacarpals are the most common hand injury for people ages 18 to 34.

#### **How will a metacarpal fracture affect my body?**

In addition to pain and other symptoms you might experience, a metacarpal fracture will make it hard — or impossible — to use your hand the way you usually can until it’s healed.

You’ll have to avoid using your hand as much as possible while you’re recovering. Talk to your provider about which motions or activities you’ll have to avoid (and for how long). Putting too much stress on your hand before your metacarpal fracture has healed can reinjure your bones and increase your chances of experiencing complications.

## **Symptoms and Causes**

Symptoms of a metacarpal fracture

· Pain.

· Swelling.

· Tenderness.

· Difficulty moving or using your hand.

· Bruising or discoloration.

· A deformity or bump that’s not usually on your body.

If you fracture a metacarpal, there’s also a good chance the other tissue in your hand around your bone is damaged, too. This includes your:

· Ligaments.

· Tendons.

· Muscles.

### **Causes metacarpal fractures**

The most common causes of metacarpal fractures include:

· Falls.

· Sports injuries.

· Other traumas like car accidents.

· Injuries at work or on job sites.

Other health conditions that affect your hands and fingers can make you more likely to experience a metacarpal fracture. Enchondromas — noncancerous tumors that grow inside your bones — can cause fractures.

#### **Osteoporosis**

You’re more likely to experience a fracture if your bones are weakened by osteoporosis.

Osteoporosis weakens bones, making them more susceptible to sudden and unexpected fractures. Many people don’t know they have osteoporosis until after it causes them to break a bone. There usually aren’t obvious symptoms.

Women older than 50 have an increased risk for developing osteoporosis. Talk to your provider about a bone density screening that can catch osteoporosis before it causes a fracture.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a metacarpal fracture with a physical exam and imaging tests.

They’ll probably be able to feel or see a metacarpal fracture in your hand, but you’ll still need imaging tests to confirm which bones are broken and what type of fracture you have.

You’ll need at least one of a few imaging tests to take pictures of your fracture, such as:

· **X-rays:** An X-ray will confirm any fractures and show how damaged your bones are.

· **Computed tomography (CT) scan:** A CT scan will give your provider or surgeon a more three-dimensional picture of your bones and the surrounding tissue than an X-ray.

· **Bone Density Test:** A bone density test (sometimes called a DEXA or DXA scan) can help diagnose osteoporosis.

## **Management and Treatment**

How your fracture is treated depends on which type it is, what caused it and how damaged your bones are.

#### **Immobilization**

If your fracture is mild and your bones didn’t move far out of place (if it’s nondisplaced), you might only need a splint or cast. Most people who experience a metacarpal fracture need immobilization for three to six weeks. You’ll need follow-up X-rays to make sure your bones are healing correctly.

#### **Closed reduction**

More severe breaks may require a closed reduction to set (realign) your bones. Your provider will physically push the outside of your hand to line up your broken bones. To prevent you from feeling pain during the procedure, you’ll receive one of the following:

· A local anesthetic to numb the area around your fracture.

· Sedatives to relax your whole body.

· General anesthesia to make you sleep through the procedure.

After the closed reduction, your provider will put you in a splint or cast.

### **Metacarpal fracture surgery**

Some metacarpal fractures require surgery. Depending on which type of fracture you have and how badly your bones are damaged, there are a few techniques your surgeon might use.

#### **Internal fixation**

Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals.

Internal fixation techniques include:

· **Plates and screws:** Metal plates screwed into your bone to hold the pieces together in place.

· **Pins (K-wires):** Stainless steel pins hold pieces of bone in place that are too small for other fasteners.

Most people live with these pieces inserted in them forever. You might need follow-up procedures to remove pins after your bones have healed.

#### **Arthroplasty**

If you fracture a joint in your hand, you might need an arthroplasty (joint replacement). Your surgeon will remove the damaged joint and replace it with an artificial joint. It’s rare to need an arthroplasty for a metacarpal fracture.

#### **Bone grafting**

You might need bone grafting if your metacarpal fracture is severely displaced or comminuted, or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to encourage your fracture to heal. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

· Internally, from somewhere else in your body — usually the top of your hip bone.

· An external donor.

· An artificial replacement piece.

After your surgery, your hand will be immobilized. You’ll need some combination of a splint or cast before you can start using it like you did before your fracture. You might need occupational therapy to help you regain your usual range of motion (how far you can move your hand).

### **What medications are used to treat metacarpal fractures?**

Over-the-counter (OTC) NSAIDs (like aspirin or ibuprofen) and acetaminophen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain.

### **Complications of metacarpal fractures and treatment**

Fracture surgery complications include:

· **Malunion**: This happens when your broken bones don’t line up correctly while they heal.

· **Nonunion**: Your bones may not grow back together fully or at all.

· **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin), you have an increased risk of bacterial infection.

· **Stiffness:** People who experience a metacarpal fracture usually feel stiffness around their fractured bone. Home exercises and occupational therapy can help reduce your stiffness.

· **Acute compartment syndrome**(ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.

### **How soon after treatment will I feel better?**

It might take a few weeks for your symptoms to improve. Pain should start getting better in a few days, but it’ll take around six weeks for your bone to regain its full strength.

Depending on which type of immobilization or surgery you needed to repair your fracture, you should be able to start moving your hand again in a few weeks.

Contact your healthcare provider right away if you experience intense pain that doesn’t get better.

## **Differential Diagnoses for Metacarpal Fracture**

* Fractures of neighboring bones:
  + Carpal bone fractures (e.g., scaphoid, lunate)
  + Phalangeal fractures (finger bones)  
    These may cause localized pain and swelling similar to metacarpal fractures.
* Soft tissue injuries:
  + Ligament sprains or tears around the metacarpophalangeal (MCP) or carpometacarpal (CMC) joints
  + Tendon injuries or ruptures
  + Joint capsule injuries  
    These can cause pain, swelling, and limited motion without a fracture.
* Metacarpal base injuries:
  + Base fractures of the 5th metacarpal (common in boxer's fractures) or thumb metacarpal (e.g., Bennett fracture)
  + Carpo-metacarpal joint dislocations or fracture-dislocations
* Growth plate (physeal) injuries in children:
  + Pseudoepiphysis or physeal separations can mimic fractures on imaging.
* Other causes of hand pain/swelling:
  + Soft tissue contusions or hematomas
  + Inflammatory or infectious conditions (less common in acute trauma setting)

## **Outlook / Prognosis**

You should make a full recovery if you break a metacarpal.

You’ll need occupational therapy to regain strength and range of motion in your hand.

#### **How long does it take metacarpal fractures to heal?**

How long it takes you to heal depends on the severity of the fracture and which treatments you need. Most people need a month or two to recover from a metacarpal fracture.

There are lots of factors that can affect how long it takes your body to heal. Talk to your provider or surgeon about a timeline that fits your specific situation.

#### **Will I need to miss work or school?**

You might have to miss work or school while your hand heals, especially if the broken metacarpal is in your dominant hand (the hand you use most often to write or do other tasks).

Most people can resume physical activities, like playing sports, after eight weeks. Talk to your surgeon or healthcare provider before resuming any physical activities.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

· Always wear your seatbelt.

· Wear the right protective equipment for all activities and sports.

· Make sure your home and workspace are free from clutter that could trip you or others.

· Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.

· Follow a diet and exercise plan that’ll help you maintain good bone health.

· Talk to your provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

· Use a cane or walker if you have difficulty walking or have an increased risk of falls.

## **Complications**

· Stiffness was the most commonly reported complication, with 76 % of patients studied reported to have total active motion less than 220°

## **Living With**

If you think you have a metacarpal fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

· Intense pain.

· You can’t move your hand or fingers like you usually can.

· Your hand is noticeably different-looking.

· You can see your bone through your skin.

· New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced trauma.

**EPIDEMIOLOGY**

While the most common fracture types of the upper extremity are distal radius followed by phalangeal fractures, metacarpal fractures are the third most common fracture. They are the second most common hand fractures. Metacarpal fractures account for approximately 40% of all hand injuries. Moreover, in patients in the 18 to 34-year-old age distribution, metacarpal fractures are the most common injury in the hand, with an incidence of 12.5 patients per 10000.Gender appears to factor in these injuries, as 76% of all metacarpal injuries occur in males.

The incidence rate of fracture associated with each digit's metacarpal bone increases from the radial to the ulnar side. The incidence rate of 2nd metacarpal fractures is lower than that of 5th metacarpal fractures. The metacarpal fractures may occur as isolated fractures, associated with other metacarpal fractures, or with other bony injuries

**Doctor-patient conversation about a metacarpal fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam. You have a metacarpal fracture, which means one of the long bones in your hand is broken. The most common type is called a ‘boxer’s fracture,’ which usually involves the neck of the fifth metacarpal, near your little finger.”

Patient:  
“What does this mean for my hand? How serious is it?”

Doctor:  
“It’s a common injury and usually heals well with proper treatment. You’ll likely have some pain, swelling, and bruising, and moving your fingers or wrist might be uncomfortable at first. Sometimes the finger may look a little crooked or bent, depending on the fracture.”

Patient:  
“Will I need surgery? Or just a cast?”

Doctor:  
“Most metacarpal fractures don’t require surgery. We usually start with a splint or buddy strapping, which means we tape the injured finger to the one next to it to protect and support it while it heals. Sometimes a cast or a special splint is used, especially if the fracture is more severe or if you’re a child. Surgery is only needed in a small number of cases, such as if the fracture is unstable, displaced, or rotated.”

Patient:  
“How long will I have to wear the splint or cast?”

Doctor:  
“Typically, the splint or buddy strap is worn for about 3 to 4 weeks. If you have a cast, it might be for a similar or slightly longer period. During this time, you should avoid heavy use of the hand and limit activities to light tasks.”

Patient:  
“When can I start moving my fingers and using my hand again?”

Doctor:  
“It’s important to start gentle finger movements early, even while wearing the splint, to prevent stiffness. After the splint or cast is removed, you may need some hand therapy or exercises to regain strength and flexibility. Most people can return to normal activities within 6 to 8 weeks, but contact sports or heavy manual work should be avoided for about 12 weeks.”

Patient:  
“What about pain? How can I manage that?”

Doctor:  
“You can take over-the-counter pain medications like paracetamol or ibuprofen as needed. Elevating your hand and applying ice in the first few days can also help reduce pain and swelling.”

Patient:  
“Are there any complications I should watch for?”

Doctor:  
“Watch for increased pain, swelling, numbness, or changes in finger position. If your finger starts to look more crooked or you have trouble moving it, please contact us. Most fractures heal well without problems if treated properly.”

Patient:  
“Thank you, that helps me understand what to expect.”

Doctor:  
“You’re welcome. We’ll arrange follow-up appointments to monitor your healing, and our hand therapy team can support your recovery. Feel free to reach out anytime if you have questions or concerns.”

### **What questions should I ask my doctor?**

## What type of fracture do I have?

You have a metacarpal fracture, which means one of the long bones in your hand is broken. The exact type depends on which metacarpal is involved (thumb, index, middle, ring, or little finger), the location of the break (head, neck, shaft, or base), and whether the bone fragments are displaced or rotated. The most common is the “boxer’s fracture,” involving the neck of the fifth metacarpal.

## Will I need surgery?

* Many metacarpal fractures can be treated without surgery using a splint, cast, or buddy taping, especially if the fracture is stable and nondisplaced.
* Surgery is recommended if the fracture is displaced, unstable, rotated, shortened, or involves the joint surface.
* Surgical options include internal fixation with pins (K-wires), screws, or plates to realign and stabilize the bone.

## How long will it take to recover?

* Immobilization typically lasts 3 to 6 weeks, depending on the fracture type and treatment.
* After immobilization, physical therapy or exercises help restore strength and motion.
* Full recovery usually takes 6 to 12 weeks, although some patients may take longer to regain full function.

## When can I resume physical activities or play sports?

* Light activities and gentle finger movements can often begin during immobilization or shortly after cast removal.
* Return to sports or heavy manual work is generally advised after 8 to 12 weeks, once sufficient healing and strength have returned.
* Your doctor and therapist will guide you on a safe timeline based on your progress.

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# **Femoral neck fracture**

A femoral neck fracture is a type of hip fracture of the thigh bone (femur)—just below the ball of the ball-and-socket hip joint. This type of fracture disconnects the ball from the rest of the femur. It often causes groin pain that worsens when you put weight on the injured leg.

Hip fractures are more common among older people, but they can occur occasionally in active younger people due to falls, auto accidents, and occasionally stress fractures related to overuse. Immediate treatment of a femoral neck fracture—or any hip fracture, for that matter—is essential to mitigating possible complications. The treatment is typically surgery, with physical therapy afterward.

A femoral neck fracture can be particularly serious because of a possible complication: It can cut off the blood supply to the head of the thigh bone. People with femoral neck fractures are typically advised to stop putting any weight on the affected hip—so that the hip doesn't dislocate. This affects activities such as walking, using the restroom, and even sleeping.

This article will discuss possible complications of femoral neck fractures, as well as what happens when you experience a femoral neck fracture, from diagnosis to treatment to recovery. It will also cover some ways you can prevent a femoral neck fracture.

## **Symptoms of a Femoral Neck Fracture**

Symptoms of a femoral neck fracture are the same as those of hip fractures in general—as well as other medical conditions. A healthcare provider can confirm the fracture and determine what type it is. If you've fractured your hip, you may experience the following:

· Pain felt in the hip, low back, and knee

· Inability to stand or walk

· Bruising

· Swelling

· One leg looking shorter due to an oddly turned foot

## **Femoral neck stress fracture causes**

Trauma is the most common cause of femoral neck fractures. Being over the age of 50 or having a medical condition that weakens your bones, such as osteoporosis, increases your risk of a fracture in the femoral neck. Having bone cancer is also a risk factor.

Falls are the most common cause of femoral neck fractures in older adults. In younger people, these fractures most often result from high-energy trauma, such as a vehicle collision or fall from a great height.

Femoral neck fractures are rare in children. Along with high-energy trauma, they can also be caused by low bone mineral density, such as osteopenia or osteoporosis, or by other conditions like cerebral palsy or muscular dystrophy.

## **When to see a doctor**

If you have insidious and progressive groin pain and pain with weight bearing on one side, make an appointment to see your doctor right away, so that he/she can determine whether you may have a femoral neck stress fracture. Because femoral neck fractures can cause a loss of blood flow to the femoral head, or avascular necrosis, early evaluation and treatment are essential.

## **Femoral Neck Fracture Diagnosis**

Your healthcare provider can usually diagnose a femoral neck fracture with a hip X-ray. In some cases, such as with a stress fracture, you might have symptoms, but your X-ray might not show significant findings. The fracture would likely be visible with a computerized tomography (CT) scan, magnetic resonance imaging (MRI), or a bone scan.

### **The Garden classification system**

This is used to rate the severity of a femoral neck fracture. There are four stages, or types, with type I being the least severe (an incomplete, non-displaced fracture; a partial break) and type IV being the most severe (a complete, fully-displaced fracture; bones are separated and out of alignment).

Your medical team will use this classification as they consider the most effective course of treatment for your fracture.

## **How Is a Femoral Neck Fracture Treated?**

Surgery is the most common treatment for a femoral neck fracture, though conservative management could be the best approach if surgery would be a very high risk for you or if you have a less-severe stress fracture.

Conservative treatments could include resting your hip joint, keeping weight off your hip with crutches, pain management, and physical therapy after the bone has healed. These approaches are rarely used instead of surgery.

### **For surgical treatment, the most important criteria include:**

· The severity of fracture displacement

· Patient age

· Open Reduction and Internal Fixation

During your surgery, your surgeon would manually re-align your displaced bone and use surgical pins, screws, or nails to hold your bones in place while they heal.4

There are several factors that determine whether you can place weight on your repaired hip. Check with your surgeon before initiating any physical therapy or exercise. As your bones heal, your pain should generally improve.

If you develop osteonecrosis, you may eventually need to have hip replacement surgery.

### **Partial or Full Hip Replacement**

In a hemiarthroplasty (partial hip replacement) or total arthroplasty, the bones of the ball-and-socket joint are removed and replaced with metal or ceramic implants. Hip replacement may be favored if you've had a displaced fracture because of the complications and healing rates associated with surgical repair of these types of fractures.

In younger patients, surgeons will make an effort to *avoid* a partial hip replacement, if possible. Hip replacements work very well for less active patients, but they tend to wear out in younger, more active patients. Some data shows that other surgical options work better in these individuals.

#### **Femoral Neck Fracture Recovery Time**

Rehabilitation typically begins immediately after a partial or full hip replacement. Many patients can progress quickly to walking with their full weight on the implant as their pain improves.

You'll likely remain in the hospital after surgery for three to five days. There, you may be given compression stockings to improve your leg's blood flow, as well as pain relievers and antibiotics to prevent infections. You may need to have a catheter inserted to drain urine for two to three days after the surgery—until you can start urinating on your own.

Despite being in the hospital, you'll be encouraged to move and walk as soon as possible, usually on the first day after the surgery. Staying active can help prevent complications of hip fracture surgery.

You will likely be given crutches or a walker at the hospital, which you may need to use for a few weeks to a few months after the surgery. Your healthcare provider or physical therapist can let you know when you can stop using the supports.

Physical therapy is recommended after femoral neck fracture surgery, beginning while you're in the hospital. Your physical therapist can also share some tips for a hazard-free home setup. You will likely need help around the home for the first one to two weeks after the surgery

## **Complications of Femoral Neck Fracture**

Mobility and quality of life are important factors when considering the impact of any hip fracture. Severe osteoarthritis can result after this type of fracture. Hip fractures are particularly dangerous for older adults.

Among older adults, the risk of death rises dramatically after sustaining such an injury. Overall mortality rates hover at 6% during hospital treatment and 20–30% during the first year after injury (with the highest rates during the first six months). Mortality can occur due to immediate complications like infection, or due to delayed complications due to lack of mobility—such as pneumonia and cardiovascular disease

If people don't get treatment for their femoral neck fractures, they may need to stay in a chair or in bed for a few months, avoiding putting any weight on the hip. This can cause them to decline both physically and mentally.

Prompt treatment of a hip fracture is crucial. Some research has shown the mortality and complication rates in elderly fracture patients can be better when surgery is done within 48 hours.

Femoral neck fractures can be complicated because the bone in that area is thin. And osteoporosis is often a contributing factor. In addition, the blood supply to the fractured portion of bone can be damaged at the time of injury, which impedes bone healing.

Disrupted blood flow to bone often results in osteonecrosis, a condition in which the bone cells die due to a lack of blood flow. This can lead to bone collapse in the area of injury.

## **How Is a Femoral Neck Fracture Prevented?**

Whether you're recovering from a femoral neck fracture or are at risk for one due to your age, here are some ways you can set up your home to avoid falling hazards

· Remove loose items such as wires, cords, or rugs from the floor.

· Ensure that your floor is even, especially around doorways, and that your furniture is steady.

· Maintain good lighting around the house, including setting up night lights.

· Make adjustments to your bathroom: Handrails next to the shower, bathtub, and toilet can be helpful, as can a slip-proof mat in your shower.

· Reduce your need to climb stairs and reach far by reorganizing items and moving your bed to the first floor.

· Avoid keeping small pets in your home.

You can also adopt lifestyle changes that keep your bones strong and prevent another fracture. These include:

· **Avoiding smoking**: This can prevent your bones from healing well.

· **Getting tested for osteoporosis**: This condition causes thin and weak bones. Your healthcare provider can help diagnose and treat it.

· **Perform regular exercise that puts weight on the hip**: This includes walking, jogging, or hiking.

· **Take care while walking**: Avoid carrying items in your hands so you can use your hands for balance.

· **Maintain a diet rich in vitamin D and calcium**: This includes consuming dairy products such as milk and yogurt, as well as sardines and broccoli, among other foods

Additionally, it's best to avoid staying in bed or a chair for a long time as it can cause pressure sores. It's also important to get your hearing and eyesight checked annually as you get older

## **Differential Diagnoses**

* Osteitis Pubis
* Slipped Capital Femoral Epiphysis
* Snapping Hip Syndrome

## 

## **Epidemiology**

### United States statistics

Stress fractures of the femoral neck are uncommon, but they may have serious consequences. Markey reported that femoral neck fractures comprise 5-10% of all stress fractures.Certain groups of athletes, including long-distance runners who suddenly change or add activities, appear to have a higher prevalence of femoral neck stress fractures compared with the general population.

Plancher and Donshik reported a prevalence rate of at least 10% for ipsilateral femoral shaft fractures, of which 30% are missed on the initial presentation.Brukner reported that women have a higher rate of stress fractures than men, with relative risks ranging from 1.2 to 10 for similar training volumes.Training errors are the most common risk factors, including a sudden increase in the quantity or intensity of training and the introduction of a new activity.

A number of factors predispose the elderly population to fractures, including osteoporosis, malnutrition, decreased physical activity, impaired vision, neurologic disease, poor balance, and muscle atrophy. Hip fractures are common and are often devastating in the geriatric population.More than 250,000 hip fractures occur in the United States each year; however, as reported by Koval and Zuckerman, with an aging population, the annual number of hip fractures is expected to double by the year 2050.

Prevention of osteoporosis is key to reducing these numbers, as osteoporosis remains the single most important contributing factor to hip fractures. The prevalence of hip fractures, regardless of location, is highest among white women, followed by white men, black women, and black men.

Koval and Zuckerman noted the age-adjusted incidence of femoral neck fractures in the United States is 63.3 cases per 100,000 person-years for women and 27.7 cases per 100,000 person-years for men.Femoral neck fractures in elderly patients occur most commonly after minor falls or twisting injuries, and they are more common in women. In addition, Joshi et al noted stress fractures of the ipsilateral femoral neck as a rare consequence of total knee arthroplasty.Influencing factors are correction of a significant knee deformity and inactivity before the total knee arthroplasty.

### International statistics

The exact incidence of femoral neck stress fractures is not known. Volpin et al reported a rate of 4.7% in 194 Israeli military recruits.Zahger et al reported a higher rate of femoral neck stress fractures in Israeli female military recruits.Insufficiency fractures are more common in females secondary to osteoporosis.

**Doctor-patient conversation about a femoral neck fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam, and you have a fracture of the femoral neck, which is the part of the thigh bone just below the ball of your hip joint.”

Patient:  
“What does that mean? How serious is it?”

Doctor:  
“A femoral neck fracture is a serious injury because this area has a limited blood supply, which can affect healing. It often causes severe hip or groin pain, difficulty or inability to bear weight, and sometimes the leg may look shorter or turned outward.”

Patient:  
“How did this happen? What will the treatment be?”

Doctor:  
“These fractures usually happen from a fall, especially in older adults with weaker bones, or from high-energy trauma in younger people. Treatment depends on your age, overall health, and the fracture type. Most patients will need surgery within 24 to 36 hours to fix or replace the hip to help you recover better and reduce complications.”

Patient:  
“What kind of surgery? Will I be able to walk again?”

Doctor:  
“There are different surgical options. For some fractures, we fix the bone with screws or a sliding hip screw. For others, especially if the bone is displaced or in older patients, we may replace part or all of the hip joint with a prosthesis. After surgery, most patients start physical therapy quickly to regain mobility. With proper care, many patients can walk again, often with assistance initially.”

Patient:  
“How long will recovery take? What should I expect?”

Doctor:  
“Recovery varies but generally takes several months. Early mobilization is important to prevent complications like blood clots or pneumonia. You’ll work with physical therapists to regain strength and balance. Full recovery may take 3 to 6 months or longer, depending on your health and rehabilitation.”

Patient:  
“What are the risks or complications?”

Doctor:  
“There are risks such as infection, blood clots, or problems with healing like non-union or avascular necrosis. We monitor closely to manage these. Early surgery and rehabilitation help reduce these risks.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Follow all post-op instructions, attend therapy sessions, maintain a healthy diet rich in calcium and vitamin D, and avoid falls. We’ll support you throughout your recovery.”

Patient:  
“Thank you, doctor. I feel better knowing what to expect.”

Doctor:  
“You’re welcome. If you have any new pain, swelling, or concerns, please contact us immediately. We’re here to help you every step of the way.”

References

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# **Tibia and fibula fractures**

Tibia (shin bone) and fibula (calf bone) fractures are two broken bones in your lower leg caused by major trauma that puts more pressure on your bones than they can handle.

Because they occur due to trauma like car accidents or falls, people often break both their tibias and fibulas during the same injury. It’s rare, but you can fracture either your tibia or your fibula without breaking the other.

Lower leg bone fractures are major injuries that need medical attention right away. You might need surgery to repair your bones and physical therapy to regain your ability to move your leg. But with time, your tibia and fibula should heal completely.

#### **Types of tibia and fibula fractures**

Your healthcare provider will assign the fracture a type or classification depending on how your tibia or fibula is broken. They classify some fractures by the shape or pattern of the break line:

· Transverse fracture.

· Oblique fracture.

· Spiral fracture.

· Segmental fracture.

· Comminuted fracture.

They classify some types of fractures by how they happen:

· Compound fracture (open fracture).

· Stress fracture.

· Avulsion fracture.

Other types of tibia and fibula fractures include:

· **Tibia plateau fractures:** When you break your tibia close to your knee and it damages your knee joint.

· **Displaced tibia and fibula fractures:** A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke.

· **Non-displaced tibia and fibula fractures:** Non-displaced fractures are still broken bones, but the pieces didn’t move far enough to be out of alignment during the break.

· **Distal fractures:** Distal is the end of a bone that’s further away from the middle of your body (trunk). If you have a distal tibia fracture, it means your shin bone is broken closer to your ankle.

· **Proximal fractures:** Proximal is the end of a bone that’s closer to your trunk. If you have a proximal fibula fracture, your calf bone is broken near the end that connects to your knee.

## **Symptoms and Causes**

Symptoms of tibia and fibula fractures include:

· Pain.

· Swelling (edema).

· Tenderness.

· An inability to move your leg like you usually can.

· Bruising or skin discoloration.

· A deformity or bump that’s not usually on your body.

### **What causes tibia and fibula fractures?**

Trauma almost always causes tibia and fibula fractures. Some of the most common causes include:

· Car accidents.

· Falls.

· Sports injuries.

You’re more likely to experience a fracture if osteoporosis weakens your bones. Osteoporosis makes your bones more susceptible to sudden and unexpected fractures. Many people don’t know they have osteoporosis until after it causes them to break a bone.

## **Diagnosis and Tests**

A healthcare provider will diagnose a tibia or fibula fracture with a physical exam and imaging tests. In some cases, this may be done in the emergency room (ER) if you’re admitted after trauma.

If you’re taken to the ER, a team of providers stabilize you and treat your injuries in the order of severity, especially if some are life-threatening. After you’re stabilized, you’ll need imaging tests to confirm the fracture.

#### **What tests are done to diagnose tibia and fibula fractures?**

You’ll need at least one of a few imaging tests to take pictures of your fracture:

· **X-rays:** X-rays confirm which of your lower leg bones are fractured. They also show how displaced the bones are.

· **MRI scan:** It’s rare, but your provider might use an MRI (magnetic resonance imaging) to get a complete picture of the damage to your bones and the area around them

· **CT scan:** A CT (computed tomography) scan will give your provider or surgeon a more detailed picture of your bones and the surrounding tissue than an X-ray.

## **Management and Treatment**

Treatment for a tibia/fibula fracture depends on which type it is, what caused it and how damaged your bones are. Treatment options include:

· **Immobilization:** If the break is mild and your bones didn’t move far out of place (if it’s non-displaced), you might only need a splint or cast. In both cases, you’ll likely need follow-up X-rays.

· **Closed reduction:** More severe breaks require a closed reduction to set (realign) your bones. It’s not surgery. Your provider lines up your broken bones by pushing and pulling them into place.

· **Internal fixation:** Fixation is surgery to repair a fracture. Your surgeon realigns your bones to their correct positions and secures them in place so they can heal and grow back together.

· **External fixation:** Your surgeon puts screws in your bone on either side of the fracture inside your body. Then, they connect the screws to a brace or bracket outside your body.

· **Physical therapy:** After surgery, you’ll need to work with a physical therapist to help increase your strength, flexibility and mobility.

#### **Complications of tibia and fibula fracture treatment**

Fracture surgery complications include:

· **Acute compartment syndrome (ACS)**: A buildup of pressure in your muscles may stop blood from getting to your tissue, which can cause permanent muscle and nerve damage.

· **Malunion**: This happens when your broken bones don’t line up correctly while they heal.

· **Nonunion**: Your bones may not grow back together fully or at all.

· **Bone infection** (osteomyelitis): If you have an open fracture (the bone breaks through your skin), you have an increased risk of bacterial infection.

· **Other internal damage**: Fractures can damage the area around the injury, including your muscles, nerves, blood vessels, tendons and ligaments.

## **Outlook / Prognosis**

It might take a few weeks for your symptoms to start to improve after treatment. Depending on which type of surgery you had to repair your fracture — and which of your two lower leg bones were broken — you should be able to start moving again in a few weeks. Contact your healthcare provider right away if you experience intense pain that doesn’t get better. Most people make a full recovery.

#### **How long does it take tibia and fibula fractures to heal?**

How long it takes you to heal depends on the severity of your fracture and which treatments you needed. Most tibia or fibula fractures will heal completely in four to six months.

There are lots of factors that can affect how long it takes your body to heal. Talk to your provider or surgeon about a timeline that fits your specific situation.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

· Always wear your seatbelt.

· Wear the right protective equipment for all activities and sports.

· Make sure your home and workspace are free of clutter that could trip you or others.

· Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.

· Talk to your provider about a bone density test if you’re 50 or older, or if you have a family history of osteoporosis.

· Use a cane or walker if you have difficulty walking or have an increased risk of falls.

### **When should I go to the emergency room?**

If you think you have a tibia or fibula fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

· Intense pain.

· You can’t move your leg like usual.

· Your leg looks noticeably different or is out of its usual place.

· You can see your bone through your skin.

· Swelling.

· New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced trauma.

### **Which questions should I ask my healthcare provider?**

Questions you may want to ask your provider include:

## Which bones are fractured?

You have a fracture involving the tibia (shinbone) and/or the fibula (calf bone). The tibia is the larger, weight-bearing bone located in the front of the lower leg, while the fibula is the thinner bone running alongside it. Fractures can involve different parts of these bones, such as the shaft, distal (near ankle), or proximal (near knee) ends.

## What type of fracture do I have?

Fractures are classified by the shape and pattern of the break, including:

* Transverse fracture: straight across the bone
* Oblique fracture: angled break
* Spiral fracture: twisting break
* Comminuted fracture: bone broken into multiple pieces
* Open (compound) or closed fracture: whether the skin is broken or intact
* Specific classifications like the Danis-Weber system classify fibular fractures based on location relative to the ankle joint (Type A, B, or C).

Your healthcare provider will assign a specific classification based on imaging and injury characteristics.

## Will I need surgery?

* Non-surgical treatment is possible if the fracture is stable, well-aligned, and closed (skin intact). This usually involves casting, bracing, or immobilization.
* Surgery is often required if the fracture is displaced, unstable, open, involves the joint, or if there is significant soft tissue injury. Surgical options include internal fixation with rods, plates, or screws to realign and stabilize the bones.
* The decision depends on fracture type, location, displacement, patient health, and associated injuries.

## How long will it take to recover?

* Recovery time varies but generally involves 6 to 12 weeks of immobilization or protected weight-bearing.
* Full recovery, including regaining strength and function, may take several months.
* Healing can be slower in open fractures or those with complications.

## When can I resume physical activities or play sports?

* Light activities and partial weight-bearing often start after initial healing, guided by your doctor or physical therapist.
* Return to sports or heavy physical activity is usually delayed until 3 to 6 months post-injury, depending on fracture healing and rehabilitation progress.
* Gradual progression with physical therapy is important to regain full function and prevent re-injury.

**Can you walk on a fractured tibia or fibula?**

Your ability to walk and move with a fracture in your lower leg depends on which bone is broken, what type of fracture it is and what kind of trauma caused the break.

Your fibula isn’t weight-bearing (it doesn’t support your body when you stand or move), so some people can walk with a fracture. However, you shouldn’t ignore pain or other symptoms in your leg. Even if you can move or walk, you should get your injury examined by your provider or in the ER right away.

It’s unlikely that you’ll be able to stand, walk or put weight on your leg if you have a fractured tibia. Because it’s weight-bearing, it’s especially important that you don’t try to “play through the pain” or ignore any symptoms.

If you were in a trauma and you experience symptoms, go to the ER right away.

**Differential diagnosis (DDX) for tibia or fibula fractures**

* Acute compartment syndrome
* Tibia fracture
* Fibula fracture
* Ankle fracture (including malleolar fractures)
* Ankle soft tissue injury (ligament sprains, tendon injuries)
* Child abuse (especially in pediatrics)
* Knee fracture (distal femur or proximal tibia)
* Pediatric limp causes (physeal injuries, infections)
* Peripheral vascular injuries (vascular compromise or ischemia)
* Soft tissue knee injuries (ligament or meniscal injuries)
* Stress fractures (overuse injuries)
* Bone tumors or infections (osteomyelitis, bone neoplasms)
* Muscle contusions or tendon ruptures

## **Epidemiology**

Fractures of the tibia are the most common long bone fractures. The annual incidence of open fracture of long bones is estimated to be 11.5 per 100,000 persons, with 40% occurring in the lower limb.The most common fracture of the lower limb occurs at the tibial diaphysis.Isolated midshaft and proximal fibula fractures are uncommon.

Toddler fracture (distal spiral fracture of the tibia) is most common among children aged 9 months to 3 years. In most cases, uncomplicated toddler fractures of the tibia do not need an orthopedic surgeon's intervention or follow-up. In a study of the National Pediatric Trauma Registry for children and adolescents with compartment syndrome over a 51-month period, 133 cases were identified. Boys outnumbered girls 4 to 1, the median age of patients was 12 years, and peak fracture incidence was reported in patients aged 10-14 years.

Tibial plateau fractures are common in the elderly population. Fractures in elderly patients may be complicated by osteoporosis, osteoarthritis, and medical comorbidities.

Fracture of the tibia is the most common lower extremity fracture among children. It accounts for 10-15% of all pediatric fractures.

**Doctor-patient conversation about a tibia or fibula fracture**

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam, and you have a fracture of your tibia and/or fibula, which are the two bones in your lower leg.”

Patient:  
“What does that mean? How serious is it?”

Doctor:  
“The tibia is the larger, weight-bearing bone in your shin, and the fibula is the thinner bone alongside it. A fracture means one or both of these bones have broken. The severity depends on the type and location of the break, but these fractures can cause pain, swelling, and difficulty putting weight on your leg.”

Patient:  
“Will I need surgery?”

Doctor:  
“That depends on the fracture. If the bones are well aligned and stable, we might treat it with a cast or brace and allow it to heal naturally. However, if the fracture is displaced, unstable, or involves the joint, surgery may be needed to realign and fix the bones using rods, plates, or screws. Surgery helps ensure proper healing and allows earlier movement.”

Patient:  
“How long will it take to recover?”

Doctor:  
“Typically, you’ll wear a cast or boot for about 6 weeks, but it can vary depending on your fracture and treatment. After immobilization, physical therapy is important to regain strength, range of motion, and balance. Full recovery can take several months, often around 3 to 6 months, depending on your overall health and adherence to rehab.”

Patient:  
“When can I start walking or using my leg again?”

Doctor:  
“Initially, you may need to avoid putting weight on the leg for several weeks. Gradually, as healing progresses, you’ll start partial weight-bearing and walking with support like crutches or a walker. Your physical therapist will guide you through exercises to safely increase your activity. Most people begin walking independently within a few months.”

Patient:  
“What kind of physical therapy will I need?”

Doctor:  
“Physical therapy usually starts with gentle ankle and knee range of motion exercises, followed by strengthening of the leg muscles. Balance training is also important to prevent falls and improve walking. Therapy is tailored to your progress and may include wobble board exercises and gait training.”

Patient:  
“What should I watch out for during recovery?”

Doctor:  
“Watch for increasing pain, swelling, numbness, or changes in skin color, which could indicate complications like compartment syndrome or infection. Also, follow all instructions about cast care and weight-bearing restrictions. If you notice any concerning symptoms, contact us immediately.”

Patient:  
“Thank you, doctor. That helps me understand what to expect.”

Doctor:  
“You’re welcome. We’ll support you throughout your recovery. Please attend all follow-ups and therapy sessions, and don’t hesitate to ask questions.”

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# **Broken Ankle**

The broken ankle happens when you break one or more bones in your ankle joint.

A broken ankle, or ankle fracture, is one of the most common causes of ankle pain. An ankle fracture happens when you break one or more bones in your ankle joint.

Your ankle joint consists of your tibia, fibula and talus. Your tibia is the big bone in your lower leg and is sometimes called your shinbone. Your fibula is a smaller, thinner bone in your lower leg (your calf bone). The lower ends of your fibula and tibia come together and butt up against your talus. Your talus is the main link between your leg and your foot.

You can break one or more ankle joint bones at the same time. Serious fractures require ankle surgery. It can take several weeks to a year to fully recover from a broken ankle.

### **Types of ankle fractures**

There are several types of fractures that can affect different parts of your ankle. Ankles are complicated. They’re made up of three bones and four ligaments, each doing a different job to keep your ankle in good working order. The different types of fractured ankles include:

· **Lateral malleolus fractures.** This injury happens when you break the bony knob on the outside of your ankle (lateral malleolus). This is the most common type of ankle fracture.

· **Medial malleolus fractures.** This fracture happens when you break the bony knob on the inside of your ankle (medial malleolus).

· **Bimalleolar fracture.** This fracture occurs when you break both bony knobs on your ankle. This is the second most common type of ankle fracture.

· **Bimalleolar equivalent fracture.** This fracture happens when you break one of your ankle bones and you damage ligaments inside your ankle.

· **Posterior malleolus fracture.** This injury occurs when you break your posterior malleolus, a bony section on the back of your tibia.

· **Trimalleolar fracture.** This type of fracture happens when you break all three of your ankle bones.

· **Pilon fracture.** Your tibia ends in a section called the roof of your ankle. When you break this section, it’s called a pilon fracture.

· **Maisonneuve fracture.** This fracture happens when you sprain your ankle and break the upper part of your fibula, near your knee.

· **Syndesmotic injury.** A syndesmotic injury happens when you have a fracture in your tibia or fibula and you sprain ligaments in your syndesmotic joint, located between your fibula and tibia.

## **Symptoms and Causes**

It’s not always easy to know if that pain in your ankle means your ankle is sprained or broken, or something else. And if your ankle is broken, you probably won’t know if you’ve broken more than one bone until a healthcare provider can take a look at it.

Broken ankle symptoms may include:

· Sudden, severe pain in your ankle

· Inability to put weight on your ankle

· Pain when you touch your ankle

· Bruising

· Swelling

### **Ankle fractures causes**

Most people break their ankles after taking a direct hit to one of them. They might fall hard or be struck by something that causes their ankle to break. Broken ankle causes include:

· Being in a motor vehicle accident

· Playing sports, particularly sports where you’re likely to be hit on your ankle or you make sudden moves that twist your ankle

· Falling from a significant height

· Tripping and falling

· Taking a misstep and “rolling" your ankle

## **Diagnosis and Tests**

A healthcare provider will use several tests to diagnose ankle fractures and determine the extent of your injury. Tests your provider might use to examine your fracture include:

· Physical examination

· X-ray

· Computed tomography (CT) scan

· Magnetic resonance imagery (MRI)

· Bone scan

## **Management and Treatment**

Ankle fracture treatment depends on factors like the number of ankle bones broken and the severity of the injury. Not all broken ankles require surgery, but all ankle fractures require some level of care to heal.

You probably won’t need surgery if you have a stress fracture or the fractured ankle is non-displaced. That means the bones aren’t out of place (they’re still lined up correctly). You might need a brace, cast or walking boot to support your ankle while it heals. More serious fractured ankles require closed reduction or surgery.

A closed reduction is when healthcare providers reposition your broken bones to correctly align your ankle. You’ll receive local anesthesia to numb your ankle.

#### **When does a broken ankle need surgery?**

A broken ankle that’s displaced typically requires surgery. “Displaced” means the bones are out of place (not in line). Surgeons use pins, wires, screws and sometimes plates to surgically repair fractured ankles. They’ll likely perform an open reduction and internal fixation.

## **Outlook / Prognosis**

It takes time for a broken ankle to heal. If you have surgery to repair more than one ankle bone, it could be two years before your ankle is back to normal. If you don’t need surgery, your ankle might heal within 12 to 16 weeks.

An ankle fracture will temporarily affect your quality of life, regardless of whether or not you have surgery. You may be in a cast or walking boot, taking medication or keeping weight off your ankle for several weeks to months. Your broken ankle recovery time can vary based on all of these factors.

## **Prevention**

Many ankle fractures happen after traumatic events such as motor vehicle accidents, falling or being injured playing sports.

But you can fracture your ankle simply by taking a misstep while walking, stepping off a curb or stumbling over something in your home. You can limit this kind of risk by:

· Taking extra care when walking on uneven surfaces and curbs

· Eliminating clutter in your home that can cause you to trip over and fall

· Wearing the right protective equipment for all activities and sports

### **When should I contact my healthcare provider?**

You should contact your healthcare provider or go to the emergency room if you have:

· Uncontrolled pain

· Numbness

· Tingling

· Increased swelling

· You can’t put weight on your ankle

· Signs of infection like fever, chills, redness or your cut (incision) is draining

**DIFFERENTIAL DIAGNOSIS**

Differentiating ankle fractures from other traumatic foot and ankle conditions is crucial, as these injuries can present with similar symptoms but necessitate distinct management approaches.

**Deltoid Ligament Sprain**

A deltoid ligament sprain typically presents with tenderness and swelling over the medial malleolus. Patients may experience pain when bearing weight. Weight-bearing ankle x-rays may reveal a shift of the talus, indicating instability. An MRI scan provides detailed images of soft tissue structures to help confirm a deltoid ligament sprain.

**Lateral Collateral Ligament Complex Sprain**

A lateral collateral ligament complex sprain presents with tenderness and swelling over the lateral malleolus, commonly resulting from an inversion injury. Like deltoid ligament injuries, severe ligament damage may result in talar shifting visible on weight-bearing x-rays. MRI imaging is useful for evaluating the lateral ligament complex, including the anterior and posterior talofibular ligaments and the calcaneofibular ligament, to confirm the diagnosis and assess the extent of injury.

**Achilles Tendon Rupture**

Patients with Achilles tendon rupture often report a sudden, sharp pain or a sensation of a snap at the back of the ankle. A palpable gap may be present on examination of the tendon. The Simmonds (Thompson) test assesses the tendon's structural integrity. The Simmonds test is performed in the prone position with the knee flexed. The examiner squeezes the belly of the calf muscle to simulate muscle contraction. If the tendon is intact, this will result in ankle plantarflexion (a negative Simmonds test). If the Achilles is completely ruptured, plantarflexion does not occur (a positive Simmonds test). Ultrasound is valuable for assessing the degree of rupture, determining the tendon gap, and planning treatment accordingly. X-rays are typically unremarkable.

**EPIDEMIOLOGY**

About 187 per 100,000 adults sustain ankle fractures every year.The incidence in the female population is highest in ages 75 to 84, compared to 15 to 24 years for males.Isolated unimalleolar fractures are the most common, accounting for 70% of the yearly incidence of all ankle fractures. About 20% of ankle fractures are bimalleolar, while trimalleolar fractures represent about 7% of all ankle fractures annually. The incidence of open ankle fractures is approximately 2%

### **What questions should I ask my healthcare provider?**

Questions you may want to ask your provider include:

## What kind of ankle fracture do I have?

**Ankle fractures are commonly classified by the Weber classification, which relates the fibular fracture location to the ankle syndesmosis (the ligament complex connecting the tibia and fibula):**

* **Weber Type A: Fracture below the syndesmosis (infra syndesmotic). Usually stable, involving the lateral malleolus below the ankle joint. The syndesmosis and deltoid ligament are intact.**
* **Weber Type B: Fracture at the level of the syndesmosis (transsyndesmotic). Often spiral fractures of the fibula. The syndesmosis may be partially injured, and the medial malleolus or deltoid ligament may also be involved. Stability varies.**
* **Weber Type C: Fracture above the syndesmosis (suprasyndesmotic). Usually unstable with syndesmosis disruption. Often associated with medial malleolus fracture or deltoid ligament injury.**

**Your doctor will determine which type you have based on X-rays and clinical findings.**

## Do I need surgery?

* **Type A fractures are usually stable and can often be treated without surgery, using a cast or walking boot.**
* **Type B fractures have variable stability; some may require surgery if there is syndesmotic injury or displacement.**
* **Type C fractures are generally unstable and almost always require surgical fixation (open reduction and internal fixation, ORIF) to restore ankle stability and function.**

## How soon can I put weight on my injured ankle?

* **For stable fractures (usually Type A), you may be allowed to weight bear as tolerated with a cast or boot, often immediately or within a few days.**
* **For unstable or surgically treated fractures (Type B or C), weight-bearing is usually delayed. You may need to use crutches and avoid putting weight on the ankle for 6 weeks or more, depending on your surgeon’s advice and healing progress.**

## How long before my ankle is completely healed?

* **Bone healing typically takes 6 to 12 weeks.**
* **Full recovery, including regaining strength, flexibility, and function, may take 3 to 6 months or longer, especially if surgery was required.**
* **Physical therapy plays an important role in recovery.**

### **Can you walk on a broken ankle?**

If you have a minor fractured ankle, you should still be able to walk on it. You might not even know you’ve broken it. But more severe fractures will require you to keep off your foot for several months. After treatment, as your ankle begins to heal, you can gradually return to walking.

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# **RIB FRACTURE(Broken Rib)**

A broken rib is a common injury that occurs when one of the bones in the rib cage breaks or cracks. The most common causes are hard impacts from falls, car accidents or contact sports.

Many broken ribs are simply cracked. Cracked ribs are painful. But they don't cause the problems that ribs that have broken into pieces can. The sharp edge of a broken bone can harm major blood vessels or lungs and other organs.

Usually, broken ribs heal on their own in about six weeks. Pain control is important for being able to breathe deeply and avoid lung issues, such as pneumonia.

## **Symptoms**

The following can cause pain with a broken rib or make pain worse:

· A deep breath.

· Pressure on the injured area.

· A bend or a twist of the body.

### **When to see a doctor**

See a health care provider if part of your rib area is tender after an accident or if you have trouble breathing or pain with deep breathing.

Seek medical help right away if you feel pressure, fullness or a squeezing pain in the center of your chest that lasts for more than a few minutes or pain that goes beyond your chest to your shoulder or arm. These symptoms can mean a heart attack.

## **Causes**

Direct impact — such as from a car accident, a fall, child abuse or contact sports — is the most common cause of broken ribs. Ribs also can be broken by repeated impact from sports such as golf and rowing or from coughing hard and long.

## **Risk factors**

The following can increase the risk of breaking a rib:

· **Osteoporosis.** This disease in which bones lose their bulk increases the risk of breaking a bone.

· **Sports.** Playing contact sports, such as hockey or football, increases the risk of injury to the chest.

· **Cancer in a rib.** Cancer can weaken the bone, making it more likely to break.

## **Complications**

A broken rib can harm blood vessels and internal organs. Having more than one broken rib increases the risk.

Complications depend on which ribs break. Possible complications include:

· **Tear in the main artery of the body, known as the aorta.** A sharp end from a break in one of the first three ribs at the top of the rib cage could pierce a major blood vessel, including the aorta.

· **Tear in a lung.** The jagged end of a broken middle rib can punch a hole in a lung and cause it to cave in.

· **Ripped spleen, liver or kidneys.** The bottom two ribs rarely break because they can move more than the upper and middle ribs. But the ends of a broken lower rib can cause serious harm to the spleen, liver or a kidney.

## **Prevention**

To help keep a rib from breaking:

· **Protect from athletic injuries.** Wear protective equipment when playing contact sports.

· **Reduce the risk of falls in the house.** Remove clutter from floors. Wipe up spills right away. Use a rubber mat in the shower. Keep your home well lit. Put backing on carpets and area rugs to keep them from sliding.

· **Strengthen bones.** Getting enough calcium and vitamin D in the diet is important for strong bones. Get about 1,200 milligrams of calcium and 600 international units of vitamin D daily from food and supplements.

## **Diagnosis**

During the physical exam, a health care provider might press gently on the ribs, listen to your lungs and watch your rib cage move as you breathe.

One or more of the following imaging tests might help with the diagnosis:

· **X-ray.** Using low levels of radiation, X-rays allow the bones to be seen. But X-rays might not show a fresh break, especially if the bone is only cracked. X-rays also can help diagnose a lung that has caved in.

· **CT scan.** This often can find breaks that X-rays might miss. CT scans also make it easier to see injuries to soft tissues and blood vessels.

· **MRI.** This scan can look for harm to the soft tissues and organs around the ribs. It also can help find smaller breaks.

· **Bone scan.** This is good for viewing cracked bones, also called stress fractures. A bone can crack after repetitive trauma, such as long bouts of coughing. During a bone scan, a small amount of radioactive material is injected into your bloodstream. It collects in the bones, particularly in places where a bone is healing, and is detected by a scanner.

## **Treatment**

Most broken ribs heal on their own within six weeks. Being less active and icing the area regularly can help with healing and pain relief.

### **Medicines**

It's important to relieve pain. Not being able to breathe deeply because of pain can lead to pneumonia. If medicines taken by mouth don't help enough, shots can numb the nerves that lead to the ribs.

### **Therapy**

Once pain is under control, certain exercises can help you breathe more deeply. Shallow breathing can lead to pneumonia.

## **Outlook / Prognosis**

If you have a rib fracture, you should expect to make a full recovery.

#### **How long does it take a rib fracture to heal?**

Most people need at least a month to recover from a rib fracture.

There are lots of factors that can affect how long it takes your body to heal. It can take longer to recover if you experienced other internal injuries during a trauma. Talk to your provider or surgeon about a timeline that fits your specific situation.

#### **Will I need to miss work or school?**

Your specific injuries will impact how long you’ll need to miss work, school and other activities. If you fracture a rib without damaging organs or other parts of your body, you shouldn’t have to miss work or school while you’re recovering.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re healing.

#### **Can I exercise with a fractured rib?**

Stay active while you’re recovering. Avoid intense workouts and playing sports, but moving and breathing as close to normally for you is an important part of your recovery. Talk to your provider about how much activity you should do with a broken rib.

## **Differential Diagnoses**

* Blunt Abdominal Trauma
* Aortic Dissection
* Amebiasis
* Domestic Violence
* Esophagitis
* Mechanical Low Back Pain
* Pneumothorax
* Pulmonary Embolism (PE)
* Sternal Fracture
* Blunt Chest Trauma
* Child Abuse
* Flail Chest
* Renal Trauma
* Clavicle Fractures
* Splenic Rupture

## **Epidemiology**

Rib fractures occur in 55% of patients who experience blunt chest trauma.The prevalence is linked to the prevalence of the underlying cause of the trauma. Rib fractures are more common in countries with a higher incidence of motor vehicle accidents.

In the United States, the incidence of rib fractures increased by 52% between 2012 and 2021. Among adult patients who presented to an emergency department with rib fractures, 58% were male and 50% were aged 65 years or older.

Because children have more elastic ribs, they are less likely than adults to sustain fractures following blunt chest trauma. Elderly individuals are more likely to have associated injuries and complications. Children present more frequently with trauma to the underlying chest and abdominal organs without the associated rib fractures commonly seen in adults. Classically, this made rib fractures in children an ominous sign of potential high-force injury. Bruising near the fracture site is uncommon with pediatric rib fractures, seen in only 9.1% of pediatric rib fractures in one study.

Older persons are more prone to rib fractures than younger adults and, therefore, the pulmonary sequelae such as atelectasis, pneumonia, and respiratory arrest.The presence of cardiopulmonary disease also significantly increases morbidity and mortality rates in patients older than 65 years.

## **Rib Fracture Procedure and Management**

* Initial Treatment:  
  Most rib fractures are managed conservatively without surgery. The mainstays of treatment include:
  + Rest and avoid activities that worsen pain or put pressure on the ribs.
  + Pain control with over-the-counter NSAIDs (ibuprofen, aspirin) or acetaminophen; stronger pain medications may be prescribed if needed.
  + Ice application for 20 minutes several times a day to reduce swelling and pain.
  + Breathing exercises and coughing with support (e.g., hugging a pillow) to prevent lung complications like pneumonia. Incentive spirometry may be recommended to encourage deep breathing.
  + Avoid chest binders or tight wraps, as they can impair lung expansion and increase pneumonia risk.
* When Surgery is Needed:  
  Surgery is rarely required and reserved for:
  + Severe fractures with displaced or multiple rib fractures causing flail chest.
  + Fractures that puncture or damage internal organs.
  + Nonunion or malunion where bones fail to heal properly.  
    Surgical repair involves internal fixation using plates and screws to realign and stabilize the ribs.
* Physiotherapy:  
  May be recommended to improve posture, flexibility, and strength, and to assist in breathing exercises and gradual return to activity.

## **Rib Fracture Healing Timeline**

| **Timeframe** | **What to Expect & Key Activities** |
| --- | --- |
| First few days | Rest, ice, pain control, begin gentle breathing exercises |
| First 1-2 weeks | Continue pain management, deep breathing, gentle activity as tolerated; monitor for complications (pneumonia, worsening pain) |
| 4-6 weeks | Most rib fractures begin to heal; pain generally decreases |
| 6 weeks | Significant healing; many patients resume most daily activities |
| 6 weeks to 3 months | Complete healing may take up to 3 months; gradual return to full activity and sports with guidance |
| Beyond 3 months | Rarely, persistent pain or complications may require further evaluation |

**Doctor-patient conversation about a rib fracture**

Doctor:  
“Hello, I’ve reviewed your symptoms and exam, and it looks like you have a rib fracture, which means one of the bones in your ribcage has cracked or broken.”

Patient:  
“Oh, that sounds serious. What does that mean for me? Will it get worse?”

Doctor:  
“Rib fractures are quite common after falls or blunt chest injuries. The good news is that most rib fractures heal on their own with time. The main concern is managing your pain and making sure you can breathe deeply to avoid lung complications like pneumonia.”

Patient:  
“I’m having quite a bit of pain, especially when I breathe or move. What can I do about that?”

Doctor:  
“Pain can be significant, especially in the first few days. We’ll give you painkillers to help manage it. It’s important to take them regularly so you can breathe deeply and cough when needed. I’ll also show you some breathing exercises to keep your lungs clear. Avoid tight bandages around your chest because they can make breathing harder.”

Patient:  
“Do I need any surgery or special tests?”

Doctor:  
“Most rib fractures don’t require surgery. We usually confirm the diagnosis with a chest X-ray, which you may have already had. Surgery is only needed if the ribs are severely displaced or if there are complications like damage to internal organs. We’ll monitor you closely for any signs of complications.”

Patient:  
“How long will it take to heal? When can I get back to my usual activities?”

Doctor:  
“Ribs usually take about 6 weeks to heal, but pain and discomfort can last a bit longer. You should avoid heavy lifting or strenuous activity until the pain improves. Gradually, you can return to normal activities as you feel able. If the pain worsens or you develop new symptoms like shortness of breath, fever, or increasing chest pain, please contact us immediately.”

Patient:  
“Is there anything else I should watch out for?”

Doctor:  
“Yes, watch for difficulty breathing, severe or worsening pain, or any signs of infection like fever. Also, if you notice numbness, weakness, or unusual symptoms, let us know. We’ll schedule follow-up to check your progress and adjust treatment if needed.”

Patient:  
“Thank you, doctor. That helps me understand what to expect.”

Doctor:  
“You’re welcome. Remember, managing your pain and breathing well are the most important parts of healing. We’re here to support you through your recovery.”

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# **Facial Fractures**

Facial fractures refer to broken bones in your face. This type of facial trauma (also called maxillofacial trauma) can happen if you’re involved in an accident, such as a car crash or fall. Facial fractures are also common among victims of physical assault and gunshot wounds. Your facial bones are thinner than a lot of other bones in your body, making them prone to injury.

#### **Types of facial fractures**

The most common facial fractures include:

· Nasal fractures (broken nose).

· Forehead fractures (broken frontal bone).

· Orbital fractures (eye sockets).

· Zygomatic fractures (cheekbones).

· Tripod facial fracture (involving your eye socket, cheekbone and upper jaw).

· Maxillary or mandibular fracture (broken jaw).

· Mid-face fractures (Le Fort fractures).

## **Symptoms and Causes**

Facial fracture symptoms depend on which area of your face has trauma.

General symptoms may include:

· Bruising.

· Swelling.

· Pain or tenderness.

· Facial numbness.

· Disfigurement.

If you have a broken nose, you may have:

· Difficulty breathing through your nose.

· Nosebleeds.

If you have fractured eye sockets, you may develop:

· Blurred vision.

· Double vision.

· Bulging eyeballs.

· Sunken eyeballs.

· Difficulty moving your eyes up, down or back and forth.

Fractured jaw symptoms may include:

· Drooling.

· Difficulty chewing or speaking.

· Pain when opening your mouth.

· Loose, broken or missing teeth.

### **What causes facial bone fractures?**

The most common cause of facial fractures is physical assault, followed by vehicular accidents and falls. Other causes include:

· Sports-related injuries.

· Workplace accidents.

· Domestic violence.

### **Complications of facial fractures**

Facial bone fractures can distort your appearance and interfere with normal function. For example, a person with a jaw fracture will have difficulty eating. Someone with a nasal fracture may have trouble breathing through their nose.

Facial trauma can also result in infections, internal bleeding and neurological issues. For instance, some facial bone fractures can cause a cerebrospinal fluid (CSF) leak.

To reduce your risk of complications, you should see a healthcare provider immediately following facial trauma.

## **Diagnosis and Tests**

During a visit with a healthcare provider, they’ll:

· Determine if you have any life-threatening injuries. (If you do, they’ll address them right away.)

· Check your nasal passages and airways for obstruction.

· Look at your eyes to see if they’re functioning properly.

· Check for damage to your central nervous system (your brain and spinal cord).

· Ask you to describe your symptoms.

· Ask about your facial injury and how it occurred.

· Check your face for asymmetry or damage.

· Gently palpate (press on) the bones of your face to determine the extent of damage.

#### **What tests help diagnose facial fractures?**

Imaging tests help healthcare providers diagnose facial fractures and rule out other issues like dislocation. Computed tomography (CT) is the most common imaging test used for diagnosing facial fractures.

## **Management and Treatment**

Your healthcare provider may prescribe pain relievers as well as corticosteroids to ease swelling. They may also prescribe antibiotics if there’s a high risk of infection.

Facial fracture treatment involves reduction and fixation.

· **Reduction**: resetting the broken bones and placing them in their correct positions.

· **Fixation**: keeping the bones in their new positions long enough for healing to take place. This usually requires keeping the affected bones still and preventing movement during recovery. Sometimes this requires surgical plates, screws and wires.

For a complex fracture with multiple broken bones, you’ll need facial reconstructive surgery. Specific treatment depends on the location and extent of your facial injury.

#### **Closed reduction**

Closed reduction involves resetting fractured bones without surgery. This means your provider can manually reset your facial bones without making incisions (cuts) or exposing your bone.

#### **Open reduction**

Open reduction involves surgical intervention. In these cases, the fractures are too complex for manual resetting. A provider will need to explore the area surgically to reset your facial bones.

#### **Facial reconstructive surgery**

Severe facial trauma may require reconstructive surgery. There are two main goals of facial reconstructive surgery:

1. Restore proper functions (like vision, chewing, swallowing or breathing through your nose).

2. Enhance and optimize your appearance.

### **How long does it take to recover after a facial fracture?**

It’s different for everyone. It depends on several factors, including the extent of your facial trauma, which treatment you had and your body’s own healing capacity.

People who go through facial reconstructive surgery usually notice that swelling and bruising fade after about two weeks. But it can take up to a few months for complete recovery.

## **Outlook / Prognosis**

Some people may not have long-term effects following a facial fracture. However, long-term complications are possible and may include:

· Sinus issues.

· Breathing issues.

· A change in your sense of taste or smell.

· Tingling or numbness.

· Vision issues.

· Headaches.

· Tenderness in your head or face.

Early intervention and treatment can reduce your risk for long-term complications. Your healthcare provider can tell you what to expect in your situation.

## **Prevention**

There’s no way to completely prevent facial fractures. However, you can take some steps to reduce the extent of injuries.

· Wear a seat belt when driving a motor vehicle or riding in one. Wear a helmet and other protective gear if you’re operating a motorcycle or all-terrain vehicle.

· Wear the correct protective equipment — such as a helmet, face mask or mouth guard — when playing sports.

· Follow safety guidelines at work and wear protective headgear if your job requires it.

### **When should I see my healthcare provider?**

If you think you could have a facial fracture, it’s important to seek medical help right away. Call a healthcare provider if you develop:

· Pain or tenderness at the injury site.

· Swelling.

· Redness.

· Bruising.

· Deformity.

· Loss of function.

Head to your nearest emergency room if you have any of the following:

· Open wounds where you can see the bone.

· Bloody or clear discharge from your nose.

· Blurred or double vision, or problems moving your eyes.

· Trouble swallowing or breathing.

· Displaced jaw or nose.

· Upper and lower jaw that don’t meet properly, or pain when you move your jaw.

· Loose teeth.

· Pain and swelling in your face.

### **What questions should I ask my healthcare provider?**

If you have facial trauma or fractures, here are some questions you might want to ask your healthcare provider:

### **How serious is a facial fracture?**

The majority of facial fractures aren’t life-threatening. However, some can lead to serious issues with your vision, airways, respiratory system or central nervous system.

You should see a healthcare provider any time you have facial trauma, even if you think it’s not serious. They can recommend appropriate treatment.

### **Can a facial fracture heal on its own?**

It’s possible for a facial fracture to heal on its own, especially if the broken bone stays in its proper position. However, in many cases, a healthcare provider will need to reset your facial bones for proper healing.

## **Differential Diagnoses**

* Cervical Spine Acute Bony Injuries in Sports Medicine
* Cervical Spine Sprain/Strain Injuries
* Concussion
* Facial Soft Tissue Injuries
* Nasal Fracture

## **Epidemiology**

### United States statistics

In 2025, Xu and Abramowicz noted that sports injuries account for 11.3-42.1% of facial fractures.Reehal reported that facial fractures represent 4-18% of all sports injuries.A review by Romeo of facial fractures sustained by athletes during sports participation noted that sporting activities account for 3-29% of facial injuries and 10-42% of all facial fractures.Tanaka and colleagues showed that 10.4% of all maxillofacial fractures are related to sports.

In another report, Laskin stated that 250,000 individuals, many of whom were children, experience facial trauma while engaged in athletic activities.The review by Hwang et al demonstrated that athletes aged 11-20 years were the population that accounted for most (40.3%) sports-related facial bone fractures.Additionally, it is estimated more than 100,000 sport-related injuries could be prevented by wearing appropriate head and face protection.

A retrospective study of pediatric sports-related facial fractures identified the most common fractures in the cohort as orbital, mandibular, nasal, and maxillary. Fractures were most often related to participation in baseball/softball and bicycling.

Retrospective analysis demonstrated a significant male predominance (13.75:1) among athletes who sustained sports-related facial bone fractures.The sports most commonly associated with facial fractures were soccer (38.1%), baseball (16.1%), basketball (12.7%), martial arts (6.4%), and skiing/snowboarding (4.7%).

Nearly 75% of facial fractures occur in the mandible, zygoma, and nose.Sports participation is the most common cause of mandibular fractures (31.5%), followed closely by motor vehicle accidents (27.2%). Most mandibular fractures (83% in one study) occur in men.A study of facial fractures sustained during recreational baseball and softball demonstrated that the zygoma or zygomatic arch was the most common fracture subtype, followed by temporoparietal skull fractures and orbital blow-out fractures.

A number of studies in the medical literature, however, indicate that the nasal bones are the most commonly fractured bones in the face, but because many of these patients do not seek medical treatment or the injuries are managed in the outpatient setting, the statistics may not reflect this trend. [2] It is likely that the nasal bones are more commonly fractured because of the lesser degree of force that is required to fracture the bone.

In a study of patients who presented to US emergency departments (EDs) with sports- or recreation-related nasal fracture, Xiao et al found that the most common causes of injury were basketball (23.2%), baseball (17.1%), softball (9.8%), soccer (7.4%), and football (7%). Among pediatric patients, the most frequent cause was baseball (25.1%).

Fractures of the orbit occur more commonly in young adult and adolescent males: the mean age for adult males is 32 years; the mean age for children, 12.5 years, and the majority of orbital fractures occur in boys. In addition to sports-related injuries, injuries sustained in motor vehicle collisions, assaults, and occupational injuries account for the majority of orbital fractures.

### International statistics

A UK study of patients with football-related facial injuries showed that 54% of these patients received a diagnosis of facial fracture. The researchers found that the most frequent injury was a midface fracture, and the most common cause was a clash of heads.

In a Finnish study of patients with sports-related nasal fractures, the majority of fractures (56%) were associated with team sports, and contact with another player was the most frequent cause of injury (52% of fractures). Among team sports, basketball posed the highest risk of nasal fracture.

**Doctor-patient conversation about a facial fracture**

Doctor:  
“Hello, I’ve reviewed your scans and examination, and you have a fracture in your facial bones. This means that one or more of the bones in your face have been broken due to the injury.”

Patient:  
“That sounds serious. What does this mean for me? Will it affect how I look or function?”

Doctor:  
“Facial fractures can vary in severity. Some affect just one bone, while others involve multiple bones and soft tissues. Our main goals are to restore your facial function—like chewing, speaking, seeing, and breathing—and also to optimize your appearance. Sometimes, fractures can cause swelling, bruising, or numbness, but with proper treatment, we aim to minimize long-term effects.”

Patient:  
“What kind of treatment will I need? Will I have surgery?”

Doctor:  
“The treatment depends on the type and location of the fracture. We use detailed CT scans to understand the exact break and plan your care. Some fractures heal well on their own with rest and support, but others require surgery to realign and stabilize the bones using plates and screws. These materials are safe and usually stay in place permanently without causing problems.”

Patient:  
“Will the surgery leave scars? How long will recovery take?”

Doctor:  
“We plan surgeries carefully to minimize visible scarring, often using natural skin creases or inside the mouth for incisions. Recovery time varies but generally takes several weeks to months. You’ll also work with therapists to regain facial movement and strength. We’ll monitor your healing closely and support you throughout.”

Patient:  
“Are there any risks or complications I should be aware of?”

Doctor:  
“As with any injury or surgery, there are risks like infection, nerve injury, or incomplete healing. However, our team is experienced in managing these injuries, and we take every precaution to reduce risks. Early treatment and follow-up are important to prevent complications.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Follow your treatment plan carefully, attend all follow-up appointments, and perform any recommended exercises or therapies. Avoid activities that might risk further injury. If you notice increased pain, swelling, vision changes, or difficulty moving your face, contact us immediately.”

Patient:  
“Thank you for explaining everything. It helps to know what to expect.”

Doctor:  
“You’re welcome. We’re here to support you every step of the way to help you heal both functionally and cosmetically.”

Reference

<https://my.clevelandclinic.org/health/diseases/16025-facial-fractures>

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# **CLAVICLE FRACTURE**

The clavicle is the bone that connects the breastplate (sternum) to the shoulder. It is a very solid bone that has a slight S-shape and can be easily seen in many people. It connects to the sternum at a joint with cartilage called the sternoclavicular joint. At the other end, the bone meets the shoulder area at a part of the shoulder blade (scapula) called the acromion. The joint at that end of the bone containing cartilage is called the acromioclavicular joint.

The collar bone acts as a strut to connect the sternum to the shoulder blade. Because of the critical location of the clavicle, any severe force on the shoulder, such as falling directly onto the shoulder or falling on an outstretched arm, transfers force to the clavicle. As a result, the collarbone is one of the most commonly broken bones in the body.

A clavicle fracture (broken collarbone) is a common injury that happens when the bone between your shoulder blade and breastbone breaks. Treatment is physical therapy and wearing a sling or immobilizer to keep the pieces of your collarbone in place while it heals. But you may need surgery if the sections of bone move around.

### **Types of clavicle fractures**

Your healthcare provider might use various terms to describe your fracture. They might describe it as:

· **Singular/comminuted**: Your clavicle can fracture in one place or in several places. You have a comminuted fracture if your collarbone breaks in more than one place.

· **Displaced/nondisplaced**: Your provider may say you have a displaced fracture if bone pieces that were lined up correctly move out of place.

Your provider may also use a specific classification system to label your fracture as a certain type. These types describe the fracture’s location and whether it affects nearby tissue or ligaments. The classification systems help your provider plan your treatment.

## **Symptoms and Causes**

Symptoms of a broken collarbone may include:

· **Bone pain**: You may have pain in your shoulder, close to the middle of your collarbone or at the base of your neck.

· **Difficulty moving your shoulder**: Your shoulder or arm might feel stiff. It might hurt more when you try to move it. You might feel or hear grinding or crackling when you move your shoulder.

· **Bruising**:Areas of skin along your clavicle may be darker than normal or discolored.

· **Visible misalignment**: Your shoulder may seem to slump unnaturally, or your collarbone may look like it’s higher or lower than the other one.

· **Skin tenting**: Pieces of bone may stick up under your skin to form what looks like a tent or bump over the section of broken bone. That can happen if you have a displaced clavicle fracture.

· **Swelling**: Your fracture can cause inflammation. This makes nearby muscles and other soft tissues swell. Your clavicle is close to your skin, so you’ll probably see and feel the swelling.

### **Fractured clavicle causes**

Most broken collarbones happen because of a traumatic injury, like:

· **Falls**: Falling on your shoulder or outstretched arm is a common way to break your collarbone.

· **Collisions**: Shoulder collisions are common sports injuries. Children may also collide during play.

· **Car accidents**: An accident may cause you to hit the dashboard or may trigger an airbag injury.

· **Birth trauma**: Babies whose shoulders get stuck in the birth canal can get clavicle fractures.

### **Complications of your fracture**

Most clavicle fractures heal completely and without any complications. But you should contact your healthcare provider if you have issues like:

· **Persistent bone pain**: A break that doesn’t heal may cause bone pain that doesn’t go away.

· **Bone deformity**: This is a bump on your collarbone that can happen if sections of your broken collarbone heal in the wrong position.

· **Calluses**: You have a buildup of hard, thick skin at the spot where your fracture healed.

· **Frozen shoulder**: The tissue around your shoulder can get stiff or tight if you don’t move it around enough as you heal.

· **Joint pain**: Damage to the cartilage in your shoulder can make your shoulder joint hurt.

## **Diagnosis and Tests**

Get help right away if you think you’ve broken your clavicle. A healthcare provider will:

· Ask how you got hurt

· Examine the area

· Take X-rays to confirm the fracture

X-rays will show the break location and type. Your provider may do a CT scan if you have more than one fracture.

## **Management and Treatment**

Most clavicle fractures heal well with conservative treatment. Only a small percentage will need surgery. Standard treatment for a broken collarbone includes:

· **Immobilization**: Your provider will give you a sling or shoulder immobilizer to help keep sections of your collarbone from moving around. You’ll wear this for several weeks.

· **Pain relief**: You might need prescription pain medications during the first week or two of recovery. After that, you can use over-the-counter (OTC) pain relievers, like aspirin, ibuprofen and acetaminophen.

· **Observation**: You’ll have regular checkups. Your provider may do X-rays to confirm that your collarbone is healing well.

· **Physical therapy**: Wearing a sling may make your soft tissues stiff. Your physical therapist will show you gentle exercises you can do as your clavicle heals. Once the bone has healed, you can work on rebuilding your muscle strength.

· **Surgery**:You may need surgery if pieces of your collarbone move out of place or the fracture damages nearby tendons, ligaments, blood vessels or nerves. An orthopedic surgeon will put the broken pieces back in place and use pins or plates and screws to keep them there.

#### **Recovery time**

Clavicle fracture recovery times may depend on factors like your age and the kind of fracture that you have. On average, healing may take:

· Eight to 12 weeks for adults

· Six to eight weeks for adolescents

· Three to six weeks for kids under 8

· About two weeks for a baby

Your healthcare provider will let you know when it’s safe to return to your usual activities.

### **When should I seek care?**

A clavicle fracture is a serious injury. Call 911 (or your local emergency service number) or go to an emergency room if you think you may have one.

If you’re recovering from a broken collarbone, contact a healthcare provider right away if you develop any new or unusual symptoms like:

· Faintness or feeling weak

· New pain or pain that gets worse

· Numbness or tingling

· Shortness of breath

## **Outlook / Prognosis**

If you’re recovering from a broken clavicle, follow these guidelines.

Do:

· Place ice on your shoulder for 20 minutes a few times a day to help ease pain and swelling

· Wear your sling or immobilizer all day and night (you can take it off to bathe)

· Use pain medications as needed, but only as directed

· Move your shoulder, arm and hand a little each day as instructed

· Go to all your follow-up appointments with your healthcare provider so they can make sure your clavicle is healing like it should

Don’t:

· Mix pain medicines unless your provider instructs you to

· Take more than the recommended dose of medications

· Drive while you still need your sling or immobilizer

· Use your arm to lift, push or pull until your provider says it’s okay

## 

## **Diagnostic Considerations**

Complications after group III (medial third of the clavicle) fractures resemble those associated with posterior sternoclavicular dislocations, including pneumothorax and compression or laceration of the great vessels, trachea, or esophagus.

The medial epiphysis ossifies later than the rest of the clavicle, beginning at age 12-19 years, and may not completely fuse until age 22-25 years. Physial injuries around this area may be mistaken for fractures, and care should be taken in evaluating injuries.

Neurovascular injuries, especially those to the ulnar nerve, are also included in the differential diagnosis of clavicle fractures.

## **Differential Diagnoses**

* Acromioclavicular Joint Injury
* Hemothorax
* Pneumothorax
* Rib Fracture
* Rotator Cuff Injury
* Scapula (Shoulder Blade) Fracture Management in the Emergency Department
* Shoulder Dislocation
* Sternoclavicular Joint Injury in Emergency Medicine

## 

## **Epidemiology**

### Occurrence in the United States

The clavicle is the most frequently fractured bone in the body in childhood, accounting for 10-16% of all fractures in this age group.

In adults, clavicle fractures account for 2.6-5% of all fractures and 44% of all shoulder girdle injuries.Middle third (group I) fractures account for 69-82% of all fractures of the clavicle, whereas distal third (group II) fractures account for 12%, and medial third (group III) fractures occur in 6% of cases.

Clavicular injuries affect 1 in 1000 people per year. Bimodal incidence occurs in men younger than 25 years and older than 55 years. Pneumothorax occurs in 3% of patients.

### International occurrence

The annual incidence rate of clavicular fractures is estimated to be between 30 and 60 cases per 100,000 population.

An analysis of 2,422 clavicle fractures in patients 15 years of age and older from 2013-2014 recorded in The Swedish Fracture Register reported that 21% of all fractures occurred in males 15-24 years of age and that 43% of all fractures were displaced midshaft fractures. Eleven percent of all fractures were treated operatively acutely with an additional 6% treated operatively after non-operative treatment was abandoned at an early stage (median of 14 days). Of the fractures that were treated operatively 80% were midshaft fractures.

### Sex- and age-related demographics

Clavicular injuries occur 2.5 times more commonly in males than in females, reflecting a greater involvement of males in contact and violent sports and motor vehicle accidents (MVAs).

Clavicle fractures, the most common of all pediatric fractures, can present even in the newborn period, especially following a difficult delivery. A large peak incidence occurs in males younger than 30 years due to sports injuries. A smaller peak occurs in elderly patients, who tend to sustain clavicle fractures (in association with osteoporosis) during low-energy falls

**Guidelines:**

* Strong evidence shows that operative treatment of displaced midshaft clavicle fractures in adults is associated with higher union rates and better early patient-reported outcomes than nonoperative management.
* Low-intensity pulsed ultrasound is not recommended for nonoperative management of acute midshaft clavicle fracture because it does not result in accelerated healing or lower rates of nonunion.
* Lateral locking plates may have fewer complications and better functional outcomes than hook plates for the treatment of lateral (Neer type II) clavicle fractures in adults.
* Surgical treatment of clavicle shaft fractures with an intramedullary nail or a single plate results in equivalent long-term clinical outcomes and similar complication rates.
* In the absence of reliable evidence, operative treatment in adolescents with displaced midshaft clavicle fractures may offer no benefit compared with nonoperative management.
* Generally, a sling is preferred for immobilization of acute clavicle fractures, rather than a figure-of-eight brace.

**Doctor-patient conversation about a clavicle fracture,**

Doctor:  
“Hello, I’ve reviewed your X-rays and examination, and you have a fracture of your clavicle, which is the collarbone connecting your shoulder to your chest.”

Patient:  
“What does that mean? How serious is it?”

Doctor:  
“Clavicle fractures are common injuries, often caused by falls or direct impacts to the shoulder. Most clavicle fractures heal well without surgery, but they can be painful and cause your shoulder to droop or feel unstable for a while.”

Patient:  
“Will I need surgery to fix it?”

Doctor:  
“Most patients don’t need surgery. We usually treat clavicle fractures with a sling to support your arm and simple pain relief. However, if the fracture is severely displaced, shortened by more than 2 centimeters, or if the bone fragments are completely out of place, surgery might be recommended to help the bone heal better and faster.”

Patient:  
“How long will it take to heal? When can I move my arm again?”

Doctor:  
“Typically, clavicle fractures take about 6 to 8 weeks to heal. You should wear the sling for comfort, but it’s important to start moving your elbow, wrist, and fingers soon after injury to prevent stiffness. Gentle shoulder movements can begin as pain allows, usually after a few weeks. Full return to activities, especially contact sports, often takes 10 to 12 weeks.”

Patient:  
“What about pain? How will it be managed?”

Doctor:  
“You’ll likely have some pain and swelling at first. Taking regular painkillers like paracetamol or ibuprofen helps. Keeping your arm supported in the sling reduces discomfort. If pain worsens or you experience numbness or weakness in your arm, please tell me immediately.”

Patient:  
“Is there anything I should watch out for during recovery?”

Doctor:  
“Yes, watch for increasing pain, swelling, numbness, or any changes in movement or sensation in your arm. Also, if you notice your shoulder becoming more droopy or unstable, or if you develop any breathing difficulties, seek medical attention promptly. We’ll schedule follow-ups to monitor your healing.”

Patient:  
“Thank you for explaining everything. It helps to know what to expect.”

Doctor:  
“You’re welcome. We’ll support you through your recovery and answer any questions along the way.”

## **Reference**

<https://my.clevelandclinic.org/health/diseases/16874-broken-collarbone-clavicle-fracture#management-and-treatment>

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# **Patella Fracture**

A patella fracture is a break in your kneecap — the small, flat bone that covers and protects your knee joint like a shield. It’s usually caused by direct injury like a fall on your knee, a blow to your knee or a collision, lik with the dashboard in a car accident. A patella fracture is a serious injury, which can impact your ability to bend or straighten your knee. Some patella fractures are simple, but this small bone is also capable of breaking into many pieces.

### **What happens when the patella fractures or breaks?**

A patella fracture is usually caused by a direct impact to your knee. Depending on the force applied, it may create a hairline crack, break into two pieces or it may break into many small pieces. Patella fractures can cause the extensor mechanism of your knee to no longer function properly. The quadriceps and patellar tendon attach to your patella, which normally allows you to flex and extend your knee. The patella is covered with cartilage, which provides a cushion for your knee joint. The cartilage can be injured with this type of fracture, which can lead to post-traumatic arthritis.

### **Types of patella fracture**

· **Stable patella fracture:** In a stable fracture, also called a “nondisplaced” fracture, the broken pieces of your bone remain essentially in the right place. They may still be connected to each other, or they may be separated by a millimeter or two. This type of fracture usually heals well without surgery. If your healthcare provider determines that you don’t need surgery, they will immobilize your knee in extension with either a knee immobilizer, a hinged knee brace or a cast. You’ll be allowed to bear as much weight as you’re comfortable.

· **Displaced patella fracture:** In a displaced fracture, your broken bone pieces have been displaced from their correct position and don’t line up with each other as they should. These pieces often need to be fixed with surgery in order to heal and allow your knee to function properly.

· **Transverse patella fracture:** A transverse fracture is a fracture where your patella breaks into two pieces. These breaks are often fixed with surgery. Various surgical techniques can be used to fix these injuries. Your surgeon will decide which is best for you.

· **Comminuted patella fracture:** In a comminuted fracture, your bone has shattered into three or more pieces. A comminuted fracture can be stable or unstable. When a comminuted fracture is unstable, some of your bone pieces may be too small to reconnect and may need to be removed in surgery.

· **Open patella fracture:** In an open fracture, your skin over your bone has been broken. Either your bone pieces themselves have penetrated through your skin, or something has penetrated your knee from the outside. An open fracture requires prompt treatment with antibiotics and surgery to thoroughly clean the wound. Open fractures tend to have a higher rate of infection, so it’s important to seek urgent medical treatment. Your surgeon will decide which surgical treatment will best fix your fracture.

Patella fractures are not common. They represent only 1% of all fractures. They are twice as likely to occur in men as in women.

## **Symptoms and Causes**

A patella fracture is usually caused by a direct blow to your kneecap, such as in a fall, from a sports injury or from a car accident. More rarely, it can also be caused by a sudden muscle contraction in your knee.

### **Signs and symptoms of a fractured patella**

· Pain.

· Swelling.

· Bruising.

· Palpable patellar defect (a change in your kneecap that you can feel through your skin).

· Inability to straighten your leg.

· Inability to raise your extended leg.

· Inability to walk.

### **Can you still walk on a fractured patella?**

A patella fracture will often leave you unable to walk. If you think you can, but it is still painful, it’s probably best not to try until you have been diagnosed. Once you have been diagnosed and treated for a patella fracture, you’ll be allowed to bear weight in a knee immobilizer, hinged knee brace or cast locked in full extension. Your orthopaedic surgeon will let you know how much you can bend your knee. At first, you won’t be allowed to flex your knee, but flexion will be allowed slowly, over time. You’ll be allowed to bear as much weight as you feel comfortable.

## **Diagnosis and Tests**

Your healthcare provider will ask about your symptoms and what happened at the time of the injury. Then they’ll examine your knee. They might have you try to extend your leg. If you can’t, that will likely necessitate surgical intervention. They may also be able to feel the edges of the fractured bone pieces through your skin.

They will check for open wounds and for signs of hemarthrosis — blood from the broken bone pieces collecting in your joint, which can cause excessive swelling. They will take X-rays or even a CT scan to define the fracture.

## **Management and Treatment**

**Examination:** The treatment for a patella fracture depends on the nature of your break. Your healthcare provider will begin by physically examining your knee and checking for signs of hemarthrosis. They may need to treat the hemarthrosis first by draining some of the blood. Then they will take X-rays to determine the type of fracture you have. If it is a stable fracture, your bone can be expected to heal without surgery.

· **Surgery:** If your bone pieces are displaced, they will need to be put back together in surgery. Bone pieces that are too far apart from each other have a hard time coming back together on their own because the strong muscles attached to your knee tend to pull the bone pieces apart. Orthopaedic surgeons can use screws, pins, plates or wires to reconnect your bone pieces. If your pieces of bone are too small, your surgeon may remove them. They may also need to reattach your tendon to your bone.

· **Rest:** You’ll be sent home with a cast, splint or brace to keep your knee in position and limit movement while it is healing. Your healthcare provider will let you know how much weight you can bear and how much you can bend your knee. Your healthcare provider will recommend over-the-counter pain medication with periodic ice and elevation to keep the swelling down.

· **Rehabilitation:** Physical therapy will be very important to restore the mobility of your knee. This injury can cause stiffness and muscle weakness, and you may need to retrain your knee to move as it did prior to your injury. Physical therapy may be ordered, which will focus on strengthening, stretching and range-of-motion exercises.

## **Outlook / Prognosis**

The healing process for a patella fracture can vary, depending on the severity of your break and whether you had surgery or not. Most people will be feeling good in about six weeks, and able to return to all of their normal activities within three to six months. Some people report long-term symptoms of pain or stiffness, and some choose to continue wearing a knee brace for support.

### **What’s the long-term outlook for a fractured patella?**

While most fractures are done healing within three to six months, it’s not uncommon for people to report long-term complications. These can include:

· Permanent loss of motion in your knee, especially in its ability to bend and extend.

· Chronic knee pain. Doctors aren’t sure why, but it seems to be related to stiffness and muscle weakness.

· Post-traumatic arthritis. This occurs when the cartilage that cushions your kneecap in the joint has been damaged. Up to 50% of people report some arthritis after about eight years.

## **Living With**

· Make sure to follow through with physical therapy after your fracture has healed, in order to restore your muscle strength and range-of-motion.

· Your healthcare provider may recommend trying to avoid stairs, squatting and bending, when possible, to limit stress on your knee and prevent future complications.

· If you suffer from chronic stiffness or weakness in your joint, you may want to continue wearing a knee brace for support.

· Non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin or ibuprofen, can help manage pain and inflammation flare-ups.

## 

## **Differential Diagnoses**

* Anterior Cruciate Ligament Injury
* Medial Collateral Knee Ligament Injury
* Meniscus Injuries
* Patellar Injury and Dislocation
* Patellofemoral Joint Syndromes
* Bipartite patella:  
  A congenital condition (2-3% of the population) where the patella has two separate bone fragments joined by fibrocartilage, usually asymptomatic but can cause pain after trauma or overuse. It typically affects the superolateral part of the patella and is bilateral in about 50% of cases.
* Patellar tendon rupture:  
  Presents with inability to extend the knee actively, swelling, and pain over the tendon below the patella.
* Quadriceps tendon rupture:  
  Similar presentation with loss of knee extension but pain and swelling above the patella.
* Tibial plateau fracture:  
  Fracture of the upper tibia near the knee joint, causing pain, swelling, and limited motion.
* Distal femur fracture:  
  Fracture of the lower end of the femur near the knee, causing similar symptoms.
* Cruciate or collateral ligament injuries:  
  Ligament tears causing knee instability, pain, and swelling.
* Meniscal injuries:  
  Cartilage tears causing joint line pain, swelling, and mechanical symptoms.
* Osteochondral fracture of the patella:  
  Injury to the cartilage and underlying bone, sometimes hard to distinguish from fractures.
* Osteochondritis dissecans:  
  A joint condition causing bone and cartilage separation, may mimic fracture symptoms.
* Prepatellar bursitis:  
  Inflammation of the bursa in front of the patella causing swelling and tenderness.
* Other knee conditions causing anterior knee pain:  
  Patellofemoral pain syndrome, tendinopathies (jumper’s knee), Osgood-Schlatter disease (in adolescents), arthritis, and infections.

## **Epidemiology**

Pain of the patellofemoral joint secondary to patellofemoral dysfunction is the most common disorder of the knee. A 5-year study published in 1984 revealed that 25% of all knee issues in a sports injury clinic were of patellofemoral origin. Another study similarly revealed that 1 in 4 runners is afflicted by patellofemoral pain. Whether related to sports or not, 1 of every 4 painful knees has been reported to be the result of patellofemoral dysfunction.

Patellar injury and dislocation are more prevalent in young female athletes. Anterior knee pain is the most common initial manifestation. One study reported 52% of 31 soccer players, 31% of 29 weightlifters, 21% of 28 long-distance runners, and 17% of 29 shooters reported knee pain at least once per month.Thijs et al evaluated gait-related intrinsic risk factors for patellofemoral pain in 102 novice recreational runners.The authors findings suggested an increased risk for patellofemoral pain may be due to excessive impact shock during heel strike and at the propulsion phase of running. In addition, Thijs et al believe their results do not support the theory that those at risk for this condition show an altered static foot posture relative to those who are unaffected.

Swimming also places the athlete at risk for knee pain.On the other hand, sports such as tennis are not associated with knee pain. In summary, factors that cause knee pain include the type, amount, and duration of sports activity.

In addition to activity-specific variance, patellofemoral pain displays some variation between the sexes. A study revealed that in the general population, the female-to-male ratio for patellofemoral dysfunction is 2:1. In the general population, patellofemoral instability has been reported to occur in 5.8 per 100,000 persons, whereas in young female athletes (aged 10-17 years) this number has been reported at 29 per 100,000.

Patellofemoral disorders are more likely the result of inappropriate activity duration and type as opposed to genetic factors. Aoyagi et al examined the higher prevalence of joint pain of female Japanese individuals living in rural Japan versus female Americans of Japanese descent living in Hawaii.Despite the similar genetic stock, significant differences in prevalence of joint pain were noted. The researchers postulated that environmental factors influencing activity levels and types were responsible.

Similarly, Zhang et al found that Chinese women in Beijing have a higher prevalence of knee osteoarthritis versus American women in Framingham, Massachusetts.Again, this was thought to be the result of the lower activity levels of women living in the United States. In the same study, men from Beijing were found to have a similar incidence of knee osteoarthritis compared with their Framingham counterparts.

**Doctor-patient conversation about a patella fracture**,

Doctor:  
“Hello, I’ve reviewed your X-rays and clinical exam, and you have a fracture of your patella, which is the kneecap bone.”

Patient:  
“Oh no, what does that mean? How serious is it?”

Doctor:  
“The patella is an important bone that helps you straighten your knee by connecting your thigh muscles to your lower leg. A fracture here can cause pain, swelling, and difficulty straightening your leg or walking. The seriousness depends on whether the fracture pieces are displaced (moved apart) or if the extensor mechanism—the system that allows you to extend your knee—is intact.”

Patient:  
“Will I need surgery?”

Doctor:  
“If the fracture is non-displaced and your knee can still straighten, we usually treat it conservatively with a cast or brace keeping your knee straight for about 4 to 6 weeks. You’ll likely use crutches to avoid putting weight on your leg initially. If the fracture is displaced or if you cannot actively straighten your knee, surgery is often recommended to realign and stabilize the bone fragments, usually with wires or screws.”

Patient:  
“How long will it take to recover?”

Doctor:  
“Bone healing typically takes about 6 weeks, but regaining full strength and motion can take several months. After immobilization, you’ll start physical therapy to restore your knee’s range of motion and strength. Most people gradually return to their normal activities over 3 to 6 months.”

Patient:  
“What kind of pain should I expect, and how will it be managed?”

Doctor:  
“Pain and swelling are common, especially in the first few days. We’ll provide pain medications to keep you comfortable. It’s important to control pain so you can begin gentle movement exercises as advised.”

Patient:  
“Are there any risks or complications?”

Doctor:  
“Complications can include stiffness, weakness, or in rare cases, problems with healing. Surgery carries risks like infection or hardware irritation, but these are uncommon. We’ll monitor you closely throughout your recovery.”

Patient:  
“What should I do to help my recovery?”

Doctor:  
“Follow the treatment plan carefully, keep your knee immobilized as directed, attend all physical therapy sessions, and avoid putting weight on your leg until cleared. If you notice worsening pain, numbness, or inability to move your knee, contact us immediately.”

Patient:  
“Thank you, doctor. That helps me understand what to expect.”

Doctor:  
“You’re welcome. We’ll support you through your recovery and answer any questions along the way.”

Reference

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# **Acetabular fracture**

An acetabular fracture is a break in your hip socket. Your hip is a “ball-and-socket” joint. Your acetabulum, which is part of your pelvis, forms the socket. Your femoral head, which is the upper end of your femur (thigh bone), forms the ball. The ball-and-socket joint allows movement between your thigh bone and your pelvis. This joint is what lets you walk.

An acetabular fracture can cause a significant loss of motion and function. Acetabular fractures are much less common than most hip fractures. Most hip fractures are in the upper femur or femoral head.

### **Types of acetabular fractures**

Acetabular fractures can occur on your left or right. Your acetabulum can break in different places and in different ways called patterns. These patterns are based on location, orientation or in a combination. Acetabular fractures include:

· **Anterior wall fractures:** An anterior wall acetabular fracture is a break in the front column of bone or area around the bony rim (wall) of your hip socket.

· **Posterior wall fractures**: A posterior wall acetabular fracture is a break in the back column of bone or area around the bony rim (wall) of your hip socket.

· **Transverse fractures**: A transverse acetabular fracture means your acetabulum broke at a 90-degree angle or perpendicular to the long part of your bone.

· **Comminuted fractures**: A comminuted acetabular fracture means your acetabulum broke into more than two fragments.

· **Stress fractures**: An acetabular stress fracture is a small crack in your acetabulum bone. This type of fracture happens because of overuse or repeated stress put on your acetabulum bone.

### **How is the severity of an acetabular fracture determined?**

Sometimes an acetabulum breaks straight across and other times it shatters into pieces. The severity of your fracture depends on the following factors:

· Number and size of bone fragments.

· How much each fragment is out of place.

· Injury to your cartilage.

· Injury to muscle, tendons, nerves and skin around your hip.

Open or compound fractures (when bone fragments stick out of the skin) are particularly severe because infection can occur in both the bone and the wound.

Knowing the pattern and severity of your fracture can help your healthcare provider determine the correct treatment for you.

## **Symptoms and Causes**

The bones of your pelvis, including your acetabulum, are very strong. It would take a strong force to break them. Acetabular fractures most commonly occur due to high-energy injuries. These injuries include car and motorcycle accidents and falls from significant heights. Acetabular fractures occur due to weakened bones, too. Some older people with osteoporosis get acetabular fractures after simple falls.

### **Symptoms of an acetabular fracture**

An acetabulum fracture causes severe hip pain. The pain is sometimes worsened with movement. If you’ve damaged any nerves, you may feel numbness or a tingling sensation down your leg. You may also feel weakness in your leg.

## **Diagnosis and Tests**

Your healthcare provider will examine your pelvis, hips and legs. They may:

· Ask you to move your ankles and toes, checking for nerve damage.

· Examine you for other injuries, depending on the cause of your injury.

Your healthcare provider may also request the following imaging tests:

· X-ray: An X-ray can show which bones in your hip are broken and if the bone fragments are in place.

· Computed tomography (CT) scan: A CT scan can show the severity of your injury by producing a cross-sectional image of your hip.

## **Management and Treatment**

Treatment for an acetabular fracture depends on the pattern of fracture and severity of your injury. If your fracture is stable and the bones are in place, surgery may not be necessary. Your healthcare provider may recommend:

· **Crutches or a walker**: Until your bones are fully healed, you won’t be able to put any weight on your leg. You may be on crutches or a walker for up to 12 weeks.

· **Leg-positioning device**: Your healthcare provider may want to restrict the positioning of your hip. You may use an abduction pillow or knee immobilizer to keep your hip in place.

· **Pain relievers**: Your healthcare provider may prescribe a medication to help with the pain.

· **Anti-coagulants (blood thinners)**: Your healthcare provider may prescribe blood thinners to reduce the risk of blood clots forming in the veins of your legs.

· A surgeon needs to repair most acetabular fractures with surgery. Depending on the pattern and severity of your injury, your surgeon may perform:

· **Open reduction and internal fixation (ORIF)**: With an ORIF, your surgeon puts the bone fragments back in place. A surgical anchor holds the fragments together until the bone heals.

· **Total hip replacement**: If your acetabulum is weak or too damaged to repair, your surgeon may perform a total hip replacement. With a total hip replacement, your surgeon removes the damaged hip and cartilage and replaces them with artificial parts.

### **What are the complications of an acetabular fracture?**

An acetabular fracture can cause difficult complications. These include:

· **Posttraumatic arthritis**: Cartilage covers your acetabulum bone. When you injure your acetabulum, you also injure the cartilage around it. When your cartilage becomes uneven, it can lead to wear and tear in the joint. This can cause arthritis.

· **Avascular necrosis or osteonecrosis**: Acetabular fractures can interrupt the blood supply to your acetabulum bone. Without the correct blood supply, your bone cells die. This can make your bone collapse.

· **Infection**: Infections can occur around the site of your incision or deep within your wound. Deep infections usually require surgery to clean the wound.

· **Blood clots**: Since you won’t be able to walk right away after surgery, the normal amount of blood flow in your legs will lessen. This increases your chance of blood clots.

· **Sciatic nerve injury**: Your sciatic nerve passes near the back of your hip socket. Your fracture or the surgery to repair it can cause injury to your sciatic nerve. This injury is called “foot drop,” a condition where you can’t lift your ankle or toes off the floor while walking.

· **Heterotopic ossification**: This is a condition where bone grows in the muscles, tendons and ligaments around your hip socket.

## **Outlook / Prognosis**

After surgery, you’ll experience pain. Your healthcare provider can prescribe a medication to help with the pain. These medications may include non-steroidal anti-inflammatory drugs (NSAIDs) or local anesthetics.

When you start walking again, you may have to use crutches or a walker. You may be able to put partial weight on your leg after six to eight weeks. You won’t be able to put full weight on your leg for a few months. You may have to continue using your walking aid.

Your healthcare provider may recommend early physical therapy to begin moving your hip again. Exercise can help build strength and endurance in your hip. Over time, your healthcare provider may allow additional low-impact exercises such as swimming or riding a stationary bike. You won’t be able to engage in more physical activity for six to 12 months.

## **Living With**

Your outcome will depend on the pattern and severity of your injury, as well as other factors such as your age and medical history. Long-term complications are a concern after an acetabular fracture. Arthritis in your hip is of particular concern because of the cartilage surrounding your hip socket. While some people return to normal functioning, many people don’t return to the same level of activity they participated in before.

## **Common Questions**

### **How long does it take for an acetabular fracture to heal?**

It takes eight to 12 weeks for an acetabular fracture to heal. The outcome varies depending on the severity of the fracture, type of fracture, any other injuries sustained, your age, health history and smoking status. (Smoking can hinder the healing process and also increases your risk for complications.)

### **Can an acetabular fracture heal on its own?**

If your fracture is stable and the bones are in place, surgery may not be necessary. However, you will still need non-surgical treatment from a healthcare provider. This may include recommendations for walking aids, positioning aids and medications.

### **How long is acetabulum surgery?**

Surgical time varies by the severity of the fracture and may range from two to six hours.

DIFFERENTIAL DIAGNOSIS

In general, one should not confuse acetabulum fractures with other fracture types given the advent of CT scans. Other fracture patterns on the differential include fracture of the pelvic ring and fractures of the proximal femur. In elderly patients that sustain low energy falls with fractures, one must be judicious about ruling out a pathologic fracture

**EPIDEMIOLOGY**

These are commonly a result of high-speed car crashes, falls from heights, and extreme sporting events. As mentioned above, the incidence over the past couple of decades has remained stable at 3 per 100000 people per year. The number of fractures caused by motor vehicle accidents has remained similar, but the number from falls from less than 10 feet has increased. There has also been an increase in the average age in patients with acetabulum fractures

**Doctor-patient conversation about an acetabular fracture,** Doctor:  
“Hello, I’ve reviewed your scans and examination, and you have an acetabular fracture, which means a break in the socket part of your hip joint where the ball of your thigh bone fits.”

Patient:  
“That sounds serious. What does this mean for my hip and walking?”

Doctor:  
“The acetabulum is a critical part of the hip joint. When it’s fractured, the ball of your femur may not fit properly, which can cause pain, difficulty moving your leg, and instability. The severity depends on how many pieces the bone is broken into, how much the fragments are displaced, and whether the cartilage surfaces are damaged.”

Patient:  
“Will I need surgery? How urgent is it?”

Doctor:  
“Most acetabular fractures require surgery to realign the bone fragments and restore a smooth hip socket surface. However, we usually don’t operate immediately. First, we make sure you’re stable overall, especially if this injury was caused by a high-energy trauma like a car accident. Sometimes, we use skeletal traction—a system of weights and pins—to keep your leg aligned and reduce pain while preparing for surgery.”

Patient:  
“What does the surgery involve?”

Doctor:  
“During surgery, we reposition the broken bone fragments into their normal alignment and fix them with metal plates and screws. The goal is to restore the hip socket so that your femoral head fits well and the joint surfaces are smooth, reducing the risk of arthritis later on. The approach depends on the fracture pattern—sometimes from the front, side, or back of the hip.”

Patient:  
“How long will recovery take? When can I walk again?”

Doctor:  
“Recovery is gradual. After surgery, you’ll likely need to avoid putting weight on the leg for several weeks while the bone heals. Physical therapy will help you regain motion and strength. Full recovery can take several months. In some cases where the acetabulum is severely damaged, a total hip replacement might be necessary, but that is less common.”

Patient:  
“What are the risks or complications?”

Doctor:  
“Risks include infection, blood clots, nerve injury, or problems with bone healing. There is also a risk of developing arthritis in the hip joint over time. We’ll monitor you closely and manage any complications promptly.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Follow all instructions carefully, attend all follow-ups and physical therapy sessions, and avoid putting weight on your leg until we say it’s safe. Keeping your overall health good—like nutrition and avoiding smoking—also helps bone healing.”

Patient:  
“Thank you, doctor. I appreciate you explaining everything.”

Doctor:  
“You’re welcome. We’ll support you through every step to help you recover as fully as possible.”

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### **Talus fracture**

Your talus is a bone in your foot that connects your ankle to your leg. A talus fracture is a break in this bone. Your talus joins with your tibia and fibula (lower leg bones) to form your ankle joint. This joint allows for the up and down movement of your foot. Your talus sits above your heel bone (calcaneus), forming your subtalar joint. This joint allows for the side-to-side movement of your foot.

Your talus helps transfer weight across your ankle joint. It’s mostly covered in cartilage. Cartilage is a slippery material that allows your bones to move smoothly against each other. A talus fracture can cause a significant loss of motion and function because of how important it is for ankle movement.

### **Types of talus fractures**

Your talus bone can break in different places and different ways. Talus bone fractures include:

· **Neck.** The most common type of talar fracture occurs in the midsection of your talus. This is called the neck. The neck is between the “body” of your talus, which is under your tibia by your ankle joint, and the “head” of your talus, which is farther down your foot.

· **Lateral process**. The outside of your talus bone is called the lateral process. These types of fractures occur when your ankle is forced outward to the side. Lateral process talus fractures are commonly seen in snowboarders and are sometimes called “snowboarder fractures.”

· **Avulsion fractures**. A talar avulsion fracture occurs when a small part of your talus bone pulls away from the rest of the bone where it’s attached to a ligament or tendon.

· **Stress fractures**. A talar stress fracture is a small crack in your talus bone. This type of fracture happens because of overuse or repeated stress put on your talus bone.

### **How are talus fractures classified?**

Talus fractures are classified by how much the talus or pieces of bone have moved out of their normal position. These classifications include:

· **Minimally displaced or stable**. The talus bone is only slightly out of place and the broken ends of your bones still line up correctly or almost correctly.

· **Displaced**. The talus bone breaks and the pieces move out of their normal position.

· **Open or compound**. The talus bone breaks through your skin. The surrounding muscles, tendons and ligaments may be affected as well.

## **Symptoms and Causes**

The most common symptoms of a talus fracture include severe ankle pain and swelling. Other symptoms may include:

· Difficulty walking.

· Inability to place weight on your foot.

· Bruising.

· Tenderness.

· Fracture blisters (fluid-filled blisters on your skin).

### **How do talus fractures happen?**

Talus fractures most commonly occur due to high-energy injuries. These injuries include car and motorcycle accidents and falls from significant heights. Talus fractures occur due to sports injuries, too. Many snowboarders break their talus bones. Sometimes, talus fractures occur due to twisting your ankle, which can result in small chips breaking off the edges of your talus.

## **Diagnosis and Tests**

Your healthcare provider will examine your ankle and foot, looking for swelling, bruises and cuts. They may:

· Ask you to move your toes, checking for nerve damage.

· Check the pulses in your foot, to ensure a good blood supply.

· Make sure fluid isn’t building up in the muscles of your leg. This is called compartment syndrome, which can result in a loss of feeling and function in your leg.

· Examine you for other injuries, depending on the cause of your injury.

Your healthcare provider may also request the following imaging tests:

· **X-ray**. An X-ray can show if your talus is broken, if the bone fragments are in place and how many bone fragments there are.

· **Computed tomography (CT) scan**. A CT scan can show the severity of your injury by producing a cross-sectional image of your foot.

## **Management and Treatment**

Treatment for a talus fracture depends on the type of fracture and the severity of your injury. First, you’ll be placed in a splint to keep your foot and ankle from moving. If your fracture is stable and your joints are well-aligned, surgery may not be necessary. Your healthcare provider may recommend:

· **Casting**. A cast holds together the bones in your foot and ankle while they heal. Typically, you’ll have to wear the cast for six to eight weeks and put minimal pressure on your foot.

· **Rehabilitation**. After the cast is removed, you’ll be given exercises to help restore the strength and function of your foot and ankle.

For most talus fractures, ankle surgery will be recommended because of the high-energy force that caused the injury. If your bones are out of place, a foot and ankle surgeon will perform surgery to reset them.

If your bone is broken into several pieces, your surgeon may perform an open reduction and internal fixation (ORIF). With an ORIF, your bone fragments are put back in place and held together with a metal plate and/or screws until your bone heals.

If there’s too much swelling, your surgeon may place you in an external fixator. With an external fixator, your surgeon will place large pins in your bones to hold them in place. The pins are visible from the outside of your skin and are held together with special bars. After the swelling goes down, your surgeon may try an ORIF again.

### **What are the complications of an untreated talus fracture or a talus fracture that doesn’t heal properly?**

A talus fracture can cause difficult complications if left untreated or if it doesn’t heal correctly. These complications include:

· **Posttraumatic arthritis**. Your talus bone is covered in cartilage. When you injure your talus, you also injure the cartilage around it. When your cartilage becomes uneven, it can lead to wear and tear in the joint. This can cause arthritis.

· **Malunion**. A malunion means the fractured bone healed in an abnormal position. A malunion can lead to long-term problems like difficulty walking.

· **Nonunion**. A nonunion means the fractured bone didn’t heal after an extended period of time.

· **Avascular necrosis or osteonecrosis**. Blood supply to your talus bone can be interrupted because of a fracture. Without the correct blood supply, your bone cells die. This can lead to the collapse of your bone.

## **Outlook / Prognosis**

After surgery, you’ll experience some pain. Your healthcare provider can prescribe a medication to help with the pain. These medications may include opioids, nonsteroidal anti-inflammatory drugs (NSAIDs) or local anesthetics.

Once your talus bone is healed, your healthcare provider may recommend rehabilitation or physical therapy to help improve the function of your ankle. Exercises can help with your range of motion, stability and strength in your foot and ankle.

When you start walking again, you may have to wear a special boot or use a cane. You won’t be able to put full weight on your foot for a few months.

Your healthcare provider will want to take X-rays to make sure the bone has healed properly, too.

## **Common Questions**

### **What is the long-term prognosis for a talus fracture?**

With or without surgery, your foot will be in a cast or splint. You won’t be able to put any weight on it or walk on it. Depending on the complexity of your injury, you may have to wear the cast for eight to 12 weeks or more.

The more severe your injury, the longer your foot will be in a cast. You may have persistent pain, stiffness and swelling even after the bone heals. After treatment, many people may return to normal activities after your healthcare provider gives you clearance to do so.

### **When can I go back to work?**

Depending on the severity of your injury and the type of job you have, you may not be able to return to work right away. Most people don’t return to work for at least two weeks. If you’re on your feet all day, you may not be able to return to work for up to a year.

### **Can you walk on a talus fracture?**

It depends on the type of talus fracture you have. A talus fracture can be a severe injury. A talus fracture can result in a significant loss of motion and function of your ankle and foot joints. This can affect your ability to walk and bear weight on your foot.

### **How long does it take for a talus fracture to heal?**

Depending on the complexity of your injury, you may have to wear a cast for three months or more. You may have pain, swelling and stiffness even after the cast is removed.

### **What does a talus fracture feel like?**

A talus fracture is a high-impact injury. People describe talus fractures as extremely painful.

### **How do you fix a broken talus?**

Some talus fractures can be corrected by casting and rehabilitation. However, most talus fractures require surgery to correct the alignment of your bones.

**DIFFERENTIAL DIAGNOSIS**

With the provided history of high-energy trauma to the foot and ankle and the above clinical findings, the primary differential diagnoses are fractures of other bones of the foot and ankle with or without injuries to the soft tissues of the foot and ankle such as ligaments, tendons, and neurovascular structures. Radiographic evaluation often narrows the differential diagnosis. Accessory ossicles are common variants of the foot and ankle which require differentiation from traumatic injury. The os trigonum can mimic a fracture of the posterior process. An acute fracture will have radiographic findings of irregular, jagged margins, while an os trigonum will have smooth, well-corticated margins.

**EPIDEMIOLOGY**

In general, talar fractures are uncommon, constituting less than 1% of all fractures in the human body and between 3% and 6% of fractures of the foot. There is likely no age predilection for these fractures, although the association with MVC would suggest increased incidence in younger patients. Also, there is a significant male predilection, with up to 73% of talar fractures occurring in men.While the incidence of these fractures is likely not increasing, these types of injuries (and, in particular, the more severe fracture patterns) are increasingly being seen due to increased survival from serious injuries.Some reports suggest that there may be an increasing incidence in lateral process fractures due to snowboarding.

Talar head fractures are the least common type of talar fractures, compromising 5 to 10% of all talar fractures. Talar neck fractures were traditionally considered the most common type of fracture, first described in WW1 pilots, though recent evidence suggests that they are likely less common than body fractures, comprising approximately 5% of talar fractures. Discrepancies may be related to differences in the definition of anatomic boundaries between the neck and body (discussed below). It is worth noting that talar neck and body fractures correlate with calcaneal and spine fractures. There is also significant variation in the reported incidence of body fractures, 13% to 61%

**Doctor-patient conversation about a talus fracture,**

Doctor:  
“Hello, I’ve reviewed your examination and imaging, and you have a fracture of the talus bone in your ankle. This is a small but very important bone that helps connect your foot to your leg and allows your ankle to move smoothly.”

Patient:  
“That sounds serious. How did this happen, and what does it mean for me?”

Doctor:  
“Talus fractures usually happen after high-impact injuries, like a fall from a height, a car accident, or certain sports injuries such as snowboarding. The fracture causes severe pain, swelling, and usually makes it impossible to put weight on your foot.”

Patient:  
“Will I need surgery? How do you decide?”

Doctor:  
“We base the treatment on the type and severity of the fracture. If the bone pieces are still in place and stable, we might treat it without surgery by immobilizing your ankle in a cast or boot for about 6 to 8 weeks. However, if the fracture is displaced, unstable, or involves multiple fragments, surgery is usually needed to realign and fix the bone with screws or plates.”

Patient:  
“What does the surgery involve?”

Doctor:  
“The surgery, called open reduction and internal fixation, involves making an incision to access the bone, carefully repositioning the fragments, and securing them with hardware like screws or plates. This helps the bone heal properly and reduces the risk of complications like arthritis or bone death.”

Patient:  
“How long will it take to recover? When can I walk again?”

Doctor:  
“Recovery can be lengthy. You’ll likely need to avoid putting weight on your injured foot for at least 6 to 8 weeks, sometimes longer depending on healing. Physical therapy will be important to restore movement and strength. Full recovery can take several months.”

Patient:  
“Are there any risks I should know about?”

Doctor:  
“Yes, talus fractures carry risks such as poor healing or avascular necrosis, where the bone loses its blood supply. There’s also a risk of arthritis developing later. We’ll monitor you closely and manage any issues promptly.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Follow all your treatment instructions carefully, keep your foot elevated to reduce swelling, avoid weight-bearing until cleared, attend all follow-up appointments, and participate fully in physical therapy when it starts.”

Patient:  
“Thank you, doctor. I feel better knowing what to expect.”

Doctor:  
“You’re welcome. We’ll work together to help you heal as well as possible.”

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Talus Fractures: Types, Symptoms, Treatment & Recovery

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### **Jones fracture**

Jones fractures are a type of broken bone. They happen when you break your fifth metatarsal — the bone that joins your pinkie toe to the base of your foot.

Jones fractures are caused when you put sudden force on the outside of your foot with your foot twisted away from your body. Repeated overuse, sports injuries and falls are the most common causes of Jones fractures. You might need surgery to repair your bone. Most people need a few months to recover from a Jones fracture.

#### **Jones fracture vs. avulsion fracture**

Jones fractures and avulsion fractures are different types of bone fractures in your feet. In fact, they both refer to breaks of the same bone, your fifth metatarsal — the bone that joins your pinkie toe to the rest of your foot. The differences between Jones and avulsion fractures are small, but important.

Your fifth metatarsal has three zones along its length, starting from the base near the middle of your foot and extending out toward your toes. These zones tell your healthcare provider specific details about exactly where you broke your fifth metatarsal.

· **Zone 1:** The base of your metatarsal, where it joins the rest of your foot. Breaks in this zone are called avulsion fractures, dancer fractures, pseudo-Jones fractures or tennis fractures. These breaks are usually treated without surgery and heal in around two months after wearing a boot or cast.

· **Zone 2:** The middle part of your fifth metatarsal meets the base of Zone 1. If Zone 1 is the “head” of your fifth metatarsal, Zone 2 is the “body” extending out from it, further away from the middle of your foot. Fractures in Zone 2 are Jones fractures. Jones fractures usually require surgery, and have higher risks for complications than other types of foot fractures.

· **Zone 3:** The part of your fifth metatarsal that connects to your toe bones. Fractures in Zone 3 are usually stress fractures that take longer to heal and sometimes require surgery.

All of these names and terms can be confusing. No matter where your fracture is, the most important first step is getting your injury examined by a provider as soon as possible. They will explain which type of fracture you have and what you’ll need to do to fix it.

Jones fractures are one of the most common foot fractures. They’re especially common in athletes, dancers and people with jobs that require them to be on their feet constantly.

### **Who gets Jones fractures?**

Jones fractures — like all bone fractures — can affect anyone. You’re more at risk for a Jones fracture if you regularly put a lot of stress on your feet in ways most people don’t. Some examples of this include:

· Athletes.

· Dancers.

· Workers who walk or stand most of the time.

Men around 30 and women over 70 are also more likely to experience Jones fractures than other age groups.

People with osteoporosis have an increased risk for all types of broken bone, including Jones fractures.

## **Symptoms and Causes**

Symptoms of a Jones fracture include:

· Pain.

· Swelling.

· Tenderness.

· Difficulty walking like you usually can.

· Bruising or discoloration.

· A deformity or bump that’s not usually on your foot.

#### **Displaced Jones fractures**

Displaced or nondisplaced are more words your provider will use to describe your fracture. A displaced fracture means the pieces of your bone moved so much that a gap formed around the fracture when your bone broke. Non-displaced fractures are still broken bones, but the pieces weren’t moved far enough to be out of alignment during the break. Displaced fractures are much more likely to require surgery to repair, non-displaced fractures are less likely to need surgery.

### **What causes Jones fractures?**

Jones fractures are caused by a sudden impact to your foot while it’s twisted, usually with your heel lifted. Some of the most common causes include:

· **Repeated overuse:** Walking, running or standing on hard surfaces for too long.

· **Sports injuries:** Jumping like in basketball or dancing, or twisting quickly like in soccer or football.

· **Falls and slips:** Tripping on the stairs, or catching yourself suddenly after slipping on a wet floor, for example.

## **Diagnosis and Tests**

Your healthcare provider will diagnose a Jones fracture with a physical exam and imaging tests.

### **What tests are done to diagnose a Jones fracture?**

After a physical exam, you’ll likely need at least one of a few imaging tests:

· **X-rays:** An X-ray will confirm any Jones or other fractures and show how damaged your bones are.

· **Magnetic Resonance Imaging (MRI):** Your provider might use an MRI to get a complete picture of the damage to your bones and the area around them. This will show them tissue around your bones too. This is especially important to determine if your muscles or connective tissue were injured.

· **CT scan:** If you need surgery, your provider or surgeon needs to know exactly how damaged your bones are. A CT scan will give them a more detailed picture of your bones and the surrounding tissue than an X-ray.

## **Management and Treatment**

How your Jones fracture is treated depends on the severity of the original break. Your broken bones need to heal back together. Depending on how damaged they are and what caused them to break, there are a few treatments your provider might use.

#### **Immobilization**

If your break is mild and the bones did not move far out of place (if it’s non-displaced), you might only need a cast or boot. You’ll typically wear them for six to eight weeks. In both cases you’ll likely need to follow up X-rays to make sure your bones are healing correctly.

#### **Closed reduction**

More severe breaks require a closed reduction to set (realign) your bones. During this non-surgical procedure, your provider will physically push and pull your body on the outside to line up your broken bones on the inside. To prevent you from feeling pain during the procedure you’ll receive one of the following:

· Local anesthetic to numb the area around your fracture.

· Sedatives to relax your whole body.

· General anesthesia to make you sleep through the procedure.

After the closed reduction, your provider will put you in a cast or boot.

### **Jones fracture surgery**

#### **Internal fixation**

The most intense fractures require surgery. Your surgeon will realign (set) your bones to their correct position and then secure them in place so they can heal and grow back together. They usually perform what’s called an internal fixation, which means your surgeon inserts pieces of metal into your bone to hold it in place while it heals. Internal fixation techniques include:

· **Rods:** A rod inserted through the center of your bone that runs from top-to-bottom.

· **Plates and/or screws:** Metal plates screwed into your bone to hold the pieces together in place.

· **Pins and wires:** Pins and wires hold pieces of bone in place that are too small for other fasteners. They’ll typically be used at the same time as either rods or plates.

Some people live with these pieces inserted in them forever. You might need follow-up surgeries to remove them.

#### **Bone grafting**

You might need bone grafting if your Jones fracture is severely displaced or if your bone isn’t healing back together as well as it should. Your surgeon will insert additional bone tissue to rejoin your fractured bone. After that, they’ll usually perform an internal fixation to hold the pieces together while your bone regrows. Bone grafts can come from a few sources:

· Internally from somewhere else in your body — usually the top of your hip bone.

· An external donor.

· An artificial replacement piece.

Jones fracture surgeries are usually outpatient procedures, and you should be able to go home the same day.

After your surgery, your foot will be immobilized. You’ll need to wear a boot or cast before you can start putting any weight on it again or using it like you did before your fracture.

### **What medications are used to treat Jones fractures?**

Over-the-counter NSAIDs like aspirin or ibuprofen can lead to bleeding and other complications after surgery. Your surgeon will talk to you about the medications you can take to reduce pain after your surgery.

#### **Complications of Jones fracture treatment**

Jones fracture surgery complications include:

· **Acute compartment syndrome** (ACS): A build-up of pressure in your muscles may stop blood from getting to tissue, which can cause permanent muscle and nerve damage.

· **Malunion**: This happens when your broken bones don't line up correctly while they heal.

· **Nonunion**: Your bones may not grow back together fully or at all. Jones fractures have some of the highest risks of nonunion for all broken bones. As many as one in three people experience nonunion.

· **Other internal damage**: Fractures can damage the area around the injury including your muscles, nerves, blood vessels, tendons and ligaments.

· **Refracture**: Jones fractures have a higher risk of breaking again than other broken bones.

Side effects of NSAIDs include:

· Bleeding.

· Ulcers.

· Stomach pain.

· Bowel complications.

### **How soon after treatment will I feel better?**

It could take a few weeks for your symptoms to improve before you can begin walking again. Depending on which type of surgery you have, you might not be able to put weight on your foot for up to eight weeks. Gradually, you’ll be able to add in more activity. You should be able to resume all your normal activities — including playing sports — in 3 to 4 months.

If you experience intense pain that doesn’t get better contact your healthcare provider right away.

## **Outlook / Prognosis**

If you have a Jones fracture, you should expect to make a full recovery. You will need physical therapy to regain strength and range of motion in your foot.

#### **How long does it take a Jones fracture to heal?**

How long it takes you to heal depends on the severity of your fracture and which treatments you need. Most people need three to four months to recover from a Jones fracture.

Complications like nonunion or refracture will extend your healing time. It’ll also take your body longer to heal if you need bone grafting to repair your Jones fracture.

#### **Will I need to miss work or school?**

If you can do your job or studies with your foot immobilized you shouldn’t need to miss work or school.

Talk to your surgeon or healthcare provider before resuming any physical activities while you’re recovering.

#### **Outlook for a Jones fracture**

The outlook for Jones fractures is positive. Even if you need surgery, you should make a full recovery.

## **Prevention**

Follow these general safety tips to reduce your risk of an injury:

· Wear the right protective equipment for all activities and sports.

· Make sure your home and workspace are free from clutter that could trip you or others.

· Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.

· Follow a diet and exercise plan that will help you maintain good bone health.

· Talk to your provider about a bone density test if you’re older than 50 or if you have a family history of osteoporosis.

### **How can I prevent a Jones fracture?**

Avoid overusing your feet if possible. Give your body time to rest and recover after intense physical activity. If you use a walker or cane to help walk, never try walking without it. Be sure to be careful while walking on uneven surfaces.

## **Living With**

If you think you have a Jones fracture — or any other broken bone — you need to see a healthcare provider as soon as possible. Go to the emergency room if you experience any of the following:

· Intense pain.

· You can’t move a part of your body that you normally can.

· A part of your body is noticeably different looking or out of its usual place.

· You can see your bone through your skin.

· Swelling.

· New bruising that appears at the same time as any of these other symptoms.

Go to the emergency room right away if you’ve experienced a trauma.

### **What questions should I ask my doctor?**

· Which bones are fractured?

· Do I have a Jones fracture or another type of fifth metatarsal break?

· Will I need surgery?

· How long will it take to recover?

· When can I resume physical activities

**Differential diagnosis of pain in this region includes:**

* Bone tumor
* Bursitis
* Calluses
* Foreign body granuloma
* Ganglia
* Gout
* Hemangioma
* Metatarsalgia
* Morton neuroma
* Neuropathic osteoarthropathy
* Osteoarthritis
* Osteomyelitis
* Plantar fibromatosis
* Plantar plate disruption
* Rheumatoid arthritis
* Sesamoiditis
* Septic arthritis
* Stress fracture
* Subchondral insufficiency fracture
* Tendinosis
* Tenosynovitis
* Tendon rupture
* Tenosynovial giant cell tumor
* Turf toe

**EPIDEMIOLOGY**

Fractures of the fifth metatarsal are the most prevalent metatarsal fractures. These fractures peak during the third decade of life for men and the seventh decade for women. There is a strong correlation between female gender and zone 1 fractures and dancer's fractures. Zone 1 injuries are typical of a twisting injury and are the most common fracture of the base of the fifth metatarsal

REFERENCES

Jones Fracture: Symptoms, Causes & Treatment

<https://www.ncbi.nlm.nih.gov/books/NBK544369/#article-41376.s8>

<https://my.clevelandclinic.org/health/diseases/22239-jones-fracture>

## **Lisfranc Injury**

Lisfranc injuries can affect any part of your joint, including your bones, ligaments and tendons.

A Lisfranc injury is any damage to the Lisfranc joint on top of your foot. It’s where your metatarsal bones (the bridges to your toes) connect to the rest of your foot.

Because so many parts of your foot meet up in one place, the Lisfranc joint is very important. It’s just like a busy highway on-ramp or main intersection in a city: A lot depends on a relatively small area to make everything work correctly.

Visit a healthcare provider if it’s hard to move or use your foot — especially if you slipped, fell or know you hurt your foot recently.

### **Types of Lisfranc injuries**

Lisfranc injuries can affect the bones or ligaments in your joint. Depending on which part of your joint is damaged (and what causes the injury), you might experience a:

· Lisfranc dislocation

· Lisfranc fracture (a type of broken foot)

· Lisfranc sprain (ligament tear)

## **Symptoms and Causes**

Lisfranc injuries cause symptoms near the top of your foot, including:

· Bruising (you might notice a bruise on the bottom of your foot)

· Foot pain (pain might get worse when you try to stand, walk or move)

· Swelling

· Trouble putting weight on your foot

### **Lisfranc injury causes**

Lisfranc injuries are almost always the result of falls, slips or sports injuries.

Anything that makes your heel unexpectedly twist or spin while you’re stepping with weight on the ball of your foot can injure your Lisfranc joint. Athletes can injure their Lisfranc joints playing sports, but even a small stumble, or missing a stair or step, can cause an injury.

Traumas that crush the Lisfranc joint can also cause Lisfranc injuries. Examples include:

· Car accidents

· Falling off a ladder

· Something falling on your foot

· Slipping off a curb while walking

#### **Risk factors**

Anyone can experience a Lisfranc injury, but you might be more likely to if you:

· Have a condition that damages or makes it harder to feel your feet (especially diabetes-related foot conditions and diabetes-related neuropathy)

· Have a physically demanding job, work with tools or lift heavy objects often

· Play competitive or contact sports

### **Lisfranc injury complications**

If it’s not treated properly, a Lisfranc injury can lead to serious complications, including:

· Arthritis

· Chronic pain

· Collapsed arches and other foot deformities

## **Diagnosis and Tests**

A healthcare provider will diagnose a Lisfranc injury with a physical exam and some imaging tests.

They’ll examine your foot and the area around it to check its shape and stability. Tell your provider what you were doing when you injured your foot or before you noticed symptoms.

After a physical exam, you’ll probably need at least one of a few imaging tests to take pictures of your foot, including:

· Foot X-ray

· MRI

· CT scan

## **Management and Treatment**

The most common Lisfranc injury treatments include:

· **Ice and elevation**.Try to keep your foot above the level of your heart as often as possible. You can prop it up on pillows or cushions. Wrap ice packs in a thin towel to avoid putting them directly on your skin. You should ice your foot for around 20 minutes at a time, a few times a day.

· **Immobilization**.Your provider will probably put your foot in a boot or cast. This will reduce stress on your foot, hold it in place and keep you from putting too much weight on it. You might need to use crutches.

· **Lisfranc surgery**. You’ll need surgery if the injury makes your joint unstable. A surgeon will repair your Lisfranc joint and put plates and screws into your foot to hold the joint in place. After surgery, you’ll need to be off your foot for a month or two. You’ll wear a boot or cast for a few months. Your surgeon might remove the plates and screws after your joint heals.

· **Pain medication**.Over-the-counter NSAIDs (nonsteroidal anti-inflammatory drugs) or acetaminophen can relieve pain and reduce swelling. Talk to your provider before taking these medications for more than 10 days in a row. Your provider or surgeon might give you prescription medications. They’ll tell you how often it’s safe to take them.

### **When should I see my healthcare provider?**

Visit a healthcare provider if you’re experiencing Lisfranc injury symptoms that don’t get better after a few days of rest and icing your foot. See a provider if you can’t put weight on your foot or walk normally.

Tell your provider if symptoms come back or get worse after you’ve started immobilization or had surgery.

## **Outlook / Prognosis**

## How long it takes a Lisfranc injury to heal depends on which type you have and what caused it.

Remember: Everyone’s body heals at different speeds, so make sure to talk through your exact treatment timeline with your provider.

· **Nonsurgical treatments**.You’ll probably need immobilization for six to eight weeks, followed by some physical therapy (PT). A physical therapist will help you regain your strength, balance and mobility.

· **Lisfranc surgery**. You’ll need up to three months in a boot or cast after your surgery. Your surgeon will tell you when it’s safe to start PT.

#### **Can you still walk with a Lisfranc injury?**

You might be able to walk with a Lisfranc injury. But you shouldn’t force yourself to use your foot if you’re in pain or have other symptoms. Continuing to use your foot can make a minor injury more severe and increase the chances that you need surgery.

It’ll probably be OK to walk in a boot or cast, but you should avoid running, jumping or any intense physical activities. Ask your provider which activities you should avoid while you recover.

**Doctor-patient conversation about Lisfranc injury,**

Doctor:  
“Hello, after examining your foot and reviewing the scans, it looks like you have a Lisfranc injury. This means there’s damage to the joints and ligaments in the middle part of your foot, where the metatarsals connect to the tarsal bones.”

Patient:  
“That sounds serious. How did this happen, and what does it mean for me?”

Doctor:  
“Lisfranc injuries can happen from a fall, twisting injury, or direct trauma to the foot. Sometimes they occur in sports or accidents. The injury can involve just the ligaments or also fractures in the bones. It’s important because this area stabilizes your foot arch, and if untreated, it can lead to pain, instability, and arthritis.”

Patient:  
“What are my treatment options? Will I need surgery?”

Doctor:  
“It depends on how severe the injury is. If the bones and ligaments are only slightly affected and there’s minimal displacement, we may treat it conservatively. This means immobilizing your foot in a cast or boot and avoiding putting weight on it for about 6 to 12 weeks. We’ll monitor healing closely with follow-up scans.”

Patient:  
“And if the injury is worse?”

Doctor:  
“For more severe injuries where the bones are displaced or the ligaments are unstable, surgery is usually recommended. The surgery involves realigning the bones and fixing them in place with screws or plates to stabilize the foot. Sometimes, parts of the joint may be fused to provide long-term stability.”

Patient:  
“How long will recovery take, and what should I expect?”

Doctor:  
“Recovery can be lengthy. You’ll need to keep weight off your foot for several weeks, followed by gradual rehabilitation. Physical therapy will help restore movement and strength. Most people take several months to regain full function, but early diagnosis and proper treatment improve outcomes.”

Patient:  
“What can I do to help my recovery?”

Doctor:  
“Keep your foot elevated to reduce swelling, apply ice as needed, and follow the non-weight-bearing instructions carefully. Attend all follow-up appointments so we can track your healing. Once cleared, physical therapy will be important to regain mobility.”

Patient:  
“Are there any complications I should watch out for?”

Doctor:  
“Yes, if you notice increased pain, swelling, redness, numbness, or if the foot changes color or temperature, contact us immediately. Also, if you develop fever or signs of infection after surgery, let us know right away.”

Patient:  
“Thank you, doctor. It helps to understand what’s going on and what to expect.”

Doctor:  
“You’re welcome. We’ll support you throughout your treatment and recovery. Don’t hesitate to ask any questions along the way.”

REFERENCE

Lisfranc (Midfoot) Injury: Types, Symptoms & Treatment

## **Calcaneus Fracture**

A calcaneus fracture is when you break your heel bone. An extra-articular fracture hurts but doesn’t cause serious damage.

A calcaneus (kal-KAY-nee-us) fracture, or calcaneal fracture, is a type of bone fracture. It happens when you break your heel bone (calcaneus). Your heel bone is the large bone at the back of your foot.

Calcaneus fractures can be severe fractures that crush your heel bone and damage a nearby joint, cartilage, ligament and tendons. Less serious fractures are calcaneus stress fractures.

Orthopedic surgeons and podiatrists are healthcare providers who specialize in diagnosing and treating broken heels.

#### **Types of fractured heel bones**

The types of fractured heel you have depends on the amount of damage to your heel:

· **Intra-articular fractures**: This fracture is when you break your heel bone and damage the subtalar joint and cartilage. Your subtalar joint is where your ankle bone meets your heel bone. Intra-articular fractures are the most severe type of broken heel. Severe calcaneus fractures are medical emergencies.

· **Extra-articular fractures**:Some extra-articular fractures are less serious than intra-articular fractures. They don’t damage the joint or cartilage near your heel bone. But an extra-articular fracture can be a serious medical issue. For example, a heel fracture that pulls a small piece of bone away from your heel bone is a medical emergency. That’s because this fracture type can damage your skin and lead to serious complications.

· **Calcaneal stress fractures**: A stress fracture is when you have one or more small breaks in your heel bone. Overuse is the most common cause. The stress can cause intense pain and make walking more difficult. It’s important to see your healthcare provider right away if you have a calcaneal stress fracture or think you could have one. Treatment can help you avoid further damaging the broken bone.

## **Symptoms and Causes**

Calcaneus fractures and calcaneus stress fractures cause different symptoms. In general, calcaneus fractures cause more serious and painful symptoms than calcaneus stress fractures.

#### **Intra-articular and extra-articular calcaneus fracture symptoms**

Intra-articular and extra-articular calcaneus fractures may cause the following symptoms:

· Sudden severe heel pain

· Difficulty walking or putting weight on your heel

· Difference in the way your heel looks (your heel may look wider than usual)

· Difficulty moving your foot

· Bruises on your ankle and heel, or hematoma and bruising on the sole of your foot

· Numbness or tingling if the broken bone presses on nearby nerves

· Swelling

**Sometimes, pieces of a broken heel bone break through your skin (compound fracture). This is a medical emergency. Call 911 (or your local emergency services number) or have someone take you to the emergency room.**

#### **Calcaneus stress fracture symptoms**

Calcaneal stress fractures cause heel pain that gets worse when you put pressure on your heel. For example, standing for a long time may make your heel hurt. The pain eases when you’re not being active. Stress fractures develop over time. You may notice a twinge in your heel that slowly becomes more noticeable. Other are:

· Bruising

· Stiffness

· Pain that gets worse when you stretch your foot or stand for a long time

· Your heel feels tender or warm to your touch

### **Calcaneal fracture causes**

All calcaneus fractures happen when you damage your heel bone. But calcaneus fractures and calcaneus stress fractures have very different causes.

For example, intra-articular and extra-articular calcaneus fractures often happen because you have a traumatic injury from:

· Falling from a high place, like a rooftop or the top rung of a tall ladder

· Vehicle accidents, especially if you crash while driving very fast

These types of fractures can happen during a crash because you push your foot down on the floorboard, brake or accelerator. Force from the crash can crush your heel bone.

Any motion you do over and over can cause a calcaneus stress fracture. The condition often affects people who walk, jog or run a lot. You may get a calcaneus stress fracture if you play sports that involve a lot of running back and forth, like basketball, soccer or tennis.

### **Complications of calcaneus fractures**

Calcaneus fractures and calcaneus stress fractures are very different injuries that may lead to different types of complications.

Intra-articular and extra-articular calcaneus fractures and treatment may cause the following complications:

· Arthritis in your subtalar joint

· Bone infection (osteomyelitis)

· Compartment syndrome (buildup of pressure on your muscles that reduces the flow of blood, oxygen and nutrients to your muscles)

· Surgical wound infection

· Malunion (your broken heel bones heal in the wrong position) and foot deformity

Without treatment, malunion and foot deformity may cause ankle pain and ankle arthritis.

Calcaneus stress fracture complications are less serious than complications from a calcaneus fracture and treatment. Complications may include:

· A change in how you walk (gait)

· Pain

· Stiffness

## **Diagnosis and Tests**

Doctors take different steps to diagnose calcaneus fractures. You may work with a podiatrist to find out why you have heel pain that comes and goes. Orthopaedic surgeons, trauma surgeons or podiatrists with special training in hindfoot and ankle surgery typically diagnose and treat more severe fractures.

#### **Diagnosing calcaneus fractures**

Most calcaneal fractures are traumatic injuries. That’s why you may receive your diagnosis and initial treatment in an emergency room. A surgeon will ask how the injury happened. They’ll examine your foot and ankle. Then, they’ll do imaging tests. The surgeon may do more tests to look for issues that a fall or vehicle crash can cause.

Studies show people with calcaneal fractures often have spinal compression fractures and tibial plateau fractures (a broken bone in your knee).

A podiatrist or sports medicine physician may diagnose a calcaneus stress fracture. They’ll ask about your symptoms and how long you’ve had them. They may ask about your daily routine and activities.

They’ll examine your heel and ankle. They may also check if you can feel sensations on the bottom of your foot.

#### **Tests to diagnose calcaneal fractures**

Your healthcare providers may do imaging tests like:

· Foot X-ray to check your heel bone

· CT scans to see how the injury affects your heel bone and to rule out any joint injuries

· MRI scans to see if the injury affects your ligaments or tendons (they may do this test to check for stress fractures)

## **Management and Treatment**

Your treatment will depend on the type of fracture. In general, surgery is treatment for calcaneus fractures where pieces of your bone are out of place, damage your subtalar joint or move enough to form a gap.

If you need surgery, your orthopedic or podiatric surgeon will do an open reduction and internal fixation. Your surgeon will make an incision (cut) in your heel. They’ll realign the broken bones. Then, they’ll place screws or plates on the bones to keep them in place while they heal.

You may need more than one surgery to repair a severe calcaneus fracture. You may also need physical therapy if your injury and surgery make it hard for you to move your foot. Physical therapy supports healing, too.

You won’t need surgery for a calcaneus stress fracture. You also won’t need it for a fracture that doesn’t affect your subtalar joint or one where your bone doesn’t move enough to create a gap. Your provider may recommend the RICE method to treat these kinds of fractures. RICE stands for:

· Rest

· Ice

· Compression

· Elevation

Your provider may place your foot in a boot if you have a stress fracture. They may put a splint or cast on your foot and ankle to treat a calcaneus fracture. The cast or splint will protect your heel and keep damaged bones in place while they heal. You’ll also receive physical therapy.

### **How long does it take for a fractured calcaneus to heal?**

That depends on your situation. For example, you may need several surgeries and other kinds of treatment if you have a severe calcaneus fracture that damages your subtalar joint. In that case, it may be months or years before you completely recover.

Most people heal from a calcaneal stress fracture within a few months. During healing, you’ll likely wear a boot and limit weight bearing on your heel. After treatment, you may need physical therapy. Therapy will improve your strength and prevent further injury.

**Doctor-patient conversation about a calcaneus (heel bone) fracture,**

Doctor:  
“Hello, after examining your foot and reviewing your X-rays, it appears you have a fracture of the calcaneus, which is the heel bone. This kind of injury usually happens from a fall or a high-impact accident.”

Patient:  
“That sounds serious. What does this mean for me? Will I be able to walk again soon?”

Doctor:  
“A calcaneus fracture can be quite painful and may affect your ability to walk for a while. Healing typically takes about six to twelve weeks, but it can take several months for the pain and swelling to fully settle. During this time, it’s important to protect your foot and avoid putting weight on it initially.”

Patient:  
“So, what will the treatment involve? Do I need surgery?”

Doctor:  
“The treatment depends on the severity and type of fracture. If the bones are well-aligned and the fracture is not displaced, we may treat it conservatively with a cast or a walking boot and restrict weight-bearing. You’ll use crutches to help you move around without putting pressure on your heel. However, if the fracture is displaced or involves the joint surface, surgery may be necessary to realign and stabilize the bones.”

Patient:  
“How long will I need to wear the boot or cast? When can I start putting weight on my foot?”

Doctor:  
“You’ll likely wear the boot or cast for about 6 to 12 weeks. At first, you should avoid putting weight on the foot to allow the bone to heal properly. Gradually, we’ll guide you to start partial weight-bearing and then full weight-bearing as healing progresses. It’s very important to follow these instructions closely to avoid complications.”

Patient:  
“What about pain and swelling? How can I manage that?”

Doctor:  
“Pain and swelling are common and can last for several months. Taking prescribed pain medications, elevating your foot, and applying ice packs regularly can help reduce swelling and discomfort. It’s normal for swelling to be worse at the end of the day during recovery.”

Patient:  
“Will I need physical therapy?”

Doctor:  
“Yes, once the bone starts healing and you can begin weight-bearing, physical therapy will help restore your foot’s strength, flexibility, and function. Rehabilitation is a key part of recovery to help you return to normal activities.”

Patient:  
“Are there any risks or complications I should watch for?”

Doctor:  
“Yes, please contact us if you notice increased pain, redness, swelling, numbness, or any signs of infection like fever. Also, if your foot changes color or temperature, or if you develop blisters or wounds, seek medical attention promptly.”

Patient:  
“Thank you, doctor. It’s helpful to know what to expect and how to take care of my foot.”

Doctor:  
“You’re welcome. We’ll work together through your recovery, and I’ll make sure you have all the support you need. Please keep all your follow-up appointments so we can monitor your healing closely.”

REFERENCES

Calcaneus Fracture (Broken Heel): Symptoms & Treatment

<https://www.royalfree.nhs.uk/patients-and-visitors/patient-information-leaflets/calcaneal-fractures-partial-weight-bearing>

### **pelvic fracture**

A pelvic fracture happens when there’s a fracture (break) in one or more of your bones that make up your pelvis. Your pelvis is the area of your body below your abdomen that’s located between your hip bones. Pelvic fractures can be mild or severe.

### **Which bones make up the pelvis?**

The bones that make up your pelvis include:

· The sacrum (the large triangle-shaped bone at the base of your spine).

· The coccyx (tailbone).

· The hip bones, which include the ilium, ischium and pubis.

Together, these bones form what’s known as the pelvic ring. Your pelvis is a highly stable structure that protects many important nerves, blood vessels and organs, including your internal reproductive organs, bladder and the lower part of your digestive tract. It also acts as an anchor for your leg muscles.

### **What types of pelvic fractures are there?**

Since your pelvis is made of multiple bones, there are many types of pelvic fractures. In general, there are also several kinds of bone fractures depending on the pattern of the break, including:

· **Closed or open (compound) fractures**: If the fracture doesn’t break open your surrounding skin, it’s called a closed fracture. If the broken bone pierces through your skin, it’s called an open fracture or a compound fracture.

· **Complete fractures**: A complete fracture happens when your bone breaks into two pieces.

· **Displaced fractures**: When a gap forms where your bone’s fractured, it’s called a displaced fracture.

· **Partial fractures**: A partial fracture happens when the fracture doesn’t go all the way through your bone.

· **Stress fractures**: A stress fracture happens when your bone has a crack in it.

In addition to the specific pattern that the fracture has, a pelvic fracture is also classified as being stable or unstable:

· **Stable pelvic fracture**: In a stable pelvic fracture, there’s usually only one break in your pelvis, and the broken parts of the bones aren’t displaced. Pelvic fractures that happen from low-impact events, such as a minor fall or running, are usually stable fractures.

· **Unstable pelvic fracture**: In an unstable pelvic fracture, there are often two or more breaks, and the ends of broken parts of the bones are displaced. Unstable pelvic fractures are most often caused by high-impact events such as a car crash.

Although it’s not as common, there’s another type of pelvic fracture called an avulsion fracture. An avulsion fracture happens when a tendon or ligament tears away from the bone it’s attached to, taking a small fragment of bone with it.

### **Who do pelvic fractures affect?**

Anyone can experience a pelvic fracture at any age. Mild pelvic fractures are more common in older people because they are more likely to have bone-weakening disorders such as osteoporosis. Severe pelvic fractures are most common in people aged 15 to 28 years. Under the age of 35, men are more likely to experience a pelvic fracture, while over the age of 35, women are more likely to experience a pelvic fracture.

Pelvic fractures aren’t very common. Only 3% of bone fractures that adults experience are pelvic fractures. Most pelvic fractures happen from high-impact events such as a car accident or falling from a significant height.

## **Symptoms and Causes**

The symptoms of a pelvic fracture depend on how mild or severe it is. Pelvic fracture signs and symptoms can include:

· Experiencing pain in your groin, hip and/or lower back.

· Experiencing more intense pain when walking or moving your legs.

· Experiencing numbness or tingling in your groin area or legs.

· Experiencing pain in your abdomen.

· Having a difficult time peeing.

· Having a difficult time walking or standing.

### **What causes pelvic fractures?**

A few situations and conditions can cause a pelvic fracture, including:

· **High-impact events**: Since your pelvis is a very stable bone structure, most pelvic fractures are caused by high-impact events such as a car accident or falling from a significant height. High-impact events usually cause unstable pelvic fractures.

· **Bone-weakening diseases**: Bone-weakening diseases such as osteoporosis can contribute to pelvic fractures. If you have a bone-weakening disease, you could get a pelvic fracture from doing a routine activity or from a minor fall. Pelvic fractures that are caused by bone-weakening diseases are usually stable fractures.

· **Athletic activities**: Although it’s not as common, someone who is playing a sport could get a pelvic fracture known as an avulsion fracture. This happens when a tendon or ligament tears away from the bone to which it’s attached. When the tendon or ligament tears away, it takes a small piece of bone with it. A pelvic avulsion fracture is usually a stable fracture.

## **Diagnosis and Tests**

All pelvic fractures require X-rays in order to be diagnosed. Your healthcare provider may have you undergo other imaging tests to learn more about your injury.

### **What tests will be done to diagnose a pelvic fracture?**

The following imaging tests can be used to diagnose a pelvic fracture:

· **X-rays**: X-rays use radiation to take images of your bones. All pelvic fractures require X-rays so your healthcare provider can see which part of your pelvis is fractured, how mild or severe the fracture is, and so they can learn how the fracture needs to be treated.

· **CT scan**: A CT (computed tomography) scan uses multiple X-rays taken from different angles of your body to produce detailed images. A CT scan provides more detailed images than regular X-rays do. Your healthcare provider may have you undergo a CT scan to learn more about your pelvic fracture and to make sure you don’t have other related injuries.

· **MRI**: An MRI (magnetic resonance imaging) uses a large magnet, radio waves and a computer to make detailed images of your organs and bones. Your healthcare provider might have you undergo an MRI if they aren’t able to get enough information about your fracture from X-rays and a CT scan.

## **Management and Treatment**

Treatment for a pelvic fracture depends on certain factors, including:

· How mild or severe your fracture is.

· The pattern and type of fracture.

· Which bones are displaced and how much they are displaced.

· Your overall health and if you have other injuries.

Treatment for mild and stable fractures in which your bones aren’t displaced usually doesn’t involve surgery. Treatment for a stable fracture can include:

· **Rest**: Your healthcare provider will most likely recommend that you rest as much as possible so you don’t put extra stress and pressure on your pelvic fracture.

· **Walking aids**: Depending on where your pelvic fracture is, your healthcare provider may have you use a walking aid such as crutches, a walker or a wheelchair to avoid bearing weight on your leg(s). You may have to use the walking aid for up to three months or until your pelvis fully heals.

· **Medications**: Your healthcare provider may prescribe medication to relieve pain. They may also have you take a blood thinner medication (anticoagulant) to reduce your risk of having blood clots form in the veins of your legs and pelvis.

Treatment for a more severe or unstable pelvic fracture usually requires one or more surgeries. Different types of pelvic fracture surgeries include:

· **External fixation**: Healthcare providers use external fixation to stabilize your pelvic area after a pelvic fracture. In this surgery, metal pins or screws are inserted into your bones through small incisions (surgical cuts) into your skin and muscle. The pins and screws stick out of your skin on both sides of your pelvis, and are attached to bars outside of your body. The resulting system acts as a stabilizing frame to hold your broken bones in their proper position while your fracture(s) heals.

· **Skeletal traction**: Skeletal traction is a pulley system outside of your body that helps realign the pieces of broken bone(s). During skeletal traction, a surgeon implants metal pins in your thighbone or shinbone that stick out of your skin to help position your leg. Weights attached to the pins gently pull on your leg, keeping the broken pelvic bone fragments in a more normal position.

· **Open reduction and internal fixation**: During open reduction and internal fixation surgery, the displaced pelvic bone fragments are first repositioned into their normal alignment. The fragments are then held together with screws or metal plates that are attached to the outer surface of the bone.

People who experience a severe pelvic fracture from a high-impact accident often have other injuries or internal injuries caused by the pelvic fracture that will also need to be treated. In these cases, the success in treating the pelvic fracture often depends on the success of treating the related injuries.

### **Can a fractured pelvis heal itself?**

Mild and stable pelvic fractures can usually heal without medical intervention such as surgery. However, if you have a mild pelvic fracture, you must limit the amount of pressure you put on your pelvis and legs and get enough rest so your fracture can heal properly. It’s important to see your healthcare provider as soon as possible even if you think you have a mild pelvic fracture.

### **How long does a fractured pelvis take to heal?**

Pelvic fractures usually take 8 to 12 weeks to fully heal. More severe pelvic fractures could take longer, especially if you have other injuries or medical complications from the event that caused your pelvic fracture.

## **Outlook / Prognosis**

The prognosis (outlook) for a pelvic fracture depends on the severity and type of injury. Mild, stable pelvic fractures usually heal well with treatment without long-term complications.

Severe and unstable pelvic fractures that are caused by high-impact events such as car accidents could result in complications such as severe bleeding and organ and/or nerve damage. If these related injuries are treated successfully, the pelvic fracture usually heals well.

### **Why are pelvic fractures life-threatening?**

Unstable, complex pelvic fractures that are caused by high-impact forces such as a vehicle accident or a significant fall can cause damage to your surrounding organs, nerves and blood vessels in your pelvic region. These subsequent injuries can lead to organ failure, severe bleeding and infection, which can be life-threatening.

### **Can a pelvic fracture cause complications?**

Severe and unstable pelvic fractures are more likely to cause complications than mild fractures. The complications are usually a result of nerve and/or organ damage that was caused by the pelvic fracture(s). Complications of pelvic fractures can include:

· Chronic pain.

· Impaired mobility.

· Sexual dysfunction.

· Deep vein thrombosis (DVT), a type of blood clot.

## **Prevention**

Some risk factors for experiencing a pelvic fracture include:

· **Having osteoporosis**: People who have osteoporosis are at a higher risk of experiencing a pelvic fracture. Pelvic fractures account for 7% of all osteoporosis-related fractures in people over the age of 50 in the United States.

· **Having a history of falls**: People who have a history of falls, especially older people, are more likely to experience a pelvic fracture from falling.

· **Playing certain sports**: Although it’s the least common type of pelvic fracture, people who play certain sports can get a pelvic avulsion fracture if the tendon that attaches their hamstring muscle to their pelvis breaks away from their pelvis and takes a small bone fragment with it.

### **What can I do to prevent a pelvic fracture?**

Depending on your age and lifestyle, there are a few things you can do to try to prevent fracturing your pelvis, including:

· **Use a walking aid if you’re at a higher risk of falling**: Using a walking aid such as a cane or a walker can help prevent you from falling, which could prevent you from getting a pelvic fracture.

· **Drive safely**: High-impact vehicle accidents are a common cause of pelvic fractures. Always practice safe driving and follow traffic laws. Avoid distractions while you’re driving.

· **Follow ladder safety instructions**: When you’re using a ladder, be sure you’re doing so properly and safely. Always make sure your ladder is in a secure position before using it.

· **Do proper stretching and conditioning if you play sports**: People who play certain sports are at risk of getting a pelvic avulsion fracture from a tendon tear. Be sure to properly stretch before activities and do conditioning exercises specific to your sport.

### **When should I see my healthcare provider?**

If you’re experiencing symptoms of a pelvic fracture such as pain in your pelvic region and difficulty walking or standing, be sure to contact your healthcare provider immediately or go to the nearest hospital.

If you’ve already been diagnosed with a fractured pelvis and are experiencing new or concerning symptoms, be sure to contact your healthcare provider.

**DIFFERENTIAL DIAGNOSIS**

Pelvic fractures may encompass several fracture types, including acetabular and iliac wing fractures. Iliac wing injuries may be managed nonoperatively. However, acetabular fractures warrant a separate investigation. Acetabular fractures are generally classified into 10 patterns, outlined by the Letournel Classification. Acetabulum fracture treatment may be nonoperative with protected weight-bearing for high-risk patients or minimally displaced fractures. Open reduction and internal fixation are indicated for acute acetabular fractures with significant displacement or hip instability

**EPIDEMIOLOGY**

In the United States, pelvic fractures are estimated to occur in 37 out of 100,000 individuals per year. The incidence is highest in patients aged 15 to 28. Men younger than 35 and women older than 35 are most commonly affected

**Doctor-patient conversation about pelvic fracture**

Doctor:  
“Hello, after reviewing your scans and examining you, it appears you have a pelvic fracture. This means one or more of the bones in your pelvis have been broken.”

Patient:  
“That sounds serious. How did this happen, and what does it mean for me?”

Doctor:  
“Pelvic fractures often occur due to high-energy trauma like falls or car accidents, but sometimes they can happen from lower-impact injuries, especially in older adults with weaker bones. The pelvis is a ring of bones that supports your body and protects important organs, so these fractures need careful management.”

Patient:  
“What kind of treatment will I need? Will I need surgery?”

Doctor:  
“The treatment depends on the type and stability of the fracture. If the fracture is stable, meaning the bones haven’t moved much, we usually treat it conservatively with bed rest, pain control, and gradually increasing your activity as tolerated. For unstable fractures, or if there is significant displacement or bleeding, surgery may be necessary to stabilize the bones.”

Patient:  
“How long will it take to heal? Will I be able to walk again?”

Doctor:  
“Pelvic fractures can take several weeks to months to heal. Initially, you may need to limit weight-bearing on the affected side and use crutches or a walker. As healing progresses, physical therapy will help you regain strength and mobility. Most patients eventually return to their normal activities, but recovery can be slow and requires patience.”

Patient:  
“What are the risks or complications I should be aware of?”

Doctor:  
“Pelvic fractures can sometimes cause significant bleeding, nerve or organ injury, and increase the risk of blood clots. We will monitor you closely for these complications. It’s important to follow all instructions about movement and medications, including blood thinners to reduce clot risk. If you notice increasing pain, swelling, numbness, fever, or difficulty urinating, please contact us immediately.”

Patient:  
“Will I need physical therapy?”

Doctor:  
“Yes, physical therapy is a key part of recovery. It will help you regain strength, improve your walking, and reduce stiffness. We’ll arrange for a therapist to work with you once you’re ready.”

Patient:  
“Thank you, doctor. It helps to understand what’s going on and what to expect.”

Doctor:  
“You’re welcome. We’ll support you throughout your recovery and make sure you get the care you need. Please don’t hesitate to ask questions or share any concerns as you heal.”

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**Tennis elbow (lateral epicondylitis)**

Tennis elbow, also known as lateral epicondylitis, is a condition that can result from overuse of the muscles and tendons in the elbow. Tennis elbow is often linked to repeated motions of the wrist and arm.

Despite its name, most people who get tennis elbow don't play tennis. Some people have jobs that involve repeated movements that can lead to tennis elbow. These include plumbers, painters, carpenters and butchers. However, often tennis elbow has no clear cause.

The pain of tennis elbow occurs mainly where the tough, cord-like tissues of the forearm muscles attach to a bony bump on the outside of the elbow. The tissues are known as tendons. Pain can spread into the forearm and wrist.

Rest, pain medicines and physical therapy often help relieve tennis elbow. People for whom these treatments don't help or who have symptoms that get in the way of daily living might have a procedure, such as a shot or surgery.

## **Symptoms and Causes**

The most common tennis elbow symptoms include:

* Elbow pain (especially on the outside of your elbow — the side furthest away from the center of your body when your arms are at your sides with your palms facing forward).
* Stiffness.
* Swelling.
* A weakened grip (especially when you’re trying to hold something like a racket, pen or shake someone’s hand).

#### **How do you know if you have a tennis elbow?**

You can’t know for sure you have a tennis elbow without visiting a healthcare provider for a diagnosis. Lots of people with tennis elbow feel a specific kind of pain in their elbow and arm. The pain usually feels:

* Sharp or burning.
* Worse when you twist or bend your arm (like turning a doorknob, opening a jar or swinging your arm).
* Like it spreads (radiates) from your elbow down to your forearm and into your wrist (especially at night).

#### **Does tennis elbow affect one or both arms?**

Most people develop tennis elbow in their dominant arm (the side you naturally use for most activities). You’re most likely to have a tennis elbow in whichever arm you use the most for a repetitive activity — the arm you hold a racket or tools with.

It’s less common, but it’s possible to develop tennis elbow in both arms at the same time.

### **What causes tennis elbow?**

Any motion or activity that you frequently repeat can trigger tennis elbow. Extra stress from repetitive movements builds up over time. Eventually, that added use and stress on your extensor muscle tendon causes tiny tears (microtraumas). Those microtraumas cause symptoms you can feel and notice.

It’s less common, but a sudden arm or elbow injury can also cause tennis elbow.

#### **Risk factors**

Anyone can develop tennis elbow, but some people are more likely to, including people who:

* Lift more than 45 pounds (22 kilograms) regularly.
* Are older than 40.
* Smoke.
* Have obesity (a body mass index, or BMI, of 30 or higher).

Athletes who play sports that put stress on their arms or elbows, including:

* Tennis (and other racket sports like squash, pickleball or racquetball).
* Baseball.
* Softball.
* Bowling.
* Golf.
* Weight lifting.

People whose jobs or hobbies put lots of stress on their elbows, including:

* Painters.
* Musicians.
* Chefs or cooks.
* Carpenters.
* Plumbers.
* Cleaners.
* Gardeners.
* Manicurists.

### **Complications**

Tennis elbow usually doesn’t cause serious complications. If you keep using your injured elbow before your tendon heals, you can increase your chances of rupturing (tearing) it.

## **Diagnosis and Tests**

A healthcare provider will diagnose tennis elbow with a physical exam and some tests. They’ll examine your injured elbow and ask about your symptoms. Tell your provider when you first noticed pain, stiffness or other symptoms and if any activities make them worse (or better).

#### **Tennis elbow tests**

Your provider may use some of the following tests to check for damage inside your arm and take pictures of your elbow:

* Elbow X-ray.
* Ultrasound.
* Magnetic resonance imaging (MRI).
* Electromyography (EMG).

## **Management and Treatment**

Your provider will suggest treatments to help your tendon heal. The RICE method is usually the best way to fix tennis elbow:

* Rest: Take a break from the activity that caused tennis elbow. Try to avoid using your elbow while it heals.
* Ice: Apply a cold compress or ice pack to your elbow for 15 to 20 minutes at a time, a few times a day. Wrap ice packs in a towel or thin cloth so they don’t touch your skin directly.
* Compression: Wrap a compression bandage around your elbow. Your provider can show you how to safely apply the compression bandage.
* Elevation: Keep your elbow above the level of your heart as often as you can.

Other nonsurgical (conservative) tennis elbow treatments include:

* Over-the-counter (OTC) pain relievers: Over-the-counter NSAIDs or acetaminophen reduce swelling and relieve pain. Talk to your provider before taking these medications for more than 10 days in a row.
* Physical therapy: A physical therapist will give you stretches and exercises to strengthen the muscles around your elbow and increase your flexibility.
* Wearing a brace: Wrist and elbow braces will allow your tendon to rest so it can heal. Your provider will tell you which kind of brace you’ll need and how often to wear it.
* Platelet-rich plasma: Your provider will take a sample of your blood and then process it to concentrate platelets (proteins that encourage healing). Then, they’ll inject that blood sample into your elbow.
* Corticosteroids: Corticosteroids are prescription anti-inflammatory medications. Your provider may inject cortisone shots into your injured elbow. Corticosteroids aren’t as common as other treatments because they may not relieve pain, especially if you’ve felt pain for more than six weeks.
* Tenotomy: Your provider will poke a needle through your skin and into your injured tendon using an ultrasound to guide them. They’ll break down and remove damaged tissue to encourage your body’s natural healing process.
* Shockwave therapy: Your provider will direct a specific pressure frequency where your tendon is injured. The shockwaves encourage your body to speed up the healing.

#### **Tennis elbow surgery**

Most people don’t need surgery to repair tennis elbow. Your provider may suggest surgery if you’re still having severe symptoms after several months of conservative treatments.

Your surgeon will remove damaged tissue and repair your tendon. Most tennis elbow surgeries are outpatient procedures, which means you can go home the same day.

Your surgeon will tell you which type of surgery you’ll need, what you can expect and how long it’ll take to recover.

### **How soon after treatment will I feel better?**

You should start feeling better as soon as you start resting your elbow and avoiding the activity that caused tennis elbow. It can take several months for your elbow to heal. It depends on what caused the injury, how severely it damaged your tendon and how long you’ve had pain. Ask your provider what to expect.

## **Outlook / Prognosis**

You should expect to take a break from the physical activities that caused tennis elbow. You may need to stop doing some activities completely, or do them with modifications (like wearing a brace while you work or taking breaks more often).

People almost always make a full recovery from tennis elbow. You should be able to resume all your usual activities once your tendon heals, even if you need surgery.

#### **How long tennis elbow lasts**

Tennis elbow can last anywhere from a few months to more than a year. It usually takes around six months to recover, but some people need longer (up to 18 months).

How long it’ll take you to recover depends on a few factors:

* What caused the tennis elbow.
* How damaged your tendon is.
* Which treatments you need.

## **Prevention**

The best way to prevent tennis elbow is to avoid overusing your arm and elbow.

During sports or other physical activities:

* Wear the right protective equipment for all work, sports or hobbies.
* Don’t “play through pain” during or after physical activity.
* Give your body time to rest and recover after intense activity.
* Stretch and warm up before playing sports or working out.
* Cool down and stretch after physical activity.
* Do sport-specific exercises or exercises that keep your body healthy for your sports, hobbies or job.

### **When should I see my healthcare provider?**

Visit a healthcare provider if you think your elbow is injured or you notice any of the following signs of tennis elbow:

* It’s hard to move your elbow or arm.
* Your elbow is swollen or discolored.
* You’re in severe pain that makes it hard to do your usual activities (including sleeping).
* You have pain that lasts more than a week.

## **Common Questions**

### **How do you know if you have tennis elbow or tendinitis?**

Tendinitis is inflammation or irritation in a tendon that makes it swell. That means you technically always have tendinitis if you have a tennis elbow. But it’s not an extra condition or injury, just another way your provider might classify what’s going on inside your elbow.

Some people with tennis elbow might actually have tendinosis. No matter what’s causing pain in your elbow, visit a provider as soon as possible.

### **What’s the difference between a tennis elbow and golfer’s elbow?**

Tennis and elbow and golfer’s elbow are similar conditions. They’re both repetitive strain injuries caused by overusing your arm and elbow.

Tennis elbow affects the extensor muscle tendon on the outer (lateral) part of your elbow. Golfer’s elbow affects the tendon on the inner (medial) part of your elbow. The medical term for golfer’s elbow is medial epicondylitis.

**Lifestyle and home remedies**

The following self-care measures might relieve tennis elbow:

* **Rest.** Do not do activities that aggravate elbow pain.
* **Pain relievers.** Try pain relievers such as ibuprofen (Advil, Motrin IB, others) or naproxen sodium (Aleve).
* **Ice.** Apply ice or a cold pack for 15 minutes 3 to 4 times a day

**DIFFERENTIAL DIAGNOSIS**

The differential diagnosis for lateral epicondylitis includes but is not limited to any of the following conditions:

* Elbow bursitis
* Cervical radiculopathy
* Posterolateral elbow plica
* Posterolateral rotatory instability (PLRI)
* Radial nerve entrapment
* Radial tunnel syndrome
  + palpation 3 to 4 cm distal and anterior to the lateral epicondyle
  + pain with resisted third-finger extension
  + pain with resisted forearm supination
* Occult fracture(s)
* Capitellar osteochondritis dissecans
* Triceps tendinitis
* Radiocapitellar osteoarthritis
* Shingles

## **Epidemiology**

### United States statistics

The annual incidence is 1-3% of the US population. Men and women are equally affected. Typically, lateral epicondylitis affects individuals older than age 40 years. There is usually a history of repetitive activity aggravating the extensor tendons of the forearm. Repetitive, eccentric motion of the wrist extensor muscles may increase risk of injury. Individuals with a current or prior history of tobacco use were also noted to be at increased risk.

A study reported the age- and sex-adjusted annual incidence of lateral elbow tendinosis decreased from 4.5 per 1000 people in 2000 to 2.4 per 1000 in 2012. The recurrence rate within 2 years was 8.5% and the proportion of surgically treated cases within 2 years of diagnosis tripled from 1.1% during the 2000-2002 period to 3.2% after 2009. The study also added that about 1 in 10 patients with persistent symptoms at 6 months required surgery.

### International statistics

Herquelot et al conducted a study that aimed to estimate the association between repeated measures of occupational risk factors and the incidence of lateral epicondylitis in a large working population. The study highlights the importance of temporal dimensions for occupational risk factors on the incidence of lateral epicondylitis. The authors conclude that further research should evaluate the risk associated with the duration and repetition of occupational exposure on the incidence of lateral epicondylitis

Lateral epicondylitis affects more than 50% of nonprofessional tennis players; however, only 5% of professional tennis players report this condition

**procedures and typical treatment timeline for tennis elbow (lateral epicondylitis)**

## Conservative (Non-Surgical) Treatment

* Rest and Activity Modification: Avoid activities that worsen symptoms, such as repetitive wrist extension or gripping.
* Bracing: Use of a counterforce brace or wrist splint to reduce stress on the tendon.
* Ice Therapy: Applying ice packs to reduce pain and inflammation.
* Medications: NSAIDs or corticosteroid injections to control pain and swelling.
* Physical Therapy: Stretching and strengthening exercises for forearm muscles, often starting after initial pain reduction.
* Other Therapies:
  + Platelet-rich plasma (PRP) injections to promote healing (effectiveness still under study).
  + Extracorporeal shock wave therapy and ultrasound therapy may be used to enhance tissue repair.
* Timeline:
  + Most patients improve within 6 to 12 months of consistent conservative management.
  + Physical therapy usually begins within weeks once acute pain subsides.

## Minimally Invasive Procedures

* Needle Fenestration/Dry Needling: Ultrasound-guided needling to stimulate healing by causing micro-injury to the tendon.
* Ultrasonic Tenotomy (TENEX): Uses ultrasonic energy to remove damaged tendon tissue through a small incision.
* These procedures are typically outpatient and help patients who do not respond to initial conservative care.

## Surgical Treatment

* Indications: Surgery is considered if symptoms persist beyond 6 to 12 months despite conservative treatment and cause significant disability.
* Open Surgery:
  + Involves a larger incision over the lateral elbow.
  + Surgeon remove damaged tendon tissue, may release part of the tendon from the bone, and debrides unhealthy tissue.
  + Sometimes a small bone chip is removed to increase blood flow and promote healing.
* Arthroscopic Surgery:
  + Minimally invasive with 1-2 small incisions.
  + Surgeon uses an arthroscope to visualize and clean the damaged tendon tissue.
  + Bone surface may be roughened to stimulate healing.
* Postoperative Care:
  + Usually outpatient surgery with regional anesthesia.
  + Immobilization for a short period followed by gradual physical therapy.
  + Return to normal activities typically takes several months.
* Risks: Include infection, nerve injury, incomplete symptom relief, and stiffness.

**Doctor-patient conversation about tennis elbow**,

“Hello, I understand you’ve been experiencing pain on the outer side of your elbow. From what you’ve described and my examination, it sounds like you have tennis elbow, which is a common condition caused by overuse of the tendons that attach to the outside of your elbow.”

Patient:  
“I don’t play tennis, so how did I get this? And what does it mean?”

Doctor:  
“Tennis elbow isn’t just from playing tennis. It can happen from any repetitive movements or strain on your forearm muscles, such as typing, gardening, or manual work. It means the tendons around your elbow are irritated or slightly damaged, causing pain and tenderness.”

Patient:  
“What can I do to get better? Will it go away on its own?”

Doctor:  
“Many people improve over time if they avoid activities that worsen the pain. Resting the arm, using a supportive elbow brace, and applying ice can help reduce symptoms. Over-the-counter painkillers like ibuprofen may ease the pain and swelling.”

Patient:  
“Should I see a physiotherapist? What will they do?”

Doctor:  
“Yes, physiotherapy is very helpful. A physiotherapist can teach you exercises to stretch and strengthen your forearm muscles, and may use treatments like massage, ultrasound, or laser therapy. Studies show physiotherapy can provide better long-term relief than steroid injections.”

Patient:  
“I heard about steroid injections. Are they a good option?”

Doctor:  
“Steroid injections can reduce pain quickly in the short term, but the pain often comes back and may even be worse later on. Because of this, we usually recommend physiotherapy and activity modification first.”

Patient:  
“How long will it take to get better?”

Doctor:  
“Tennis elbow often improves over several months—typically 6 to 12 months—with proper treatment and avoiding aggravating activities. Most people recover fully with conservative care.”

Patient:  
“What if it doesn’t get better?”

Doctor:  
“If symptoms persist despite treatment, there are other options like minimally invasive procedures or, rarely, surgery. But these are usually last resorts after trying physiotherapy and other conservative measures.”

Patient:  
“Thank you, doctor. That helps me understand what’s going on and what I can do.”

Doctor:  
“You’re welcome. Remember to follow the advice on activity modification and physiotherapy, and come back if your symptoms change or worsen. We’re here to support your recovery.”

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**GOLFERS ELBOW**

**DEFINITION AND DESCRIPTION**

Golfer's elbow is a condition that causes pain where the tendons of your forearm muscles attach to the bony bump on the inside of your elbow. The pain might spread into your forearm and wrist.

Golfer's elbow is similar to tennis elbow, which occurs on the outside of the elbow. It's not limited to golfers. Tennis players and others who repeatedly use their wrists or clench their fingers also can develop golfer's elbow.

The pain of a golfer's elbow doesn't have to keep you off the course or away from your favorite activities. Rest and appropriate treatment can get you back into the swing of things.

**Causes**

Golfer's elbow, also known as medial epicondylitis, is caused by damage to the muscles and tendons that control your wrist and fingers. The damage is typically related to excess or repeated stress — especially forceful wrist and finger motions. Improper lifting, throwing or hitting, as well as too little warm up or poor conditioning, also can contribute to a golfer's elbow.

Besides golf, many activities and occupations can lead to golfer's elbow, including:

* **Racket sports.** Improper technique with tennis strokes, especially the backhand, can cause injury to the tendon. Excessive use of topspin and using a racket that's too small or heavy also can lead to injury.
* **Throwing sports.** Improper pitching technique in baseball or softball can be another culprit. Football, archery and javelin throwing also can cause golfer's elbow.
* **Weight training.** Lifting weights using improper technique, such as curling the wrists during a biceps exercise, can overload the elbow muscles and tendons.
* **Forceful, repetitive occupational movements.** These occur in fields such as construction, plumbing and carpentry

To cause a golfer's elbow, the activity generally needs to be done for more than an hour a day on many days.

**Risk factors**

You could be at higher risk of developing golfer's elbow if you're:

* Age 40 or older
* Performing repetitive activity at least two hours a day
* Obese
* A smoker

### **Symptoms of golfer’s elbow**

## Golfer’s elbow symptoms can take weeks or months to develop. They might start with pain in your inner elbow that seems worse first thing in the morning. Other symptoms include:

## Aching pain in your forearm or wrist

## Decreased grip strength

## Numbness in your hand

## Pain when you try to make a fist

## Radiating pain up and down your arm

## Tingling in your hand

## Golfer’s elbow (medial epicondylitis) usually affects your dominant arm. For example, right-handed people develop a golfer's elbow in their right arm.

## **Diagnosis and Tests**

## Your healthcare provider will ask what activities make your elbow hurt. They’ll examine your arm for specific movements and/or positions that cause pain. Other tests might include:

## Magnetic resonance imaging (MRI)

## Ultrasound

## Computed tomography (CT) scans

## **Management and Treatment**

## First, give your arm a break. Healthcare providers recommend you rest your arm for at least four to six weeks before playing sports or resuming the daily activities that put a strain on your arm.

## Other golfer’s elbow treatments include:

## Using ice on your forearm

## Taking anti-inflammatory medications

## Wearing a brace on your forearm

## Wearing a night splint

## Using kinesiology tape

## Going to physical therapy

## Persistent golfer’s elbow (medial epicondylitis) pain that’s not significantly reduced by physical therapy might require additional treatment, including:

## Massage to stimulate nerve endings and pressure points to promote healing and reduce pain

## Extracorporeal shock wave therapy to stimulate blood flow and encourage healing by delivering high-energy sound waves

## Topical nitroglycerin patches to reduce inflammation

## Corticosteroid injections for short-term symptom relief

## Platelet-rich plasma (PRP) injections to reduce pain and improve function

## Prolotherapy to jump-start your body’s healing process

## Botulinum toxin (Botox®) injections to block nerve signals and reduce pain

## Ultrasound-guided percutaneous tenotomy to repair damage to your tendons

## Transcutaneous electrical nerve stimulation (TENS) to relieve pain

## If you haven’t had any improvement of your symptoms with these methods over six to 12 months, your provider may recommend surgery, but this is rare.

### **When should I see my healthcare provider?**

## Contact your provider if you still have symptoms even after resting your arm and doing physical therapy.

## Golfer’s elbow doesn’t usually require an emergency room visit. But your symptoms might be signs of a serious problem. Go to the emergency room or get immediate attention if:

## Your elbow looks misshapen

## Your elbow feels hot or inflamed, and you have a fever

## You think you’ve broken a bone

#### **What questions should I ask my healthcare provider?**

## **Some questions you may want to ask your provider include:**

## I don’t play golf. How did I develop golfer’s elbow?

## **Golfer’s elbow (medial epicondylitis) is caused by repetitive overuse or strain of the tendons on the inside of the elbow, not just by playing golf. Activities that involve repetitive wrist flexion, gripping, or forearm twisting—such as weightlifting, throwing sports (baseball, javelin), racket sports, manual labor (carpentry, painting, plumbing), gardening, or even frequent computer use—can cause this condition. It often develops when muscles and tendons are suddenly overused or stressed without adequate rest, leading to small tendon injuries and degeneration.**

## 2. What can I do about the pain?

## **Rest and avoid activities that worsen the pain.**

## **Apply ice packs to reduce pain and swelling.**

## **Use over-the-counter pain relievers such as NSAIDs (ibuprofen) to ease discomfort.**

## **Wearing a counterforce brace or elbow strap can reduce strain on the tendons.**

## **Gentle stretching and gradual strengthening exercises can help once pain improves.**

## 3. Are there exercises I can do?

## **Yes, specific stretching and strengthening exercises for the forearm muscles are key to recovery. These include:**

## **Wrist flexor stretches (gently bending the wrist backward)**

## **Eccentric strengthening exercises (slowly lowering the wrist after lifting)**

## **Forearm pronation and supination exercises A physical therapist can guide you through the proper exercises tailored to your condition and stage of healing.**

## 4. Will I need surgery?

## **Surgery is rarely needed and usually reserved for cases that do not improve after 6 to 12 months of conservative treatment. Most people recover fully with rest, physical therapy, and activity modification. If surgery is required, it involves removing damaged tendon tissue and repairing the tendon, but this is a last resort**

## **Outlook / Prognosis**

## Fortunately, most people recover from golfer’s elbow without surgery. There are also simple steps you can take every day that can help your tendons heal. But left untreated, golfer’s elbow could cause long-term problems like limiting your elbow’s range of motion, causing chronic pain and weakening your grip.

### **How do I take care of myself?**

## Start by giving your aching arm some R&R. Here are other steps you can take once you’re back in the swing of things — whether that’s sports or work:

## Talk to your healthcare provider about appropriate stretches or strengthening exercises that you can do before you participate in activities that strain your wrist and arm.

## Wear a brace while you work or play sports.

## Ice your arm after work or playing sports.

## **Prevention**

You can take steps to prevent golfer's elbow:

* **Strengthen your forearm muscles.** Use light weights or squeeze a tennis ball. Even simple exercises can help your muscles absorb the energy of sudden physical stress.
* **Stretch before your activity.** Walk or jog for a few minutes to warm up your muscles. Then do gentle stretches before you begin your game.
* **Fix your form.** Whatever your sport, ask an instructor to check your form to avoid overload on muscles.
* **Use the right equipment.** If you're using older golfing irons, consider upgrading to lighter graphite clubs. If you play tennis, make sure your racket fits you. A racket with a small grip or a heavy head may increase the risk of elbow problems.
* **Lift properly.** When lifting anything — including free weights — keep your wrist rigid and stable to reduce the force to your elbow.
* **Know when to rest.** Try not to overuse your elbow. At the first sign of elbow pain, take a break.

## **Living With**

Start by giving your aching arm some R&R. Here are other steps you can take once you’re back in the swing of things — whether that’s sports or work:

* Talk to your healthcare provider about stretches for your wrist and arm that you can do before you participate in activities that strain your wrist and arm.
* Wear a brace while you work or play sports.
* Ice your arm after work or playing sports.

## **Epidemiology**

### United States statistics

Medial epicondylitis accounts for only 10-20% of all epicondylitis diagnosis; the annual incidence is between 3-4 per 10,000 patients in the United States and is more common in patients aged 40 years and older. The condition is classically described in the dominant elbow of a golfer.Tennis players who hit their forehand with a heavy topspin are also at increased risk for developing medial epicondylitis.

**DIFFERENTIAL DIAGNOSIS**

The differential diagnosis for medial epicondylitis includes, but is not limited to, the following:

* Ulnar neuropathy
* Cervical radiculopathy
* Ulnar (medial) collateral ligament sprain or tear
* Valgus extension overload syndrome
* Posteromedial elbow impingement
* Synovial plica
* Synovitis
* Elbow bursitis
* Rheumatoid arthritis
* Osteoarthritis
* Osteochondritis dissecans
* Occult fracture
* Myofascial pain complex
* Shingles

**Doctor-patient conversation about golfer’s elbow**

Doctor:  
“Hello, I understand you’ve been having pain on the inside of your elbow. From your symptoms and examination, it looks like you have golfer’s elbow, which is also called medial epicondylitis. This is an overuse injury affecting the tendons that attach to the inner part of your elbow.”

Patient:  
“But I don’t play golf. How did I get this?”

Doctor:  
“That’s a common question. Golfer’s elbow isn’t caused only by golf. It can happen from any repetitive activity that strains the muscles and tendons that bend your wrist and fingers, like lifting, throwing, gardening, or even repetitive work like typing or manual labor. Over time, this repeated stress causes inflammation and small tendon injuries.”

Patient:  
“What can I do about the pain?”

Doctor:  
“The first step is to rest and avoid activities that worsen your pain. Applying ice packs several times a day can help reduce inflammation. Over-the-counter painkillers like ibuprofen can ease the discomfort. Wearing a brace or strap around your forearm can also reduce strain on the tendons.”

Patient:  
“Are there exercises I can do to help?”

Doctor:  
“Yes, once the pain starts to improve, specific stretching and strengthening exercises for your forearm muscles are very helpful. For example, gentle wrist flexor stretches and eccentric strengthening exercises can promote healing. A physiotherapist can guide you through the right exercises and techniques.”

Patient:  
“Will I need surgery?”

Doctor:  
“Surgery is rarely needed. Most people improve with rest, physiotherapy, and activity modification within a few months. Surgery is only considered if symptoms persist for 6 to 12 months despite treatment and significantly affect your daily life.”

Patient:  
“How long will it take to get better?”

Doctor:  
“Recovery usually takes several weeks to a few months. It’s important to be patient and consistent with treatment. Avoiding activities that aggravate your symptoms and following your physiotherapy program will give you the best chance of a full recovery.”

Patient:  
“Thank you, doctor. That helps me understand what’s going on and what I can do.”

Doctor:  
“You’re welcome. If your symptoms change or worsen, or if you have any questions, please don’t hesitate to contact me. We’ll work together to get you back to full strength.”

REFERENCES

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[Golfer's elbow - Symptoms and causes - Mayo Clinic](https://www.mayoclinic.org/diseases-conditions/golfers-elbow/symptoms-causes/syc-20372868)

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### **Shin splints**

Shin splints refers to pain in the front part of your lower legs (shins). This pain occurs when the muscles, tendons and tissue around your shin bone (tibia) become inflamed. Athletes often have shin pain because they put repeated stress on their shin bones, muscles and connective tissues. Healthcare providers sometimes call shin splints medial tibial stress syndrome.

Shin splints are a very common overuse injury. With rest and ice, most people recover from shin splints without any long-term health problems. However, if left untreated, shin splints do have the potential to develop into a tibial stress fracture.

## **Symptoms and Causes**

The most common symptom of shin splints is lower leg pain. The pain can range from mild to severe, and your shin bone may be tender to the touch. Mild swelling may occur, as well.

#### **What do shin splints feel like?**

Pain from shin splints can:

* Commonly be felt on the inner lower part of your leg or front of your shin bone.
* Start off as come-and-go discomfort with activity and progress to a steady and persistent pain even after the activity has ended.
* Be sharp or a dull ache.
* Get worse after activity.

### **What causes shin splints?**

Shin splints develop from repeated stress to your shin bone by the pulling and tugging of the muscles and connective tissues in your lower leg. Frequent, repetitive pressure from running and jumping can cause your shin bone to become inflamed (swollen or irritated) and weakened. When the bone doesn’t have time to heal, the damage can get worse and cause severe pain. Such repeated stress can happen for many reasons, including starting a new exercise routine or increasing your level of physical activity too quickly.

Although anyone can get shin splints, certain people have a higher chance of developing the condition. Groups with a higher risk of shin splints include:

* Runners, especially those who run on uneven surfaces or suddenly increase their running program.
* Athletes who play high-impact sports that put stress on their legs.
* Dancers.
* People who have flat feet, high arches or very rigid arches. In these situations, your muscles and bones may not absorb or distribute force from impact and loading activities, as well.
* Members of the military and people who march or walk a lot.
* People who wear unsupportive shoes when exercising.
* People who walk extreme distances.
* Anyone with underlying vitamin D deficiency, an eating disorder or loss of normal menses (periods).
* People with osteopenia or osteoporosis who may already have weaker bones.

### **Complications of shin splints**

Complications from shin splints are rare. If you continue to run or play sports without letting your legs heal, shin splints can progress into a stress fracture. A stress fracture occurs when little cracks form in your bone. To treat a stress fracture, healthcare providers often recommend using crutches or wearing a walking boot until the bones heal.

## **Diagnosis and Tests**

Healthcare providers diagnose shin splints by learning your medical history and doing a physical exam. Your provider will look at how you walk and examine your lower leg, ankle and foot. A complete exam will involve moving your ankle and foot around and feeling tenderness along the bone. Standing on the painful leg or hopping on that leg may help to diagnose shin splints or a stress fracture.

To rule out a stress fracture, your provider will first order an X-ray, although stress fractures aren’t seen in about two-thirds of plain X-rays. Therefore, if your provider is concerned, they may then order a magnetic resonance imaging (MRI) scan or bone scan. These tests allow your provider to see if the shin splint has become a stress fracture because they pick up the injury before an X-ray

## **Management and Treatment**

To relieve your symptoms, you need to give your bones and muscles time to heal. Shin splints treatment usually includes a combination of:

* Rest: Take a break from sports, running and other activities to give your muscles and bones a chance to recover. You may need to rest and take it easy for a few weeks or longer.
* Ice: Apply a cold compress to your shins every 10 to 20 minutes, three to four times a day, for a few days. Ice helps relieve the swelling and pain of shin splints.
* Pain relievers: Over-the-counter (OTC) nonsteroidal anti-inflammatory drugs (NSAIDs) can ease pain and swelling.
* Supplements: A vitamin D3 supplement (1000 to 2000 IU daily) may help. Discuss supplements with your healthcare provider.
* Shin splint stretches: Gently stretching and flexing your lower leg muscles may be helpful.
* Slow increase in activity level: When you do become active again, start slowly. Increase your activities gradually to reduce the risk of shin splints returning.
* Supportive shoes and shoe inserts: For people who have flat feet, shoe inserts (orthotics) can be effective at relieving the pain of shin splints. Orthotics support your arches and reduce stress on the muscles and bones in your lower legs.
* Physical therapy: Physical therapy can help you get moving again by strengthening your legs and reducing your chance of repeated injury.

#### **What are the side effects of the treatment for shin splints?**

Side effects from NSAIDs are rare but can occur. They usually happen only after you’ve taken the medication for a long time. You should use the lowest dose for the shortest time to minimize side effects.

Side effects of NSAIDs can include:

* Heartburn, stomach pain and (rarely) stomach ulcers.
* Headaches, dizziness and lightheadedness.
* High blood pressure (hypertension).

## **Outlook / Prognosis**

Most people who have shin splints recover after taking time off from sports and activities. Shin splints often go away once your legs have had time to heal, usually in three to four weeks. Most people can resume an exercise program after their legs have healed. It takes longer to recover from a stress fracture, so it’s best to treat shin splints early.

#### **How long do shin splints last?**

Shin splints aren’t permanent. You should be able to ease pain from shin splints with rest, changing the amount of exercise you’re doing and making sure to wear supportive footwear. If your shin splints don’t go away over a long period of time, see your healthcare provider. You may need to be tested for stress fractures or other conditions that could be causing the pain. Preventing shin splints from returning may require an evaluation of your footwear, stretching and flexibility.

## **Prevention**

While you may not always be able to prevent shin splints, you can reduce your risk of developing the condition or making it worse. To lower your risk, you can:

* Wear supportive shoes when exercising. Running shoes should be replaced every 300 miles. Consider wearing orthotic inserts that support your arches. Stop in and chat with someone at a running shoe store where they can help match your foot type with a proper running shoe or orthotic. You may also consider speaking with a pedorthist. A pedorthist is a specialist in using shoes and other footwear to solve problems related to your lower legs and feet.
* Start slowly and increase your activity level and intensity over time. Avoid sudden increases in activity. Stick to the 10% rule — don’t increase more than 10% per week in activity. For example, if you run 5 miles (8 kilometers) total in one week, you should only add a half mile to your total mileage the following week (5.5 miles or 8.85 kilometers total).
* Stretch your muscles before exercising to warm them up.
* Avoid surfaces that are hard, uneven or hilly when you’re running. If you run often, consider adding low-impact exercises (like swimming) to your exercise program to give your legs a break from the stress of running. Consider cross-training and taking days off.
* Rest between activities to allow your muscles and bones time to heal.
* Use pain as your guide. If you’re noticing shin pain, reduce your activity level until this improves. Don’t try to push through pain.

### **When should I see my healthcare provider?**

You should call your healthcare provider if your shin pain is severe or doesn’t go away after a few weeks of rest. Call your provider if your legs are very swollen, red or painful. These symptoms could mean you have an infection or another condition.

### **What questions should I ask my healthcare provider?**

Questions you may want to ask your provider include:

## . How did I get shin splints?

Shin splints occur due to repetitive stress and inflammation of the muscles, tendons, and bone tissue around the shinbone (tibia). They commonly affect athletes like runners, dancers, and military recruits, especially when there is a sudden increase in exercise intensity, duration, or frequency. Running on hard or uneven surfaces, improper footwear, flat feet or high arches, and poor running mechanics also increase risk.

## 2. How can I get rid of shin splints?

* Rest from activities that cause pain to allow healing.
* Apply ice packs to the affected area several times a day to reduce pain and inflammation.
* Use over-the-counter pain relievers like ibuprofen if needed.
* Wear proper, supportive shoes and consider shock-absorbing insoles or arch supports if you have foot abnormalities.
* Gradually return to activity with proper warm-up and stretching.
* Strengthen leg, ankle, hip, and core muscles to reduce stress on your shins.

## 3. How long will they last?

Shin splints usually improve with rest and treatment within a few weeks to a couple of months. However, if ignored and activity continues without rest, the condition can worsen and lead to stress fractures, which take longer to heal.

## 4. Is it OK to walk with shin splints?

Walking is generally okay if it does not cause pain. Low-impact activity like walking can help maintain fitness without overloading the shins. However, if walking causes pain, you should reduce weight-bearing and rest until symptoms improve.

## 5. How can I prevent shin splints in the future?

* Increase exercise intensity and duration gradually to avoid overloading your shins.
* Wear well-fitting, supportive shoes and replace them regularly (every 350–500 miles for runners).
* Use arch supports or shock-absorbing insoles if you have flat feet or high arches.
* Cross-train with low-impact activities like swimming or cycling.
* Perform strengthening exercises for your legs, ankles, hips, and core.
* Consider a running gait analysis to correct biomechanical issues

**DIFFERENTIAL DIAGNOSIS**

Given the location on the lower extremity, the differential diagnosis includes the following: tibial stress fracture, chronic exertional compartment syndrome (CECS), and vascular etiologies (e.g., functional popliteal artery entrapment syndrome, peripheral arterial disease, etc.).

Tibial stress fractures can be difficult to distinguish from MTSS and are likely part of the same continuum of tibial bone stress injury. Anterior cortex stress fractures are more common than posteromedial tibial stress fractures and are distinguished by point tenderness (<5 cm) along the tibia. Radiographs may reveal the "dreaded black line," and MRI can help determine the severity of the stress injury.

Chronic exertional compartment syndrome (CECS) is considered a disorder of muscular origin and presents similarly with exercise-induced lower extremity pain that is also diffusely located. It often involves both extremities, relieved by rest, and may have additional symptoms such as paresthesias, pallor, cold skin temperature, and loss of pulses in the distal lower extremity. CECS diagnosis is made by measuring intramuscular compartment pressures.

Functional popliteal artery entrapment syndrome (FPAES) and peripheral arterial disease (PAD) both manifest as claudication. FPAES is thought to be due to anatomic variations or hypertrophy of the musculature in the popliteal fossa leading to popliteal artery compression with increased activity. FPAES diagnosis is by stress arteriography. PAD is often due to atherosclerosis and is diagnosed by arteriography or Doppler ultrasound examination.

**EPIDEMIOLOGY**

The incidence of medial tibial stress syndrome ranges between 13.6% to 20% in runners and up to 35% in military recruits. Significant increasing loads, volume and high impact exercises can predispose to MTSS and further bone stress injury. Intrinsic risk factors include increases in the female gender, previous history of MTSS, high BMI, navicular drop (a measure of arch height and foot pronation), ankle plantar flexion range of motion, and hip external rotation range of motion. Studies in military basic training recruits have linked vitamin D deficiency to an increased risk of stress injury

**Doctor-patient conversation about shin splints**

Doctor:  
“Hello, I understand you’ve been experiencing pain along your shins, especially when you run or exercise. Based on your symptoms and examination, it sounds like you have shin splints, which is a common condition caused by inflammation of the muscles and tissues around your shinbone.”

Patient:  
“What exactly causes shin splints? I don’t remember any injury.”

Doctor:  
“Shin splints usually develop from repetitive stress on your lower leg, especially if you suddenly increase your activity level, run on hard surfaces, or wear shoes that don’t provide enough support. It’s essentially your body’s way of telling you that the muscles and tendons around your shin are overloaded.”

Patient:  
“How can I get rid of the pain?”

Doctor:  
“The best treatment is to rest and avoid activities that cause pain for a while. Applying ice to your shins several times a day can help reduce inflammation. Over-the-counter painkillers like ibuprofen can also ease the discomfort. Once the pain starts to improve, we can work on strengthening and stretching exercises to help prevent it from coming back.”

Patient:  
“How long will it take to heal?”

Doctor:  
“Most people feel better within a few weeks to a couple of months with proper rest and care. However, if you keep pushing through the pain without resting, it could lead to more serious problems like stress fractures, which take longer to heal.”

Patient:  
“Is it okay to keep walking or exercising?”

Doctor:  
“Walking is usually fine as long as it doesn’t cause pain. Low-impact activities can help you stay active without putting too much stress on your shins. But if walking or any activity causes pain, it’s important to rest and let your legs heal.”

Patient:  
“What can I do to prevent shin splints in the future?”

Doctor:  
“To prevent shin splints, it’s important to increase your exercise intensity gradually, wear supportive shoes, and replace them regularly. Strengthening your leg and core muscles and cross-training with low-impact activities like swimming or cycling can also help. If needed, we can evaluate your running form or foot mechanics to make sure everything is aligned properly.”

Patient:  
“Thank you, doctor. That really helps me understand what’s going on and how to take care of it.”

Doctor:  
“You’re welcome. If your pain worsens or doesn’t improve with rest, or if you notice any swelling or numbness, please come back so we can reassess. We’ll work together to get you back to full health.”

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[Shin splints - Diagnosis & treatment - Mayo Clinic](https://www.mayoclinic.org/diseases-conditions/shin-splints/diagnosis-treatment/drc-20354110)

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### **Torn meniscus**

A torn meniscus is a tear in the tough cartilage inside your knee. Two pieces of cartilage sit inside your knee between your thighbone (femur) and shinbone (tibia). This cartilage is the meniscus. The rubbery wedges of cartilage act like shock absorbers for your knee, providing cushioning for your bones and knee joint. It can tear after a hard twist or rotation of your knee.

As you get older, the cartilage in your knees wears down and gets weaker. This thinner cartilage can tear more easily. Arthritis (a breakdown of cartilage in the joints) can also lead to a meniscus tear. It’s also a common sports injury in people who play sports, even in children and teenagers.

#### **Types of meniscus tears**

Each of your knee joints has two menisci:

* Medial meniscus: A medial meniscus tear affects the cartilage on the inside of your knee.
* Lateral meniscus: A lateral meniscus tear affects the cartilage on the outside of your knee.

A torn meniscus is a very common sports injury. Often, athletes and people who play sports for fun get meniscus tears. The injury also commonly affects older people and those with arthritis in their knees. Meniscal tears affect 61 out of every 100,000 people in the U.S.

## **Symptoms and Causes**

### People who tear a meniscus often feel like something has popped in their knees at the time of the injury. Other meniscus tear symptoms include:

* Feeling like your knee might give out beneath you.
* Having knee pain or stiffness or a swollen knee.
* Being unable to fully bend or straighten your leg.

#### **Can you still walk with a torn meniscus?**

At first, you might be able to bear weight on your injured leg. But your knee will start to swell and become more and more painful over the span of a few days.

### **What causes meniscal tears?**

Acute meniscus tears occur during a sudden motion in which your knee twists while your foot stays planted on the ground. The tear frequently occurs while playing sports. People whose cartilage wears down (due to age or arthritis) can tear a meniscus from a motion as simple as stepping on an uneven surface. Sometimes, degeneration from arthritis causes a tear, even without a knee injury.

#### **Who might tear a meniscus?**

People who play sports (like tennis, soccer, basketball or football) that involve sudden, twisting movements are most likely to tear a meniscus. Playing contact sports also increases your risk of a meniscus tear. Getting hit or tackled can make you twist your knee, tearing the cartilage. But degenerative meniscus tears from wear and tear of your cartilage over time are common no matter your activity level.

### **What are the complications of this condition?**

If your meniscus tear doesn’t heal properly, you may have continued pain and discomfort in your knee. Meniscus injury can also speed up the wear and tear on your knee joint, increasing your risk for osteoarthritis.

## **Diagnosis and Tests**

Your healthcare provider will physically examine your knee, looking for signs of swelling. They’ll test your range of motion using a McMurray test or Thessaly test. You may also get imaging tests, like X-rays or an MRI (magnetic resonance imaging), to assess the damage.

Your provider may recommend knee arthroscopy to better view and accurately diagnose your injury. During this procedure, the surgeon inserts a tiny camera (called an arthroscope) through a small cut (incision) and into your knee.

## **Management and Treatment**

Depending on the size and location of your meniscus tear, it may heal without surgery. Your healthcare provider may recommend taking a nonsteroidal anti-inflammatory (NSAID) medicine (like ibuprofen or aspirin) to relieve pain and reduce swelling. In the days after your injury, you should also follow the RICE method. RICE stands for rest, ice, compression and elevation:

* Rest: Keep your weight off your injured knee as much as possible.
* Ice: Place an ice pack on your knee for about 20 minutes, several times a day.
* Compression: Wrap your knee with a compression bandage to help reduce swelling.
* Elevation: Rest with your leg raised higher than your heart to decrease swelling.

Your provider may also recommend working with a physical therapist to strengthen your knee and increase your range of motion.

#### **Is knee surgery necessary to repair a torn meniscus?**

More serious meniscus tears may not heal on their own. If your injury doesn’t improve with RICE, NSAIDs and physical therapy, your healthcare provider may recommend meniscus surgery. This is a minimally invasive surgery with little downtime. It’s one of the most common orthopedic surgeries in the U.S.

Surgery is a very effective way to repair a torn meniscus. If the tear is too big to repair, your surgeon may remove all or part of the meniscus. After recovery, you’ll be less likely to develop additional knee problems.

## **Outlook / Prognosis**

Most people who tear a meniscus can return to full activity. If you have surgery to repair a torn meniscus, your knee should be fully recovered after a few months of physical therapy.

If you have surgery to remove all or part of your meniscus, you may be at a higher risk of developing arthritis down the road. That’s because you now have less shock absorption in your joint. Over time, the joint can break down.

## **Prevention**

It can be hard to prevent an accidental injury. But you can reduce your risk of a torn meniscus if you:

* Strengthen the muscles that support and stabilize your knee.
* Wear a knee brace if you know your knee is unstable or weak.
* Work up slowly to more intense exercise activity.
* Wear athletic shoes that are appropriate for the sport you’re doing.

### **When should I call my healthcare provider?**

You should call your healthcare provider if you:

* Can’t fully bend or straighten your leg without knee pain.
* Have swelling that doesn’t go away with a few days of RICE and taking NSAIDs.
* Feel like your knee locks up or might give way underneath you.

#### **What questions should I ask my healthcare provider?**

You may want to ask your healthcare provider:

## How severe is the tear in my meniscus?

Meniscus tears are classified by their depth, location, and type:

* Partial tears affect only one surface (top or bottom), while complete tears go through both surfaces.
* Tears in the outer third (red zone) have better blood supply and a higher chance of healing. Tears in the middle or inner thirds (red-white or white zones) have less blood supply and heal poorly.
* Types include longitudinal (bucket-handle), radial, horizontal, flap, and complex tears.  
  Severity depends on how much of the meniscus is torn, whether the tear causes mechanical symptoms (like locking), and its location. MRI and arthroscopic classification help determine severity.

## 2. Is the tear likely to heal on its own?

* Tears in the outer third (vascular zone), especially small and partial tears, have a better chance of healing naturally with rest and conservative care.
* Tears in the inner two-thirds generally do not heal well on their own due to poor blood supply.
* Small, stable tears without mechanical symptoms may improve without surgery, but larger or displaced tears usually require intervention.

## 3. Will I need physical therapy?

Yes, physical therapy is important for almost all meniscus tears, whether treated conservatively or after surgery. Therapy focuses on:

* Reducing pain and swelling
* Restoring knee range of motion
* Strengthening muscles around the knee to support joint stability
* Gradual return to activity and function

## 4. Do I need surgery to repair or remove the torn meniscus?

* Surgery is considered if:
  + The tear is large, causes mechanical symptoms (locking, catching), or does not improve with conservative treatment.
  + Tears in the outer third may be repaired (sutured) to preserve meniscal tissue.
  + Tears in the inner third are usually trimmed (partial meniscectomy) to remove unstable fragments and reduce symptoms.
* Many small or degenerative tears can be managed without surgery.

## 5. When will I be able to get back to full activity?

* Recovery depends on tear severity and treatment:
  + Mild tears (Grade 1): 2 to 4 weeks with conservative care.
  + Moderate tears (Grade 2): 4 to 8 weeks, often with physical therapy.
  + Severe tears (Grade 3) requiring surgery: 3 to 6 months including rehabilitation.
* Return to sports or strenuous activity is gradual and guided by symptom resolution and strength recovery.

## 6. What are signs the injury is getting worse instead of healing?

* Increasing or persistent knee pain and swelling
* Locking or catching sensation in the knee
* Difficulty fully straightening or bending the knee
* Feeling of instability or giving way
* New or worsening joint stiffness
* Symptoms that do not improve or worsen despite rest and therapy

## **Diagnostic Considerations**

These include the following:

* Collateral ligament injuries
* Loose bodies in the knee
* Osteochondritis dissecans

## **Differential Diagnoses**

* Anterior Cruciate Ligament Injury
* Contusions
* Iliotibial Band Syndrome
* Knee Osteochondritis Dissecans
* Lateral Collateral Knee Ligament Injury
* Lumbosacral Radiculopathy
* Medial Collateral Knee Ligament Injury
* Medial Synovial Plica Irritation
* Patellofemoral Joint Syndromes
* Pes Anserine Bursitis
* Posterior Cruciate Ligament Injury

## **Epidemiology**

### Frequency

*United States*

Although the exact incidence and prevalence of meniscal injury are unknown, it is a fairly common sports-related injury among adults. Knee meniscal injuries also occur in individuals who are skeletally immature, but less commonly than in adults. Meniscal injuries are rare in children younger than 10 years with morphologically normal menisci.

### Mortality/Morbidity

Meniscal injuries usually are associated with pain that results in gait deviation and loss of time from work and/or sport.

A study by Yasuda et al suggested that medial meniscus tears cause spontaneous osteonecrosis of the knee (SONK). Specifically, the investigators found medial meniscal extrusion and the femorotibial angle to be significantly associated with SONK stage and volume in the medial femoral condyle.

### Race

A correlation between race and meniscal injuries is not known to exist.

### Sex

Meniscal injuries are more common in males, which may be a reflection of greater involvement by males in aggressive sporting and manual activities that predispose to rotational injuries of the knee.

### Age

Meniscal injuries are common in young males who are involved in sporting or manual activities. A second peak of incidence is observed in persons older than 55 years; this is secondary to a degenerate meniscus being susceptible to injuries with minor trauma.As previously stated, meniscal injuries are rare in children younger than 10 years with morphologically normal meniscal tear

**doctor-patient conversation about a meniscal tear**,

Doctor:  
“Hello, I’ve reviewed your knee examination and imaging, and it appears you have a meniscal tear. The meniscus is a cartilage cushion inside your knee that helps absorb shock and stabilize the joint.”

Patient:  
“How bad is the tear? Will it heal on its own?”

Doctor:  
“The severity depends on the tear’s size, type, and location. Tears on the outer edge of the meniscus have better blood supply and sometimes can heal with rest and therapy. However, tears in the inner part usually don’t heal by themselves because of poor blood flow. Small, stable tears may improve without surgery, but larger or displaced tears often need treatment.”

Patient:  
“Will I need physical therapy?”

Doctor:  
“Yes, physical therapy is very important. It helps reduce pain and swelling, restore your knee’s range of motion, and strengthen the muscles around your knee to support it and prevent further injury.”

Patient:  
“Do I need surgery to fix or remove the torn meniscus?”

Doctor:  
“Not everyone with a meniscal tear needs surgery. If your symptoms are mild and improving with conservative treatment, we can avoid surgery. But if you have persistent pain, swelling, or mechanical symptoms like locking or catching, surgery might be recommended. For younger patients with traumatic tears, we often try to repair the meniscus to preserve as much tissue as possible. In older patients or degenerative tears, partial removal of the damaged meniscus may be done to relieve symptoms.”

Patient:  
“When can I get back to full activity?”

Doctor:  
“Recovery time varies. With conservative treatment, many people improve within a few weeks to a couple of months. If surgery is needed, it usually takes about 3 to 6 months to return to full activity, depending on the procedure and your rehabilitation progress.”

Patient:  
“What signs mean the injury is getting worse instead of better?”

Doctor:  
“You should watch for increasing pain or swelling, difficulty fully straightening or bending your knee, sensations of locking or catching, or feelings of instability. If these occur or your symptoms don’t improve with treatment, please come back for reassessment.”

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[Torn Meniscus: Causes, Symptoms, Treatment & Prevention](https://my.clevelandclinic.org/health/diseases/17219-torn-meniscus#overview)

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### **Hip labral tear**

A hip labral tear is an injury to the labrum in your hip joint. The labrum is a rim of cartilage that lines your hip socket.

Joints are places in your body where two bones meet. Your hip joint is the connection between your thigh bone (femur) and your hip bone (pelvis). The top of your femur (the femoral head) is shaped like a ball that fits into the socket in your pelvis (the acetabulum).

The hip labrum is a soft, protective lining around the acetabulum that protects the socket and prevents your bones from grinding against each other when they move. It helps your hip bones move smoothly and seals the space between them. It makes sure the bones are held together but not directly touching.

Hip labral tears happen when something damages the labrum. Visit a healthcare provider if you’re feeling pain or stiffness in your hip that doesn’t get better in a few weeks.

## **Symptoms and Causes**

The most common symptoms of a labral tear in your hip include:

* Hip pain (especially when you bend, move, exercise or play sports).
* Stiffness.
* A clicking or popping sound and feeling when you move your hip.
* Feeling unsteady or unstable when you’re standing or moving.

Some people with a small labral hip tear have no symptoms. They may never know they have one unless it’s diagnosed when a healthcare provider sees it on imaging tests for other issues.

#### **What does a hip labral tear feel like?**

Everyone experiences pain differently, and which kind of hip pain you feel depends on how severely your labrum is torn — and if you have other injuries. The pain usually feels like:

* A constant dull ache.
* Sharp and stabbing in certain positions or during certain activities (like lying on that side or during exercise).
* It comes from deeper inside your body (not close to the surface like a cramp or muscle pain). It might feel like bone pain.
* It spreads (radiates). Some people with a hip labral tear feel pain in their groin, lower back or leg. You might change how you walk, move or hold your body without knowing you’re doing it. This unconscious change to your posture can put stress on muscles and other tissue around your injured hip.

### **What causes hip labral tears?**

Anything that puts too much pressure on your hip can damage the joint and tear your labrum. The most common causes include:

* Femoroacetabular impingement (FAI): FAI happens when your hip joint naturally doesn’t fit together as it should. If the bones don’t come together properly, they put extra pressure on your hip labrum. Eventually, that pressure and any friction can tear the labrum. Providers also call FAI hip impingement.
* Injuries: Sports injuries, falls and car accidents can all cause hip labral tears.
* Osteoarthritis: Osteoarthritis is “wear and tear” arthritis. Normal, everyday stress on your joints adds up over time to cause it. If you have osteoarthritis, cartilage in your joint can wear down enough to tear your labrum.

#### **What are the risk factors?**

Anyone can experience an injury or trauma that damages their hip joint and tears their hip labrum. Athletes who play sports that put a lot of pressure on their hips have a higher risk, including:

* Hockey.
* Dance.
* Football.
* Soccer.
* Golf.
* Gymnastics.

## **Diagnosis and Tests**

A healthcare provider will diagnose a hip labral tear with a physical exam and some tests. They’ll examine your hip and ask you about your symptoms. Tell your provider when you first noticed pain and other symptoms, and if any activities, movements or positions make them worse.

Your provider might have you move and use your hip. They’ll ask you to stand, bend and walk. Tell your provider if any of these movements hurt — and which ones are the most painful.

Your provider will probably need imaging tests to take pictures of your hip joint and the tissue around it. They might use:

* Hip X-ray.
* Ultrasound.
* Magnetic resonance imaging (MRI).
* Computed tomography (CT) scan.

## **Management and Treatment**

Your provider will suggest treatments to manage your symptoms. Surgery is the only way to repair a hip labral tear, but some people can manage their symptoms with nonsurgical treatments.

The most common treatments for hip labral tears are:

* Over-the-counter (OTC) pain relievers: NSAIDs (like ibuprofen, aspirin and naproxen) or acetaminophen reduce inflammation and relieve pain. Don’t take pain relievers for more than 10 days in a row without talking to your provider.
* Corticosteroids: Corticosteroids are prescription anti-inflammatory medications. Your provider may inject a corticosteroid directly into your hip joint.
* Physical therapy: A physical therapist will give you stretches and exercises to strengthen the muscles around your affected hip joint and increase your flexibility.

#### **Hip labral tear surgery**

Your healthcare provider might recommend surgery to repair the tear in your hip labrum if you’re experiencing severe symptoms or if other treatments haven’t worked after a few months.

Your surgeon will usually perform a hip arthroscopy. They’ll repair the tear in your hip labrum and fix other damage inside your hip joint. If you have hip impingement, they might reshape the bones in your joint so they fit together better.

Hip arthroscopies are usually outpatient procedures, which means you can go home the same day. Your provider or surgeon will tell you what to expect.

#### **Can a tear heal on its own?**

No, hip labral tears can’t heal on their own. Surgery is the only way to repair a torn hip labrum. Some tears are so small that they don’t cause pain or other symptoms, but even those won’t heal without surgical repair.

However, if you’re not experiencing severe symptoms and the labral tear isn’t affecting your quality of life or daily routine, you can live with it without needing surgery.

Never ignore pain, stiffness or other symptoms. Visit a healthcare provider if you have hip pain that doesn’t get better with rest and at-home treatments in a few weeks.

## **Outlook / Prognosis**

Most people with a tear in their hip labrum find a combination of treatments that manages their symptoms. Talk to your provider if you’re still feeling pain or other symptoms after trying medications or physical therapy. They’ll tell you when you should consider surgery.

Even though hip labral tears don’t heal on their own, you shouldn’t have to live in constant pain or discomfort. Talk to your provider if it feels like your symptoms are changing — especially if they’re getting worse or affecting your ability to participate in your daily routine.

#### **How long does it take to recover?**

It usually takes around four to six months to recover after a hip arthroscopy. Your surgeon will tell you what to expect based on your unique needs.

If you’re using conservative (nonsurgical) treatments, there might not be a set recovery timeline. That’s because medications and physical therapy technically don’t repair the tear. However, you may never need surgery if you can manage your symptoms and they don’t affect your day-to-day activities.

### **Can you still walk with a torn labrum in your hip?**

Many people can walk with a hip labral tear. Some people feel no pain. Others can walk and move, but will feel noticeably uncomfortable.

Even if you can walk, move or exercise with a hip labral tear, it might not be safe to do intense physical activity. Talk to your provider about which activities are safest.

## **Prevention**

You usually can’t prevent a hip labral tear. That’s because most of them are caused by the natural shape of your hip joint (if you have FAI), a health condition that you can’t prevent (like osteoarthritis) or unexpected injuries.

Follow these general safety tips to reduce your risk of an injury:

* Make sure your home and workspace are free from clutter that could trip you or others.
* Always use the proper tools or equipment at home to reach things. Never stand on chairs, tables or countertops.
* Use a cane or walker if you have difficulty walking or have an increased risk of falls.

During sports or other physical activities:

* Wear the proper protective equipment.
* Don’t “play through the pain” if your hip hurts during or after physical activity.
* Give your body time to rest and recover after intense activity.
* Stretch and warm up before playing sports or working out.
* Cool down and stretch after physical activity.

### **When should I see my healthcare provider?**

Hip pain is very common, and you can treat many causes at home with rest, ice and over-the-counter pain relievers. Visit a healthcare provider if pain, stiffness and other symptoms in your hip don’t get better on their own after a few weeks. Don’t ignore pain that comes back (recurs) or feels like it’s getting worse.

Go to the emergency room if you’re experiencing any of the following symptoms:

* Severe hip or groin pain.
* You experience trauma like a fall or car accident.
* You can’t move or put any weight on your hip or leg.

### **What questions should I ask my provider?**

## Do I have a hip labral tear or another injury?

## **Hip labral tears cause symptoms such as deep groin or hip pain, stiffness, limited range of motion, and sometimes clicking, locking, or catching sensations in the hip joint. However, other conditions like hip impingement, arthritis, muscle strains, or bursitis can cause similar symptoms. A thorough physical exam and imaging tests are necessary to differentiate a labral tear from other injuries.**

## 2. Which tests will I need?

## **Physical examination: Your doctor will assess hip range of motion, pain with specific movements, and gait.**

## **X-rays: To check for bone abnormalities, alignment issues, or arthritis.**

## **MRI or Magnetic Resonance Arthrography (MRA): These provide detailed images of soft tissues including the labrum; MRA with contrast is often preferred for detecting labral tears.**

## **Sometimes, an ultrasound-guided injection of anesthetic into the hip joint is used to confirm the diagnosis if pain relief occurs after injection.**

## 3. Which nonsurgical treatments will be best for me?

## **Physical therapy: Focused on improving hip strength, flexibility, and stability while avoiding painful movements.**

## **Activity modification: Avoiding activities that worsen symptoms, such as deep hip flexion or twisting motions.**

## **Medications: NSAIDs (like ibuprofen) to reduce pain and inflammation.**

## **Injections: Corticosteroid injections may help reduce inflammation and pain temporarily.**

## 4. When should I consider having surgery?

## **Surgery is usually considered if:**

## **Symptoms persist despite several weeks to months of nonsurgical treatment.**

## **You have mechanical symptoms such as locking or catching that interfere with daily activities.**

## **Imaging confirms a significant labral tear or associated hip abnormalities. Surgical options include hip arthroscopy to repair or remove the torn labrum and address any underlying bone abnormalities. Recovery typically involves a period of limited weight-bearing and physical therapy.**

## 5. Which activities or sports should I avoid?

## **Avoid activities that involve deep hip flexion, twisting, pivoting, or prolonged sitting, as these can aggravate symptoms.**

## **High-impact sports or exercises that place excessive stress on the hip joint, such as running, soccer, hockey, or ballet, should be limited during recovery.**

## **Your physical therapist can guide you on safe activities and gradual return to sport.**

### **How serious is a labral tear in the hip?**

How serious a hip labral tear is depends on what caused it and how much it’s affecting your ability to use your hip. Some tears are so small or mild that you may never know that you even have one. You might only need physical therapy or over-the-counter medications to manage occasional symptoms of a mild tear.

Some hip labral tears are serious enough to require surgery. These types of tears cause severe pain and make it hard (or impossible) to move or stay active.

## **Differential Diagnosis for Hip Labral Tear**

* Athletic pubalgia (sports hernia): Chronic groin pain due to weakness or injury of the lower abdominal wall.
* Snapping hip syndrome: A snapping sensation or sound around the hip caused by tendons moving over bony prominences.
* Piriformis syndrome: Sciatic nerve irritation from the piriformis muscle causing buttock and hip pain.
* Trochanteric bursitis: Inflammation of the bursa over the greater trochanter causing lateral hip pain.
* Osteitis pubis: Inflammation of the pubic symphysis causing groin pain.
* Septic (infectious) arthritis: Infection within the hip joint causing severe pain, swelling, and systemic symptoms.
* Avascular necrosis (AVN) of the femoral head: Bone death due to impaired blood supply, causing deep hip pain and limited motion.
* Hip fractures or dislocations: Trauma-related injuries causing acute pain and dysfunction.
* Inguinal or femoral hernia: Can cause groin pain mimicking hip pathology.
* Legg-Calve-Perthes disease: Pediatric condition causing avascular necrosis of the femoral head.
* Slipped capital femoral epiphysis (SCFE): Pediatric hip disorder causing hip pain and limited motion.
* Referred pain from lumbosacral spine or sacroiliac joint: Nerve root irritation or joint dysfunction causing hip or groin pain.
* Contusions or muscle strains: Soft tissue injuries around the hip.
* Osteoarthritis of the hip: Degenerative joint disease causing chronic hip pain and stiffness.
* Tumors (benign or malignant): Rare, but important to consider in persistent or atypical pain.

**Epidemiology of Hip Labral Tears:**

* Hip labral tears are common in both symptomatic and asymptomatic populations, with prevalence varying widely depending on the group studied and diagnostic methods used.
* In young asymptomatic adults (average age ~26 years), studies using high-resolution MRI found labral tears in approximately 38.6%, with some having isolated tears and others associated with additional intra-articular pathology.
* Among patients presenting with hip or groin pain, the prevalence of labral tears ranges from 22% to 55%.
* Labral tears occur across a wide age range, from 8 to 72 years, but are most commonly diagnosed in people in their fourth decade of life (30s).
* Women are more likely than men to suffer from hip labral tears.
* In athletic populations, especially sports involving frequent hip rotation and hyperextension (e.g., hockey, skiing, ballet), prevalence of labral tears is significantly higher, with some studies reporting rates of 56% to 89% even in asymptomatic young athletes.
* Labral tears are strongly associated with femoroacetabular impingement (FAI) and hip dysplasia, with prevalence of tears in these conditions reported as high as 79% to 94%.
* The risk of labral tears increases with age, duration of sports participation, and presence of cam morphology (a bony abnormality of the femoral head-neck junction).
* Many labral tears are asymptomatic, highlighting the importance of correlating imaging findings with clinical symptoms before deciding on treatment

## **Procedures for Hip Labral Tear**

1. Nonsurgical (Conservative) Treatment

* Activity modification: Avoid movements that worsen symptoms, such as deep hip flexion or twisting.
* Medications: NSAIDs (ibuprofen, naproxen) to reduce pain and inflammation.
* Physical therapy: Focuses on improving hip strength, flexibility, and stability while minimizing stress on the labrum.
* Injection therapy: Corticosteroid or platelet-rich plasma (PRP) injections may provide temporary pain relief.
* Duration: Typically tried for 3 to 6 months before considering surgery. Many patients improve sufficiently to avoid surgery.

2. Surgical Treatment (Hip Arthroscopy)

* Indications: Persistent pain and mechanical symptoms (clicking, catching) despite conservative care, or significant labral damage confirmed on imaging.
* Procedure: Minimally invasive arthroscopic surgery to repair (suture) or debride (trim) the torn labrum. If hip impingement (FAI) is present, bony abnormalities may be reshaped.
* Outpatient surgery: Usually performed as same-day surgery under regional or general anesthesia.
* Risks: Infection, bleeding, nerve injury, incomplete symptom relief, or need for further surgery.

## Recovery Timeline

| **Phase** | **Duration** |
| --- | --- |
| Post-Surgery (0-4 weeks) | Pain control, limited weight-bearing, passive range of motion exercises, swelling reduction. |
| Early Rehabilitation (4-8 weeks) | Gradual increase in mobility, partial weight-bearing, gentle strengthening, and balance exercises. |
| Intermediate Recovery (8-12 weeks) | Progressive strengthening, improved balance, introduction of low-impact activities (cycling, swimming). |
| Advanced Recovery (12-16 weeks) | Dynamic movements, sport-specific training, increased activity intensity. |
| Full Return to Activity (4-6 months) | Return to normal daily activities and sports, guided by symptom resolution and functional recovery. |

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## 

## **LABRAL TEAR SHOULDER**

## **Labrum of the shoulder**

The labrum is a cup-shaped rim of cartilage that lines and reinforces the ball-and-socket joint of the shoulder. The shoulder joint is composed of the glenoid (the shallow shoulder "socket") and the head of the upper arm bone known as the humerus (the "ball"). The labrum is the attachment site for the shoulder ligaments and supports the ball-and-socket joint as well as the rotator cuff tendons and muscles. It contributes to shoulder stability and, when torn, can lead to partial or complete shoulder dislocation.

## **What does a torn shoulder labrum feel like?**

The most common symptoms of a shoulder labrum tear are shoulder pain, instability and, in some cases, a feeling of grinding, locking or catching while moving the shoulder. These symptoms may vary depending on the type of labral tear a person has.

Among baseball players, pain is frequently felt when throwing, particularly between cocking and releasing the ball, and it may expand to the front of the shoulder during these movements. This soreness is frequently associated with biceps-related difficulties, such as releasing the ball and following through.

Patients often note that pain increases during activities that place strain on the shoulder, such as carrying large objects, pushing, throwing, or doing overhead tasks such as serving in tennis. Depending on the severity, they may have additional symptoms such as clicking, locking, snapping, grinding, or a sense that their shoulder is unstable.

## **Types of shoulder labral tears**

The two most common types of labral injuries are the SLAP tear and Bankart tear. Both types of tears are usually accompanied by aching pain and difficulty performing normal shoulder movements.

### **SLAP tears**

SLAP stands for "superior labrum from anterior to posterior." This type of tear occurs at the front of the upper arm where the biceps tendon connects to the shoulder. Athletes most prone to this injury include baseball pitchers, volleyball, and lacrosse players who engage in high-energy, quick-snap motions over the top of the shoulder which test the structures in the shoulder. This is why the term “overhead athletes” is often used when describing labral pathology. Patients with SLAP tears may experience pain at the front of the shoulder near the biceps tendon.

### **Bankart tears**

Bankart tears typically occur in younger patients who have dislocated their shoulder. When the shoulder joint ball slips out of the socket, the joint capsule (fibrous tissues that surround and protect the joint) can pull on the lower portion of the labrum and tear it. This in turn creates instability because the breached labrum makes it easier for the shoulder to dislocate again. A dislocation where the head of the humerus shifts toward the front of the body, it leads to what is called "anterior instability." When the ball slips toward the back of the body, it leads to "posterior instability." Anterior instability is more common than posterior instability.

With Bankart tears, patients may feel apprehension that the shoulder may slip out of place or dislocate in certain positions.

## **Diagnosis of a labrum tear made**

Because this cartilage is deep in the shoulder, it is very difficult to make the diagnosis of a torn labrum upon physical examination. There are several tests that the physician can perform that may indicate a torn labrum, but these tests are not always accurate. The other problem is that labrum tears take different forms as described above, and certain tests will detect one kind of tear but not another. Some physicians feel very confident that they can make the diagnosis of a labral tear upon physical examination, but this is controversial. There are not many scientific studies that show that physical examination is reliable for making the diagnosis of a labral tear. As a result of this uncertainty, other studies can be done to confirm the diagnosis if it is suspected.

The best tests available to make the diagnosis of a labral tear are magnetic resonance imaging (MRI) scans or a test called a CT-arthrogram (the latter is a CAT scan preceded by an arthrogram where dye is injected into the shoulder). Both of these tests are relatively good at defining a labrum tear due to a subluxation or dislocation, but they are only around 80 percent to 85 percent accurate. For that reason, some physicians believe that tests are not always needed if the diagnosis of subluxation or dislocation can be made by history and physical examination. Neither of those tests is currently very good at making the diagnosis of a SLAP lesion. This area is very complex and it is difficult to reliably get good pictures of this area with MRI.

However, if the MRI definitely shows a tear then frequently it will be present. The problem is that the MRI may miss smaller tears and cannot reliably make the diagnosis in larger tears of the labrum.

The best way to make the diagnosis of labrum tearing is with arthroscopy of the shoulder. Unfortunately this is an operative procedure and requires some form of anesthesia. Making the diagnosis also takes some experience on the part of the surgeon, since the anatomy of the inside of the shoulder can be quite complex. The relationship between labrum tears and symptoms has not been totally figured out, so it is not clearly known which ones should be repaired and which ones can be left alone.

## **What is the treatment for labrum tears?**

The treatment depends upon which kind of tear there is in the labrum. Tears that are due to instability of the shoulder, either subluxation or dislocations, require that the labrum be reattached to the rim of the socket. This can be done with an incision on the front of the shoulder, or it can be done with arthroscopic techniques through smaller incisions. There are advantages and disadvantages of each approach. At this institution we favor an open operation with an incision until arthroscopic techniques become more perfected.

If the labrum is frayed, usually no treatment is necessary since it doesn’t usually cause symptoms. However, if there is a large tear of the labrum, the torn part should either be cut out and trimmed, or it should be repaired. Which treatment is used depends upon where the tear is located and how big it is. This type of tear requiring repair without instability of the shoulder is rare.

Tears of the labrum near the biceps tendon attachment (SLAP lesions) may be just trimmed or may need to be reattached to the top of the socket. The best way to do this is with arthroscopic surgery since this area is difficult to reach with an open operation through a large incision. Using the arthroscope and small incisions for other instruments, the labrum can be reattached to the rim of the socket using either sutures or tacks.

## **Can labral tears of the shoulder be prevented?**

Unfortunately, labral tears are hard to prevent, especially in athletes, because the force of the overhead motion contributes to the injury. Although athletes are most prone to labral tears, people who experience a traumatic event – such as falling down a flight of stairs – are also at risk. This is especially the case in older adults, because our cartilage becomes more brittle with age.

## **Can a torn shoulder labrum tear heal on its own without surgery?**

In some cases, the labrum can heal with rest and physical therapy, depending on the severity of the tear. Surgeons should try to be as conservative as possible when treating a torn shoulder labrum. Surgeons will start with a physical exam of the shoulder and an X-ray followed by an MRI, if necessary, to determine the severity of the injury and the appropriate treatment.

## **Torn labrum shoulder recovery without surgery**

When surgery is not indicated, SLAP tears are usually treated with rest, anti-inflammatory medications and, in some cases, an in-office cortisone shot. This is followed by gradual stretching of the shoulder, initially with a physical therapist, for six weeks to two months. When appropriate, a platelet-rich-plasma (PRP) injection is a newer treatment that has promising results.

If the injury is a minor Bankart tear with a dislocation, the physician (or even a team coach or patient themselves) can usually pop the shoulder back into place – a process called reduction – and then follow up with physical therapy to strengthen the muscles.

## **When do you need surgery for a torn shoulder labrum?**

Surgery may be required if the tear gets worse or does not improve after physical therapy. If physical therapy fails and the athlete still can’t complete overhead motions, or the shoulder continues to dislocate, surgical treatment might be required to reattach the torn ligaments and labrum to the bone. Arthroscopic procedures, in which the doctor operates through a small incision, are usually preferred because they are less invasive than open surgery.

In general, nonsurgical treatment is usually most appropriate for older patients who do not engage in regular physical activity, while younger athletes who regularly participate in higher impact sports can expect recurrence and may want to consider arthroscopic surgery.

## **What is the recovery time for shoulder labrum repair surgery?**

Patients who undergo arthroscopic repair can expect shorter recovery times and less pain. Those undergoing open surgery should expect more pain, longer recovery, and in some cases incomplete shoulder rotation. Athletes may require six months to one year for full recovery, with overhead throwing athletes taking the longest.

Regardless of which type of surgery is performed, almost all athletes are advised to wear a sling for the first four weeks after surgery to protect the shoulder as it heals. If fixed properly, most athletes should be able to return to at least 80% of their pre-injury level of play.

**DIFFERENTIAL DIAGNOSIS**

* Biceps tendonitis
* Internal impingement
* Glenohumeral internal rotation deficit
* Other labral pathology and/or instability
* Rotator cuff tears
* Scapular dyskinesis

**EPIDEMIOLOGY**

The incidence of SLAP tears is a controversial topic in the current literature. A 2012 study evaluating trends in SLAP repair found SLAP tears were more common in men (greater than 3:1) compared to women. The highest incidences of SLAP repairs were found in the 20 to 29 and 40 to 49 decades at 29.1 and 27.8 per 10,000 patients, respectively.Other studies have shown rates between 6% and 26% at the time of arthroscopy.Specific populations, however, can present with increased rates of SLAP tears, with one study demonstrating upwards of an 83% prevalence in overhead athletes.

The variation in SLAP tear reporting may be attributed to some SLAP tears being considered an incidental finding on advanced imaging or at the time of arthroscopy. SLAP tears are a common coexisting injury in patients with other shoulder pathologies, and they do not always account for the primary cause of symptoms.

**Doctor-patient conversation about a shoulder labral tear**,

Doctor:  
“Hello, I’ve reviewed your symptoms and examination, and it appears you have a tear in the labrum of your shoulder. The labrum is a ring of cartilage around the shoulder socket that helps stabilize your shoulder joint.”

Patient:  
“What does a labral tear feel like? How did this happen?”

Doctor:  
“People with a labral tear often feel a sharp popping or catching sensation when moving their shoulder, especially with certain movements like raising or rotating the arm. Sometimes the shoulder can feel loose or unstable, as if it might slip out of place. Labral tears can happen from injuries like a shoulder dislocation, repetitive overhead activities, or trauma.”

Patient:  
“How do you diagnose it? What tests will I need?”

Doctor:  
“We start with a detailed history and physical exam, looking for specific movements that cause pain or catching. To confirm the diagnosis, we usually order an MRI, often with contrast (called an MR arthrogram), which gives a clear picture of the labrum and any tears. Sometimes X-rays or CT scans are also done to rule out other issues.”

Patient:  
“What treatment options do I have? Will I need surgery?”

Doctor:  
“Many labral tears can be managed conservatively at first. Physical therapy can help by strengthening the muscles around your shoulder, improving stability, and reducing pain. Activity modification and anti-inflammatory medications can also help. If your symptoms persist or your shoulder feels unstable despite therapy, surgery might be recommended. Arthroscopic surgery can repair or trim the torn labrum through small incisions, often allowing a faster recovery.”

Patient:  
“What does recovery look like after surgery?”

Doctor:  
“After surgery, you’ll likely wear a sling for a few weeks and start gentle motion exercises. Physical therapy will gradually increase your shoulder’s strength and flexibility. Most patients return to normal activities within 3 to 6 months, but full recovery depends on the tear’s size and your adherence to rehab.”

Patient:  
“What signs should I watch for that mean the injury is getting worse?”

Doctor:  
“If you notice increasing pain, swelling, a feeling that your shoulder is slipping or dislocating, or if you develop weakness or numbness, you should contact us promptly. These could indicate worsening instability or other complications.”

Patient:  
“Thank you, doctor. That helps me understand what’s going on and what to expect.”

Doctor:  
“You’re welcome. We’ll work together to manage your symptoms and get your shoulder back to full function.”

## **Procedures for Shoulder Labral Tear**

1. Arthroscopic Labral Repair Surgery

* Most labral tears, including SLAP (Superior Labrum Anterior to Posterior) lesions, are treated with arthroscopic surgery.
* The surgeon makes small incisions and uses a camera to visualize the joint, then repairs the torn labrum using sutures anchored to the bone.
* If there is associated shoulder instability or bony abnormalities, these may be addressed simultaneously.

2. Conservative Treatment

* Physical therapy focusing on strengthening, stability, and range of motion is often tried first, especially for mild tears without instability.
* Activity modification and anti-inflammatory medications are part of nonsurgical management.

## Typical Recovery Timeline After Arthroscopic Labral Repair

| **Phase** | **Duration** | **Key Activities and Goals** |
| --- | --- | --- |
| 0-4 weeks (Immobilization and Passive Motion) | Sling worn full-time (4-6 weeks); passive range of motion (PROM) exercises only; no active shoulder movement; pain and swelling control. |  |
| 5-7 weeks (Early Rehabilitation) | Gradual increase in range of motion; begin gentle active-assisted exercises; avoid active external rotation and abduction initially; focus on scapular stabilization and isometric exercises. |  |
| 7-12 weeks (Strengthening Phase) | Discontinue sling; start active range of motion; begin light strengthening exercises for rotator cuff and scapular muscles; continue stretching and mobility work. |  |
| 3-4 months (Advanced Strengthening and Conditioning) | Progress to more dynamic strengthening; introduce sport-specific or work-related activities; gradual return to heavier weight training after 3 months. |  |
| 4-6 months (Return to Full Activity) | Most patients return to full daily activities and sports; overhead and high-demand activities resumed cautiously; ongoing strengthening and flexibility exercises. |  |

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