The following tests will help determine the site or sites of the incompetent valves.

Venous groin cough impulse. This helps determine long saphenous vein incompetence. Place the fingers over the line of the vein immediately below the fossa ovalis (4 cm below and 4 cm lateral to the pubic tubercle).[12] Ask the patient to cough—an impulse or thrill will be felt expanding and travelling down the long saphenous vein. A marked dilated long saphenous vein in the fossa ovalis (saphena varix) will confirm incompetence. It disappears when the patient lies down.

Trendelenburg test. In this test for long saphenous vein competence, the patient lies down and the leg is elevated to 45° to empty the veins (see FIG. 55.8A). Apply a tourniquet with sufficient pressure to prevent reflux over the upper thigh just below the fossa ovalis. (Alternatively, this opening can be occluded by firm finger pressure, as originally described by Trendelenburg.)

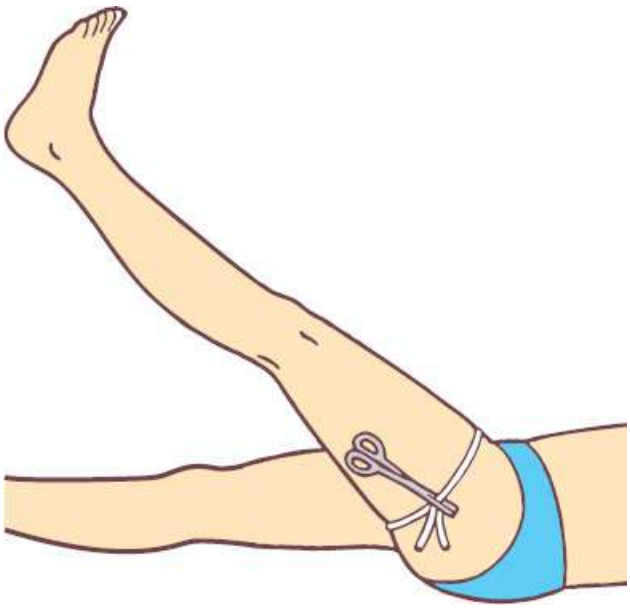

FIGURE 55.8a Trendelenburg test: the leg is elevated to 45° to empty the veins and a tourniquet applied

The patient then stands. The long saphenous system will remain collapsed if there are no incompetent veins below the level of the fossa ovalis. When the pressure is released, the vein will fill rapidly if the valve at the saphenofemoral junction is incompetent (see FIG. 55.8B). This is a positive Trendelenburg test.

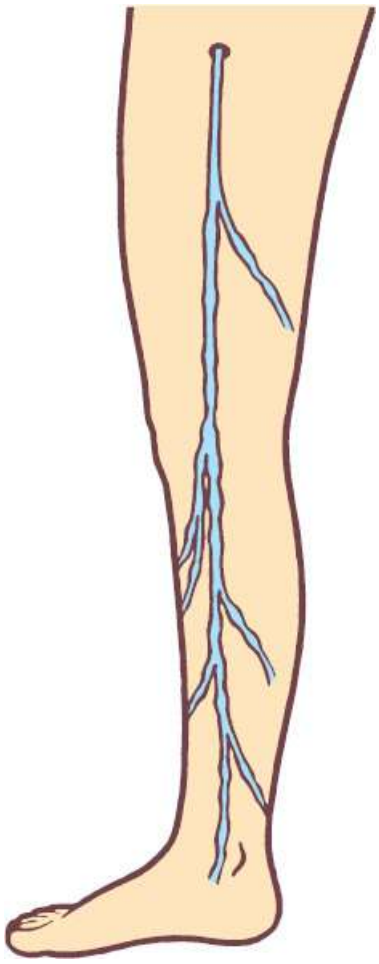

FIGURE 55.8b Trendelenburg test: test for competence of long saphenous venous system (medial aspect of knee)

Note: A doubly positive Trendelenburg test is when the veins fill rapidly before the pressure is released and then with a ‘rush’ when released. This indicates coexisting incompetent perforators and long saphenous vein.

Short saphenous vein incompetence test. A similar test to the Trendelenburg test is performed with the pressure (tourniquet or finger) being applied over the short saphenous vein just below the popliteal fossa (see FIG. 55.9).

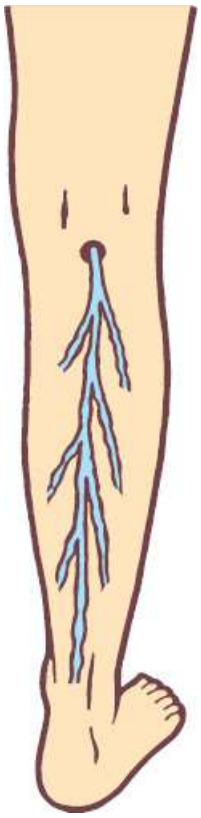

FIGURE 55.9 Testing for competence of the short saphenous vein

Incompetent perforating vein test. Accurate clinical tests to identify incompetence in the three common sites of perforating veins on the medial aspect of the leg, posterior to the medial border of the tibia, are difficult to perform. The general appearance of the leg and palpation of the sites give some indication of incompetence here.

Note: Venous duplex ultrasound studies will accurately localise sites of incompetence and determine the state of the functionally important deep venous system.

Prevention

- Maintain ideal weight.
- Avoid constipation (high-fibre diet).
- Rest and wear supportive stockings if at risk (pregnancy, a standing occupation).

Treatment

- Keep off legs as much as possible.
- Sit with legs on a footstool.

- Use supportive stockings or tights (apply in morning before getting out of bed and standing up).
- Avoid scratching itching skin over veins.

Compression sclerotherapy (liquid or foam)

- Use a small volume of sclerosant (e.g. sodium tetradecyl sulphate—Fibro-vein 3%).
- It is ideal for smaller, isolated veins, particularly below the knee joint.

Radiofrequency ablation

Surgical ligation and stripping

- This is the best treatment when a clear association exists between symptoms and obvious varicose veins (i.e. long saphenous vein incompetence).
- Remove obvious varicosities and ligate perforators.

Note: Surgery for varicose veins may not relieve heavy, aching legs.

Superficial thrombophlebitis

Clinical features

- Usually occurs in superficial varicose veins
- Presents as a tender, reddened subcutaneous cord in leg
- Usually localised oedema
- No generalised swelling of the limb or ankle
- Requires symptomatic treatment only (see below) unless there is extension above the level of the knee, when there is a risk of pulmonary embolism
- Venous duplex scan is diagnostic and also determines:

    extent of superficial thrombosis

    if coexisting, unsuspected DVT is present

Treatment

The objective is to prevent propagation of the thrombus by uniform pressure over the vein.

- Cover whole tender cord with a thin foam pad.

- Apply a firm elastic bandage (preferable to crepe) from foot to thigh (well above cord).
- Leave pad and bandage on for 7–10 days.
- Bed rest with leg elevated if severe, otherwise keep active.
- If complication of IV infusion: prescribe a NSAID (e.g. diclofenac 75 mg bd or diclofenac 1% gel topically tds).[13]
- If spontaneous: LMWH (e.g. dalteparin 5000 units SC daily for 4 weeks).[13]
- The traditional glycerin and ichthyol dressings are still useful.
- Consider association between thrombophlebitis and deep-seated carcinoma.

- If the problem is above the knee, ligation of the vein at the saphenofemoral junction is indicated.

Deep venous thrombosis

Refer to CHAPTER 122 .

Iliofemoral thrombophlebitis (phlegmasia dolens)[14]

This rare but life-threatening condition is when an extensive clot obstructs the iliofemoral veins (following an acute DVT) so completely that subcutaneous oedema and blanching occurs. This initially causes a painful ‘milky white leg’, previously termed phlegmasia alba dolens (used to be seen in late pregnancy or early puerperium). It may deteriorate and become cyanotic—phlegmasia cerulea dolens—representing incipient venous infarction. Massive iliofemoral occlusion is an emergency as such patients may develop ‘shock’, gangrene and pulmonary embolus. Limb amputation will usually follow.

Other painful conditions

Cellulitis and erysipelas

The causative organisms are *Streptococcus pyogenes* (commonest) and *Staphylococcus aureus.* Others include *Haemophilus influenzae*, *Aeromonas* and fungal infection (especially in the immunocompromised). Predisposing factors include cuts, abrasions, ulcers, insect bites, foreign matter, IV drug use and skin disorders such as eczema and tinea pedis of toe webs. Look for evidence of diabetes.

- Rest in bed.
- Elevate limb (in and out of bed).

- Use aspirin or paracetamol for pain and fever.
- Wound cleansing and dressing with non-sticking saline dressings.

Streptococcus pyogenes[15]

- If *S. pyogenes* confirmed:

  phenoxymethylpenicillin 500 mg (o) 6 hourly for 5–10 days or procaine penicillin 1.5 g IM daily for 5 days

- If organism doubtful:

  flu/dicloxacillin 500 mg (o) 6 hourly for 7–10 days

- If penicillin hypersensitive/allergic:

  cephalexin 500 mg (o) 6 hourly

  or (if severe)

  cefazolin 2 g IV 6 hourly

Staphylococcus aureus[15]

- Severe, may be life-threatening: flucloxacillin/dicloxacillin 2 g IV 6 hourly for 7–10 days
- Less severe: flucloxacillin/dicloxacillin 500 mg (o) 6 hourly for 5–10 days

  or

  cephalexin 500 mg (o) 6 hourly

Furuncle (boil) of groin

A painful furuncle caused by *S. aureus* in the hairy area of the groin is common. The aim is to treat conservatively.

- Localised:

  local antiseptics

  hot compresses

  drain when ‘ripe’

- Deep/extensive:

dicloxacillin 500 mg (o) 6 hourly for 5–7 days

drain when ‘ripe’, not before

Tibial stress syndrome

Tibial stress syndrome (usual medial, possibly lateral tibia), formerly known as ‘shin splints’, causes pain and localised tenderness over the tibial border. It is related to exercise, especially running and jumping on hard surfaces. Relative rest for at least 6 weeks is first-line management. There is no strong evidence for intervention.

Pain in the calf

Calf pain is usually not serious except if swelling is present. Some of the uncommon causes have serious implications and necessitate careful assessment.

Common causes: cramp, muscle stiffness, muscle injury, e.g. gastrocnemius tear, soleus strain, claudication (PVD).

Not to be missed: deep venous thrombosis, cellulitis, thrombophlebitis, popliteal artery entrapment.

Other: ruptured Baker cyst, referred pain (back, knees), Achilles tendon rupture.

Torn ‘monkey muscle’

The so-called torn ‘monkey muscle’ or ‘tennis leg’ is a rupture or severe strain of the medial head of the gastrocnemius muscle in the lower calf. Symptoms include a sudden sharp pain in the calf with an inability to comfortably put the heel to the ground and a need to walk on tiptoe. There is localised tenderness and hardness, possible local bruising and painful dorsiflexion of the ankle. Treatment includes RICE treatment for 48 hours, ice packs every 2 waking hours, a firm elastic bandage (toes to below the knee), crutches if severe, a raised heel, active mobilisation after 48 hours’ rest and physiotherapist-supervised stretching massage and exercises.

Nocturnal muscle cramps

Note: Treat cause (if known)—tetanus, drugs, sodium depletion, hypothyroidism, hypocalcaemia, pregnancy.

Physical measures

- Muscle stretching and relaxation exercises: calf stretching for 3 minutes before retiring,[15] then rest in chair with the feet out horizontal to the floor with cushion under tendoachilles for 10 minutes.

- Massage and apply heat to affected muscles.
- Try to keep bedclothes off feet and lower part of legs—a doubled-up pillow at the foot of the bed can be used.

Medication for idiopathic cramps

- Tonic water and oral fluids before retiring may help.
- Drug treatment: consider biperiden 2–4 mg nocte

Quinine sulphate is effective, but with a 1–3% incidence of haematological abnormalities, especially thrombocytopenia, it is no longer recommended in Australia. It is very toxic to children. There is no scientific evidence to support the use of magnesium for idiopathic muscle cramps.[16]

Roller injuries to legs

A patient who has been injured by a wheel passing over a limb, especially a leg, can present a difficult problem. A freely spinning wheel is not so dangerous, but serious injuries occur when a non-spinning (braked) wheel passes over a limb and these are compounded by the wheel then reversing over it. This leads to a ‘degloving’ injury due to shearing stress. The limb may look satisfactory initially, but skin necrosis may follow.

- Admit to hospital for observation.
- Fasciotomy with open drainage may be an option for compartment syndrome.
- Surgical decompression with removal of necrotic fat is often essential.
- Rehydrate the patient and monitor renal function.

When to refer

- The sudden onset of pain, pallor, pulselessness, paralysis, paraesthesia and coldness in the leg
- Worsening intermittent claudication
- Rest pain in foot
- Presence of popliteal aneurysm
- Superficial thrombophlebitis above knee
- Evidence of DVT
- Suspicion of gas gangrene in leg

- Worsening hip pain
- Evidence of disease in bone (e.g. neoplasia, infection, Paget disease)
- Severe sciatica with neurological deficit (e.g. floppy foot, absent reflexes)

Practice tips

- Always X-ray the legs (including hips) of a patient complaining of unusual deep leg pain, especially a child.
- Pain that does not fluctuate in intensity with movement, activity or posture has an inflammatory or neoplastic cause.
- Hip disorders such as osteoarthritis and slipped femoral epiphysis can present as pain in the knee (usually medial aspect).
- Consider retroperitoneal haemorrhage as a cause of acute severe nerve root pain, especially in people on anticoagulant therapy.
- Avoidance of amputation with acute lower limb ischaemia depends on early recognition (surgery within 4 hours—too late if over 6 hours).

Patient education resources

Hand-out sheets from *Murtagh's Patient Education* 8th edition:

- Calf muscle injury
- Cramp
- Deep vein thrombosis
- Sciatica

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56 The painful knee

The human knee is a joint and not a source of entertainment.

PERCY HAMMOND, 1912, REVIEW OF A PLAY

The knee, which is a gliding hinge joint, is the largest synovial joint in the body. Its small area of contact of the bone ends at any one time makes it dependent on ligaments for its stability. Although this allows a much increased range of movement it does increase the susceptibility to injury, particularly from sporting activities. Finding the cause of a knee problem is one of the really challenging features of practice. It is useful to remember that peripheral pain receptors respond to a variety of stimuli. These include inflammation due either to inflammatory disorders or chemical irritation such as crystal synovitis, traction pain (e.g. trapped meniscus stretching the capsule), tension on the synovium capsule (e.g. effusion or haemarthrosis) and impact loading of the subchondral bone.

Key facts and checkpoints

- The most common presenting symptoms in order of frequency are pain, stiffness, swelling, clicking and locking.[1]
- The relative frequencies of most knee conditions are age-related.
- Excessive strains across the knee, such as a valgus-producing force, are more likely to cause ligament injuries, while twisting injuries tend to cause meniscal tears.
- A ruptured anterior cruciate ligament (ACL) is a commonly missed injury of the knee.[2] It should be suspected with a history of either a valgus strain or a sudden pivoting of the knee, often associated with a cracking or popping sensation, or ‘something going out and back’. It is often associated with the rapid onset of haemarthrosis or inability to walk or weight-bear.
- A rapid onset of painful knee swelling (minutes to 1–4 hours) after injury indicates blood in the joint—*haemarthrosis*.
- Swelling over 1–2 days after injury indicates synovial fluid—*traumatic synovitis*.

- Any collateral ligament repair should be undertaken early, but, if associated with ACL injuries, early surgery may result in knee stiffness. Thus, surgery is often delayed. With isolated ACL ruptures, early reconstruction is appropriate in the high-performance athlete; otherwise, delayed reconstruction is appropriate if there is clinical instability.[3]
- Acute spontaneous inflammation of the knee may be part of a systemic condition such as rheumatoid arthritis, rheumatic fever, gout, pseudogout (chondrocalcinosis), a spondyloarthropathy (psoriasis, ankylosing spondylitis, reactive arthritis, bowel inflammation), Lyme disease and sarcoidosis.
- Consider Osgood–Schlatter disorder (OSD) in the prepubertal child (especially a boy aged 10–14) presenting with knee pain.
- Disorders of the lumbosacral spine (especially L3 to S1 nerve root problems) and of the hip joint (L3 innervation) refer pain to the region of the knee joint.
- If infection or haemorrhage is suspected, the joint should be aspirated.
- The condition known as anterior knee pain is the commonest type of knee pain and accounts for at least 11% of sports-related musculoskeletal problems. The prime cause of this is patellofemoral dysfunction pain. It is a benign condition with a good prognosis. Consider Hoffa syndrome.

The knee and referred pain—key knowledge

Pain from the knee joint

Disorders of the knee joint give rise to pain felt accurately at the knee, often at some particular part of the joint, and invariably in the anterior aspect, very seldom in the posterior part of the knee. An impacted loose body complicating osteoarthritis and a radial tear of the lateral meniscus[4] are the exceptional disorders liable to refer pain proximally and distally in the limb, but the problems obviously originate from the knee.

Pain referred to the knee

Referred pain to the knee or the surrounding region is a time-honoured trap in medicine. The two classic problems are disorders of the hip joint and lumbosacral spine.

- The hip joint is mainly innervated by L3, hence pain is referred from the groin down the front and medial aspects of the thigh to the knee (see FIG. 56.1). Sometimes the pain can be experienced on the anteromedial aspect of the knee only. It is not uncommon for children with a slipped upper femoral epiphysis to present with a limp and knee pain.

- Knee pain can be referred from the lumbosacral spine. People with disc lesions may notice that sitting, coughing or straining hurts the knee, whereas walking does not.

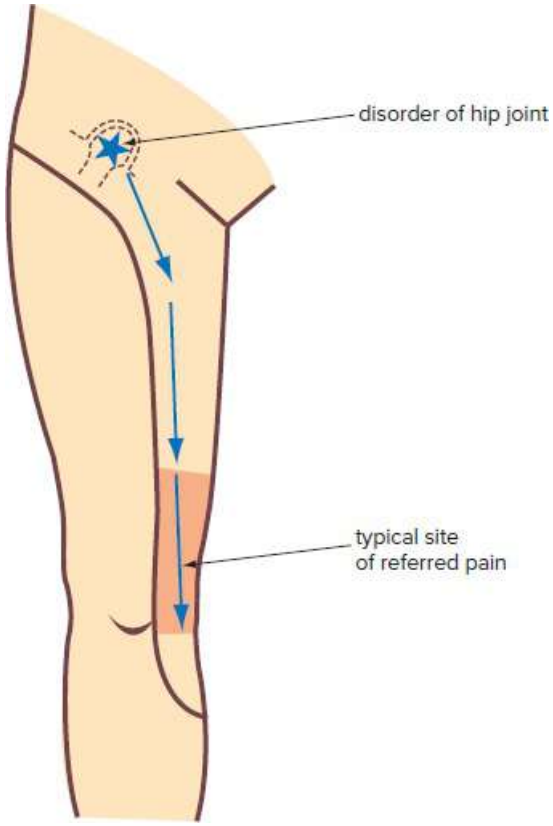

FIGURE 56.1 Possible area of referred pain from disorders of the hip joint

L3 nerve root pressure from an L2–3 disc prolapse (uncommon) and L4 nerve root pain will cause anteromedial knee pain; L5 reference from an L4–5 disc prolapse can cause anterolateral knee pain, while S1 reference from an L5–S1 prolapse can cause pain at the back of the knee (see FIG. 56.1).

A diagnostic approach

A summary of the diagnostic strategy model is presented in TABLE 56.1 .

Table 56.1 The painful knee: diagnostic strategy model

Probability diagnosis
Ligament strains and sprains ± traumatic synovitis
Osteoarthritis

Patellofemoral syndrome
Prepatellar bursitis

Serious disorders not to be missed

Acute cruciate ligament tear
Vascular disorders:

- deep venous thrombosis
- superficial thrombophlebitis

Neoplasia:

- primary in bone
- metastases

Severe infections:

- septic arthritis
- tuberculosis

Rheumatoid arthritis
Juvenile chronic arthritis
Rheumatic fever

Pitfalls (often missed)

Referred pain: back or hip
Foreign bodies
Intra-articular loose bodies
Osteochondritis dissecans
Osteonecrosis
Synovial chondromatosis
Synovial plica syndrome
Osgood–Schlatter disorder
Meniscal tears including degenerative tears
Fractures around knee
Pseudogout (chondrocalcinosis)
Gout → patellar bursitis
Ruptured popliteal cyst
Hoffa fat pad syndrome
Rarities:

- sarcoidosis
- Paget disease
- spondyloarthropathy

Seven masquerades checklist

Depression

Diabetes
Drugs (indirect)
Spinal dysfunction

Is the patient trying to tell me something?

Psychogenic factors relevant, especially with possible injury compensation.

Probability diagnosis

A UK study[1] highlighted the fact that the commonest causes of knee pain are simple ligamentous strains and bruises due to overstress of the knee or other minor trauma. Traumatic synovitis may accompany some of these injuries. Some of these so-called strains may include a variety of recently described syndromes, such as the synovial plica syndrome, patellar tendinopathy and infrapatellar compressive fat pad inflammation (see FIG. 56.2).

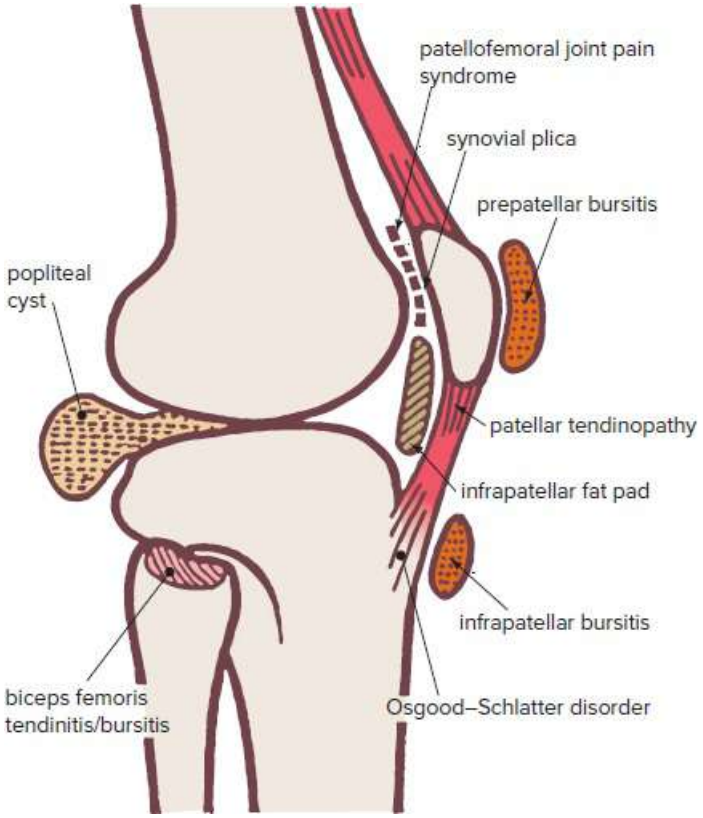

FIGURE 56.2 Lateral view of knee showing typical sites of various causes of knee pain

Low-grade trauma of repeated overuse, such as frequent kneeling, may cause prepatellar bursitis known variously as ‘housemaid’s knee’ or ‘carpet layer’s knee’. Infrapatellar bursitis is referred

to as ‘clergyman’s knee’.

Osteoarthritis of the knee, especially in the elderly, is a very common problem. It may arise spontaneously or be secondary to previous trauma with associated internal derangement and instability.

The most common overuse problem of the knee is the patellofemoral joint pain syndrome (often previously referred to as chondromalacia patellae).

Serious disorders not to be missed

Neoplasia in the bones around the knee is relatively uncommon but still needs consideration. The commonest neoplasias are secondaries from the breast, lung, kidney, thyroid and prostate. Uncommon examples include osteoid osteoma, osteosarcoma and Ewing tumour (more likely in younger people). Septic arthritis and infected bursitis are prone to occur in the knee joint, especially following contaminated lacerations and abrasions. Septic arthritis from blood-borne infection can be of the primary type in children, where the infection is either staphylococcal or due to *Haemophilus influenzae*, or gonococcal arthritis in adults. Rheumatic fever should be kept in mind with a fleeting polyarthritis that involves the knees and then affects other joints.

Inflammatory disorders such as spondyloarthropathies, sarcoidosis, chondrocalcinosis (a crystal arthropathy due to calcium pyrophosphate dihydrate in the elderly), gout and juvenile chronic arthritis have to be considered in the differential diagnosis.

Red flag pointers for knee pain

- Acute swelling with or without trauma
- Acute or chronic erythema
- Systemic features (e.g. fever) in absence of trauma
- Unexplained chronic, persistent pain

Pitfalls

There are myriad pitfalls in knee joint disorders, often arising from ignorance, because there are myriad problems that are difficult to diagnose. Fortunately, many of these problems can be diagnosed by X-ray. A particular trap is a foreign body, such as a broken needle acquired by kneeling on carpet.

The presence of a spontaneous effusion demands careful attention because it could represent a rheumatic disorder or conditions such as osteochondritis dissecans (more common in the young) or osteonecrosis of the femoral condyle (a necrotic problem in the elderly) and perhaps a

subsequent loose body in the joint.

A ruptured Baker cyst will cause severe pain behind the knee and can be confused with deep venous thrombosis. It is important to bear in mind complications of varicose veins, which can cause pain or discomfort around the knee joint.

General pitfalls

- Overlooking referred pain from the hip or low back as a cause of knee pain
- Failing to realise that meniscal tears can develop due to degeneration of the menisci with only minimal trauma
- Failing to X-ray the knee joint and order special views to detect specific problems, such as a fractured patella or osteochondritis dissecans

Ottawa knee rules for X-ray following trauma

Any of the following:

- aged 55 years or older
- isolated tenderness of the patella
- tenderness at the head of the fibula
- inability to flex to 90°
- immediate inability to weight-bear and in the emergency room (four steps: unable to transfer weight twice onto each lower limb). *Note:* Limping does not qualify.

Seven masquerades checklist

Of these, spinal dysfunction is the prime association. Diabetes may cause pain through a complicating neuropathy and drugs such as diuretics may cause gout in the elderly.

Psychogenic considerations

Patients, young and old, may complain of knee pain, imaginary or exaggerated, to gain attention, especially if compensation for an injury is involved. This requires discreet clinical acumen to help patients work through the problem.

The clinical approach

History

The history is the key to diagnosis. If any injury is involved careful description of the nature of the injury is necessary. This includes past history. A special problem relates to the elderly who can sustain knee injuries after a ‘drop attack’, but attention can easily be diverted away from the knee with preoccupation with the cerebral pattern.

It is relevant to define whether the pain is acute or chronic, dull or sharp, and continuous or recurring. Determine its severity and position and keep in mind age-related causes.

Key questions

Related to an injury

- Can you explain in detail how the injury happened?
- Did you land awkwardly after a leap in the air?
- Did you get a direct blow? From what direction?
- Did your leg twist during the injury?
- Did you feel a ‘pop’ or hear a ‘snap’?
- Did your knee feel wobbly or unsteady?
- Did the knee feel as if the bones separated momentarily?
- How soon after the injury did the pain develop?
- How soon after the injury did you notice swelling?
- Have you had previous injury or surgery to the knee?
- Were you able to walk after the injury or did you have to be carried off the ground or court?
- Does this involve work care compensation?

No history of injury

- Does the pain come on after walking, jogging or other activity?
- How much kneeling do you do? Scrubbing floors, cleaning carpets?
- Could there be needles or pins in the carpet?
- Does your knee lock or catch?

- Does swelling develop in the knee?
- Does it ‘grate’ when it moves?
- Does the pain come on at rest and is there morning stiffness?
- Do you feel pain when you walk on steps or stairs?

Significance of symptoms

Swelling after injury

The sudden onset of painful swelling (usually within 60 minutes) is typical of haemarthrosis (see FIGS 56.3 and 56.4). Bleeding occurs from vascular structures such as torn ligaments, torn synovium or fractured bones, while injuries localised to avascular structures such as menisci do not usually bleed. About 75% of cases are due to ACL tears.[5] If a minor injury causes acute haemarthrosis suspect a bleeding diathesis or anticoagulant usage. The causes of haemarthrosis are listed in TABLE 56.2 .

FIGURE 56.3 Haemarthrosis in a sportsman presenting with an acutely painful swollen knee

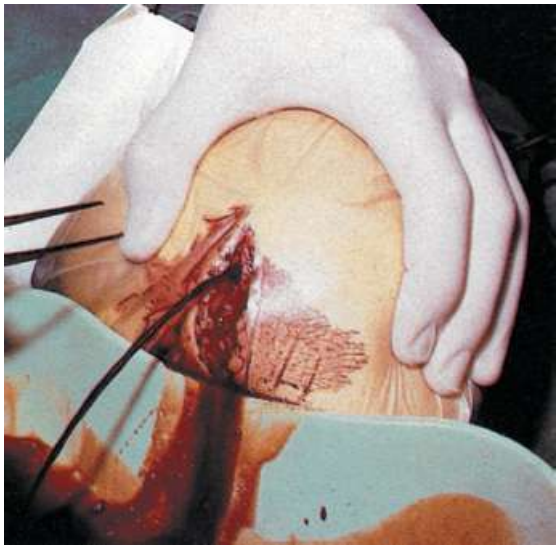

FIGURE 56.4 Haemarthosis: dramatic surgical release of intra-articular blood under pressure in the knee shown in FIGURE 56.3

Table 56.2 Causes of haemarthrosis

Torn cruciate ligaments, esp. ACL
Capsular tears with collateral ligament tears
Peripheral meniscal tears
Dislocation or subluxation of patella
Osteochondral fractures
Bleeding disorders (e.g. haemophilia), anticoagulants

Swelling of an intermediate rate of onset, stiffness and pain in the order of hours (e.g. 6–24 hours) is typical of an effusion of synovial fluid. Causes include meniscal tears and milder ligamentous injuries. Swelling gradually developing over days and confined to the anterior knee is typical of bursitis such as ‘housemaid’s knee’.

Recurrent or chronic swelling

This indicates intra-articular pathology and includes:

- patellofemoral pain syndrome
- osteochondritis dissecans

- degenerative joint disease including degenerative meniscus tears
- arthritides

Locking

Locking usually means a sudden inability to extend the knee fully (occurs at 10–45°, average 30°) but ability to flex fully.[6] The importance of the symptom has been magnified in light of increasing evidence that arthroscopic repairs of degenerative knees have little evidence to support them, with locking being the primary exception.

Causes

True locking:

- torn meniscus (bucket handle)
- loose body (e.g. bony fragment from osteochondritis dissecans)
- torn ACL (remnant)
- flap of articular cartilage
- avulsed anterior tibial spine
- dislocated patella
- synovial osteochondromatosis

Pseudo-locking:

- patellofemoral disorders
- first- or second-degree medial ligament tear
- strain of ACL
- gross effusion
- pain and spasm of hamstrings

Catching

‘Catching’ of the knee implies that the patient feels that something is ‘getting in the way of joint movement’ but not locking. Causes include any of the conditions that cause locking, but a subluxing patella and loose bodies in particular must be considered.

Causes of loose bodies

- Osteochondritis dissecans (usually lateral side of medial femoral condyle)
- Retropatellar fragment (e.g. from dislocation of patella)
- Dislodged osteophyte

- Osteochondral fracture—post injury
- Synovial chondromatosis

Clicking

Clicking may be due to an abnormality such as patellofemoral maltracking or subluxation, a loose intra-articular body or a torn meniscus, but can occur in normal joints when people climb stairs or squat.

Anterior knee pain[7]

Common causes include:

- fat pad disorder (inflammation)
- patellofemoral syndrome
- osteoarthritis of the knee
- patellar tendinopathy
- osteonecrosis

Lateral knee pain

Consider:

- osteoarthritis of lateral compartment of knee
- lesions of the lateral meniscus
- patellofemoral syndrome

Medial knee pain

Consider:

- osteoarthritis of medial compartment of knee
- lesions of the medial meniscus

- patellofemoral syndrome

Examination

The provisional diagnosis may be evident from a combination of the history and simple inspection of the joint but the process of testing palpation, movements (active and passive) and specific structures of the knee joint helps to pinpoint the disorder.

Inspection

Inspect the knee with the patient walking, standing erect and lying supine. Ask the patient to squat to help localise the precise point of pain. Then ask them to sit on the couch with legs hanging over the side and note any abnormality of the patella. Note any deformities, swelling or muscle wasting.

The common knee deformities are genu valgum ‘knock knees’ (see FIG. 56.5A), genu recurvatum ‘back knee’ (see FIG. 56.5B) and genu varum ‘bowed legs’ (see FIG. 56.5C).

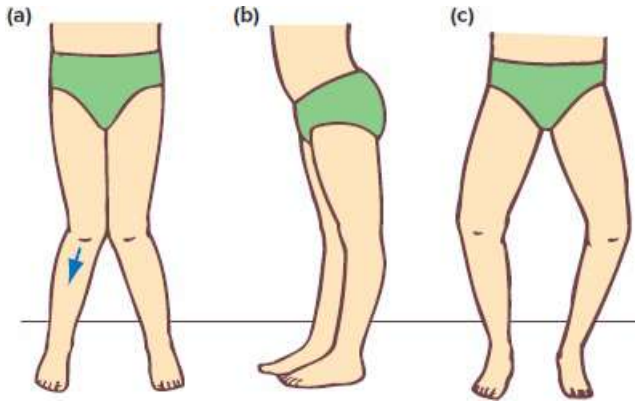

FIGURE 56.5 Knee deformities: **(a)** genu valgum (‘knock knees’): tibia deviates laterally from knee, **(b)** genu recurvatum (‘back knee’), **(c)** genu varum (‘bowed legs’)

A useful way of remembering the terminology is to recall that the ‘l’ in valgus stands for ‘l’ in lateral.[7] In the normal knee the tibia has a slight valgus angulation in reference to the femur, the angulation being more pronounced in women.

Palpation

Palpate the knee generally, concentrating on the patella, patella tendon, joint lines, tibial tubercle, bursae and popliteal fossa.

Palpate for presence of any fluid, warmth, swelling, synovial thickening, crepitus, clicking and tenderness. Feel for a popliteal (Baker) cyst in the popliteal fossa. Draw the fingers upwards over the suprapatellar pouch: synovial thickening, a hallmark of chronic arthritis, is most marked just

above the patella—it feels warm, boggy, rubbery and has no fluid thrill.

Flex the knees to 45° and check for a pseudocyst, especially of the lateral meniscus (see FIG. 56.6).

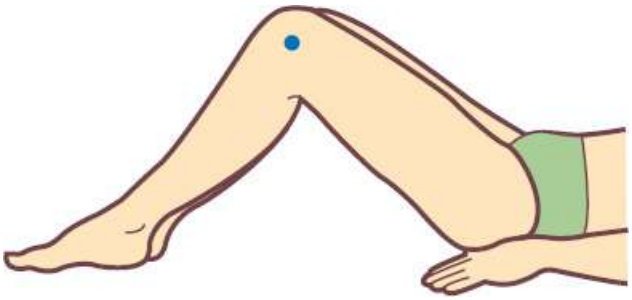

FIGURE 56.6 Pseudocyst of the lateral meniscus: flex the knees to 45° to force lump (if present) to appear

Fluid effusion

The bulge sign: compress the medial side of the joint and evacuate any fluid. The test is positive when the lateral side of the joint is then stroked and the fluid is displaced across the joint, creating a visible bulge or filling of the medial depression (see FIG. 56.7).

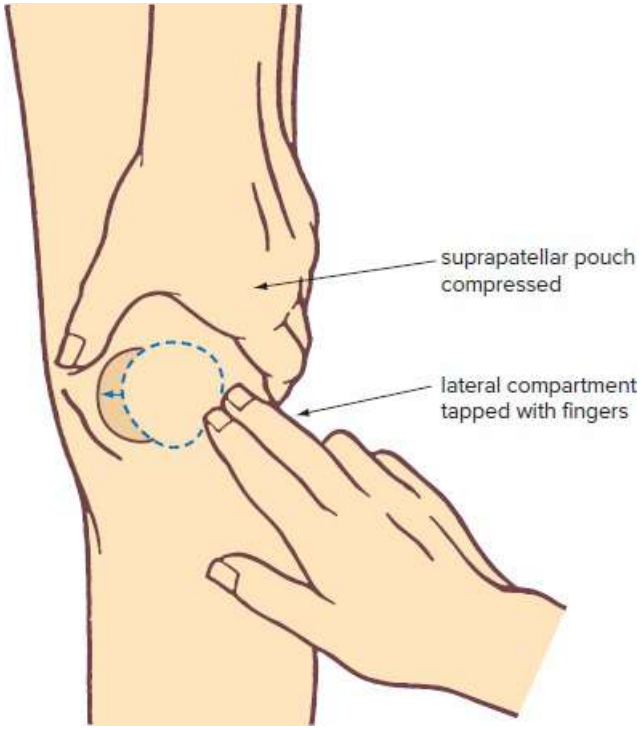

FIGURE 56.7 The bulge sign with a knee effusion: fluid bulges into the medial

compartment

The test will be negative if the effusion is gross and tense, in which case the *patellar tap test* (see FIG. 56.8) is used by sharply tapping the lower pole of the patella against the femur with the index finger. A positive tap is when the patella can be felt to tap against the femur and then float free.

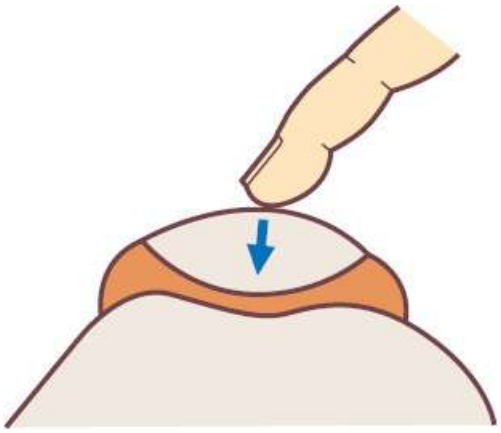

FIGURE 56.8 The patellar tap test

Movements

Extension: normal is 0–5°. The loss of extension is best measured by lifting the heel off the couch with the knee held down. In the normal knee the heel will lift 2.5–4 cm off the couch, that is, into hyperextension.

Flexion (supine or prone): normal to 135°. The normal knee flexes heel to the buttock but in locking due to medial meniscus tears there may be a gap of 5 or more centimetres between the heel and buttock.

Rotation: normal 5–10°. Test at 90° with patient sitting over the edge of the couch; rotate the feet with the hand steadying the knee.

Note: Normally, no abduction, adduction or rotation of the tibia on the femur is possible with the leg fully extended.

Ligament stability tests

Collateral ligaments. Adduction (varus) and abduction (valgus) stresses of the tibia on the femur are applied in full extension and then at 30° flexion with the leg over the side of the couch. With ligament strains there is localised pain when stressed. With a complete (third-degree) tear the joint will open out. This end-point feel should be carefully noted: firmness indicates stability, ‘mushiness’ indicates damage (see FIG. 56.9).

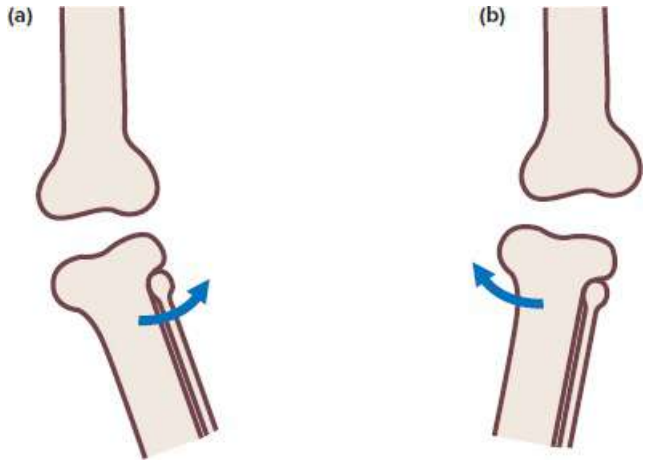

FIGURE 56.9 Medial and lateral ligament instability: **(a)** medial instability of knee joint, **(b)** lateral instability of knee joint

Cruciate ligaments. Stability of the ACL can be tested with the anterior drawer test. This is done with the patient supine and the knee flexed to 90°. The tibia is pulled forwards off the femur and in the presence of a cruciate ligament injury there will be increased gliding of the tibia on the femur. An aberrant positive sign can occur in the presence of posterior cruciate ligament (PCL) insufficiency, in which case the knee is actually brought back to its normal site from a dropped-back position. This gives the appearance of a positive anterior drawer sign. In that situation, a Lachman test will be negative. In the presence of medial ligament injury, the increased external rotation of the tibia against the femur may add to the positive drawer sign.

Specific provocation tests

The simplest menisci function tests are those outlined in TABLE 56.4 , later in this chapter.

- *McMurray test.* The patient lies on the couch and the flexed knee is rotated (internally and externally) in varying degrees of abduction as it is straightened into extension. A hand over the affected knee feels for ‘clunking’ or tenderness. This can be difficult in larger patients.

Page 682

- *Thessaly test.* The patient stands on the affected leg, flat-footed, with the knee flexed to 20°, with outstretched arms supported by the examiner’s hands. The patient pivots with firm twists of the body and knee three times medially and laterally on the knee. A positive test is when the patient experiences joint line discomfort, or locking or catching. This is the most sensitive and specific clinical test for meniscal injury.[6]

- *Apley grind/distraction test.* The patient lies prone and the knee is flexed to 90° and then rotated under a compression force. Reproduction of painful symptoms may indicate meniscal tear. Then repeat the rotation under distraction—tests ligament damage.

- *Patella apprehension test.* At 15–20° flexion, attempt to push the patella laterally and note the

patient’s reaction.

- *Patellar tendinopathy.* Palpate patellar tendon (refer to FIG. 56.19 , later in this chapter).
- *Patellofemoral pain test.* Refer to FIGURE 56.18 , later in this chapter.

Examine the lumbosacral spine and the hip joint of the affected side.

Measurements

Quadriceps. For suspected quadriceps wasting, measure the circumference of the thighs at equal points above the tibial tuberosity. It is helpful to assess quadriceps function by feeling the tone.

Static Q angle (see FIG. 56.10)—the angle between the quadriceps muscles and the patella tendon.

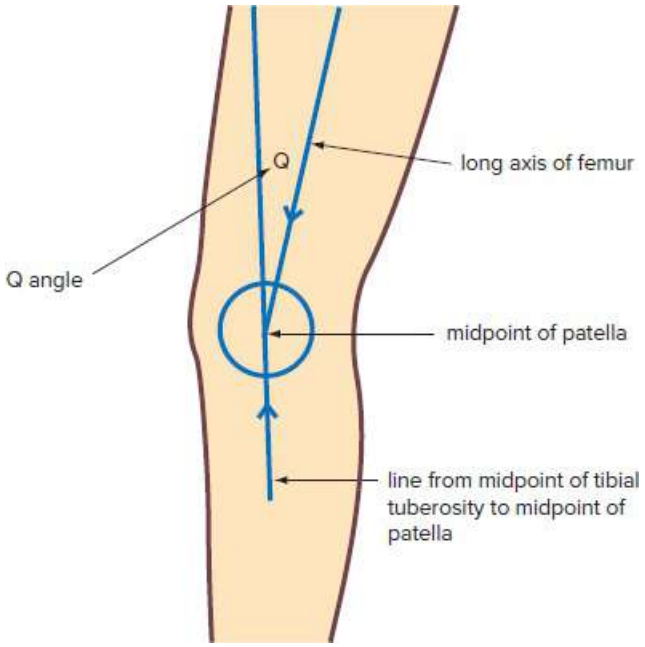

FIGURE 56.10 The Q angle of the knee gives a measure of patellar alignment

If the Q angle is >15° in men and >19° in women there is a predisposition to patellofemoral pain and instability.[8]

Investigations

Investigation for the diagnosis of knee pain can be selected from:

- blood tests:

RA factor tests; ANA; HLA–B_{27}

ESR

blood culture (suspected septic arthritis)

- radiology:[8]

  plain X-ray

  special views: intercondylar (osteochondritis dissecans, loose bodies); tangential (or skyline view for suspected patella pathology); oblique (to define condyles and patella); weight-bearing views looking for degenerative arthritis

  bone scan: for suspected tumour, stress fracture, osteonecrosis, osteochondritis dissecans

  MRI: excellent for diagnosing cartilage and menisci disorders and ligament damage; the investigation of choice for internal ‘derangement’

  ultrasound: good for assessment of patellar tendon, soft tissue mass, fluid collection, Baker cyst and bursae. However, do not order simply to confirm a clinically obvious joint effusion.

- CT: useful for complex fractures of tibial plateau and patellofemoral joint special dysfunction

- special:

  examination under anaesthesia

  arthroscopy

  knee aspiration: culture or crystal examination

Fractures that may be missed on plain films[9]

- Patellar fracture
- Tibial plateau fracture
- Tibial spine fracture
- Epiphyseal injuries in children
- Osteochondral fracture:

  patella

  femoral condyle

- Stress fracture upper tibia
- Avulsion fracture (e.g. Segond fracture of upper lateral tibia, with ACL tear)

Knee pain in children

Children may present with unique conditions that are usually related to growth, including epiphyseal problems. Their tendency towards muscle tightness, especially in the growth spurt, predisposes them to overuse injuries such as patellar tendinopathy and patellofemoral pain syndrome.

First decade

A painful knee during the first decade of life (0–10 years) in non-athletes is an uncommon presenting symptom, but suppurative infection and juvenile chronic arthritis have to be considered.

Genu valgum or varum is a common presentation but usually not a source of discomfort for the child. However, genu valgum, which is often seen around 4–6 years, may predispose to abnormal biomechanical stresses, which contribute to overuse-type injuries if the child is involved in sport.

Second decade

Pain in the knee presents most frequently in this decade and is most often due to the patellofemoral syndrome,[10] which is related to the retropatellar and peripatellar regions and usually anterior to the knee. It occurs in the late teenage years of both sexes.

An important problem is subluxation of the patella, typically found in teenage girls. It is caused by maltracking of the patellofemoral mechanism without complete dislocation of the patella (see FIG. 56.11).

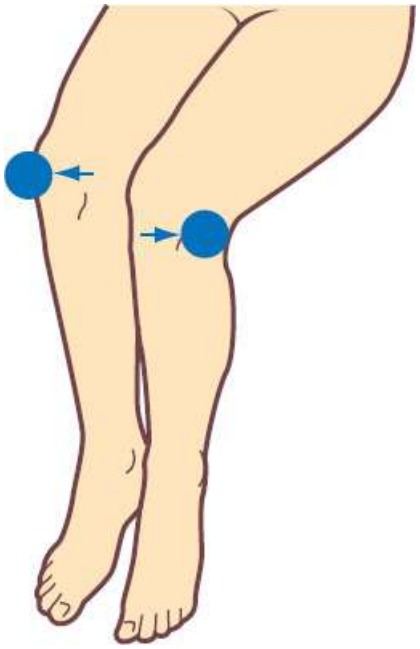

FIGURE 56.11 Lateral subluxation of the patella

On examination, the patella is usually in a high and lateral position. Surgery may be required if symptoms persist.

OSD is common in pre-pubertal adolescent boys but can occur in those aged 10–16 years.

Other conditions found typically in this age group include:

- slipped upper femoral epiphysis—usually in middle teenage years after a growth spurt
- anserinus (‘goose foot’) bursitis
- osteochondritis dissecans

Age-related causes of the painful knee are presented in TABLE 56.3 .[10]

Table 56.3 Age-related causes of painful knee

First decade (0–10 years)
Infection
Juvenile chronic arthritis
Second decade (10–20 years)
Patellofemoral syndrome
Subluxation/dislocation of patella

Slipped femoral epiphysis (referred)
‘Hamstrung’ knee
Osteochondritis dissecans
Osgood–Schlatter disorder
Anserinus tendinopathy
Third decade (20–30 years)
Bursitis
Mechanical disorders
Fourth and fifth decades (30–50 years)
Cleavage tear of medial meniscus
Radial tear of lateral meniscus
Sixth decade and older (50 years and over)
Osteoarthritis
Osteonecrosis
Paget disease (femur, tibia or patella)
Anserinus bursitis
Chondrocalcinosis and gout
Osteoarthritis of hip (referred pain)

The little athlete

Children competing in sporting activities, especially running and jumping, are prone to overuse injuries such as the patellofemoral pain syndrome, traumatic synovitis of the knee joint and OSD. Haemarthrosis can occur with injuries, sometimes due to a synovial tear without major joint disruption. If knee pain persists, especially in the presence of an effusion, X-rays should be performed to exclude osteochondritis of the femoral condyle.[11]

The Ottawa knee rules

A knee X-ray series is only required for children with any of the findings in the Ottawa knee rules (see earlier in this chapter).

Osgood–Schlatter disorder

Osgood–Schlatter disorder (OSD) is a traction apophysitis resulting from repetitive traction stresses at the insertion of the patellar tendon into the tibial tubercle, which is vulnerable to repeated traction in early adolescence.

Clinical features

- Commonest in ages 10–14 years
- Boys:girls = 3:1
- Bilateral in about one-third of cases
- Common in sports involving running, kicking and jumping
- Localised anterior knee pain in region of tibial tubercle during and after activity—gradually increasing over time
- Aggravated by kneeling down and going up and downstairs
- Development of lump of the tibia tubercle
- Localised swelling and tenderness at affected tubercle
- Pain reproduced by attempts to straighten flexed knee against resistance

X-ray to confirm diagnosis (widening of the apophysis and possible fragmentation of bone) and exclude tumour or fracture (see FIG. 56.12).

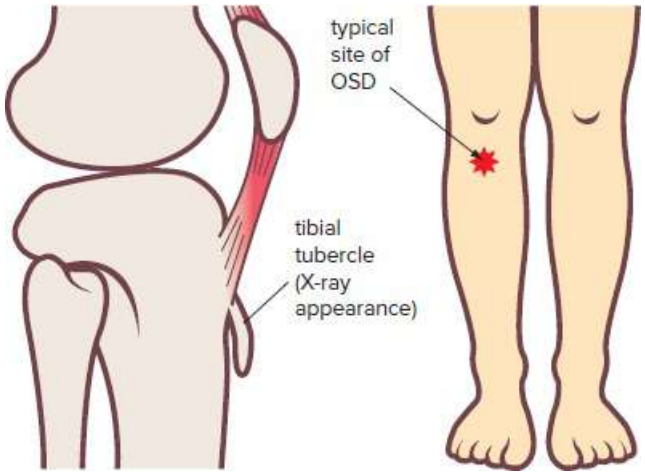

FIGURE 56.12 Features of Osgood–Schlatter disorder

Management

Treatment is conservative as it is a self-limiting condition (6–18 months: average 12 months).

- If acute, use ice packs and analgesics.
- The main approach is to abstain from or modify active sports.

- Localised treatments such as electrotherapy are unnecessary.
- Corticosteroid injections should be avoided.[12]
- Plaster cast immobilisation should also be avoided.
- Surgery may be used (rarely) if an irritating ossicle persists[12] after ossification.
- Gentle quadriceps stretching.
- Graded return to full activity.

Prevention

- Promote awareness and early recognition of OSD.
- Program of stretching exercises for quadriceps mechanism in children in sport—thigh and calf.

Osteochondritis dissecans: juvenile form[6]

This commonly occurs in adolescent boys aged 5–16 years whereby a segment of articular cartilage of the femoral condyle (85%) undergoes necrosis and may eventually separate to form an intra-articular loose body (see FIG. 56.13).

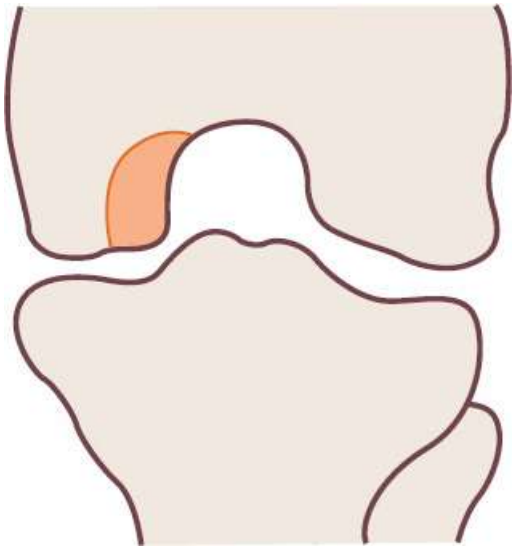

FIGURE 56.13 Osteochondritis dissecans: on X-ray, sclerosis of the lateral aspect of the medial condyle

It usually presents as pain and effusion and locking.

If the fragment has separated, surgery to reattach it can be contemplated.

Knee pain in adults

Rheumatic disorders are very common and responsible for considerable pain or discomfort, disability and loss of independence in the elderly.

Osteoarthritis is the most common cause and excellent results are now being obtained using total knee replacement in those severely affected.

The elderly are particularly prone to crystal-associated joint diseases, including monosodium urate (gout), CPPD (pseudogout) and hydroxyapatite (acute calcific periarthritis).

Chondrocalcinosis of knee (pseudogout)

The main target of CPPD is the knee, where it causes chondrocalcinosis. Unlike gout, chondrocalcinosis of the knee is typically a disorder of the elderly with about 50% of the population having evidence of involvement of the knee by the ninth decade.[13] Most cases remain asymptomatic but patients (usually aged 60 or older) can present with an acutely hot, red, swollen joint resembling septic arthritis.

Investigations include aspiration of the knee to search for CPPD crystals, and X-ray. If positive, consider an associated metabolic disorder such as haemochromatosis, hyperparathyroidism or diabetes. The treatment is similar to acute gout although colchicine is less effective. Acute episodes respond well to NSAIDs or intra-articular corticosteroid injection.

Osteonecrosis[14]

Spontaneous osteonecrosis of the knee (SPONK) is more common after the age of 60, especially in females; it can occur in either the femoral (more commonly) or tibial condyles. The aetiology is unknown. The sudden onset of pain in the knee, with a normal joint X-ray, is diagnostic of osteonecrosis. However, the X-ray (especially later) will demonstrate an area of osteonecrosis. The pain is usually persistent, with swelling and stiffness, and worse at night. It can take three months for the necrotic area to show radiologically, although a bone scan or MRI may be positive at an early stage (see FIG. 56.14). The condition may resolve in time with reduction of weight-bearing. Surgery in the form of subchondral drilling may be required for persistent pain in the early stages.

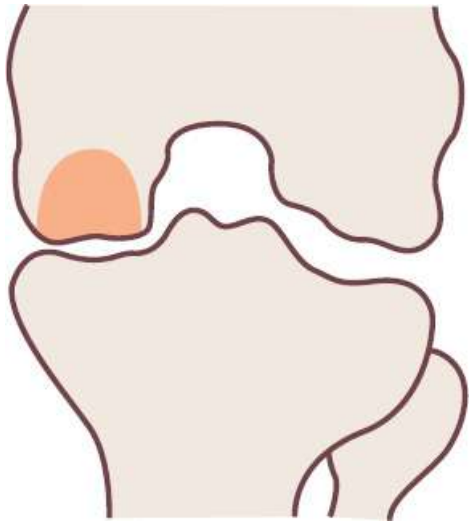

FIGURE 56.14 Osteonecrosis: necrosis in the medial femoral condyle can take three months to show radiologically

Acute injuries

Meniscal tears

Medial and lateral meniscal tears are usually caused by abduction and adduction forces causing the meniscus to be compressed between the tibial and femoral condyles and then subjected to a twisting force or a rotatory movement on a semi-flexed weight-bearing knee.

The medial meniscus is three times more likely to be torn than the lateral. These injuries are common in contact sports and are often associated with ligamentous injuries. Suspect these injuries when there is a history of injury with a twisting movement with the foot firmly fixed on the ground (e.g. anchored in a groove).

However, pain in the knee can present in the patient aged 30–50 years (and beyond) as the menisci degenerate, with resultant cleavage tears from the posterior horn of the medial meniscus and ‘parrot-beak’ tears of the mid-section of the lateral meniscus. These problems cause pain because these particular deformities create tension on the joint capsule and stretch the nerve ends. Refer to the provocation tests—Thessaly, McMurray and Apley grind tests. X-rays are not specifically useful, but an MRI scan should confirm diagnosis.

Clinical features

- General symptoms:[8]

  joint-line pain (49%)

locking (17%)

swelling (14%)

loss of movement: restricted flexion, loss of last 5–10° extension

- Parrot-beak tear of lateral meniscus:

  pain in the lateral joint line

  pain radiating up and down the thigh

  pain worse with activity

  a palpable and visible lump when the knee is examined at 45°

Arthroscopic partial meniscectomy may offer relief in younger patients, or in older patients with locking. The peripheral meniscus is vascular and can be repaired within 6–12 weeks of injury.[15]

- Cleavage tear of medial meniscus:

  pain in medial joint line

  pain aggravated by slight twisting of the joint

  pain provoked by patient lying on the side and pulling the knees together

  pain worse with activity

Arthroscopic meniscectomy for a degenerative meniscal tear is one first-line treatment intervention, but systematic reviews found no difference between this method compared with non-operative management.[16] However, the subgroup for those with knee locking and collapse did benefit.[17]

A diagnostic mémoire

TABLE 56.4 is a useful aid in the diagnosis of these injuries. There is a similarity in the clinical signs between the opposite menisci, but the localisation of pain in the medial or lateral joint lines helps to differentiate between the medial and lateral menisci.

Table 56.4 Typical symptoms and signs of meniscal injuries

	Medial meniscus tear	Lateral meniscus tear
Mechanism		
Twisting force on a weight-	Abduction (valgus) force	Adduction (varus) force

loaded flexed knee	Internal rotation of femur on tibia	External rotation of femur on tibia
Symptoms		
1 Knee pain during and after activity	Medial side of knee	Lateral side of knee
2 Locking	Yes	Yes
3 Effusion	+ or –	+ or –
Signs		
1 Localised tenderness over joint line (with bucket-handle tear)	Medial joint line	Lateral joint line (may be cyst)
2 Pain on hyperextension of knee	Medial joint line	Lateral joint line
3 Pain on hyperflexion of knee joint	Medial joint line	Lateral joint line
4 Pain on rotation of lower leg (knee at 90°)	On external rotation	On internal rotation
5 Weakened or atrophied quadriceps	May be present	May be present

Note: The diagnosis of a meniscal injury is made if three or more of the five examination findings ('signs' in TABLE 56.4) are present.

Ligament injuries

Tears of varying degrees may occur in the:

- anterior cruciate ligament
- posterior cruciate ligament
- medial collateral ligament
- lateral collateral ligament

Anterior cruciate ligament rupture

This is a very serious and disabling injury that may result in chronic instability. Chronic instability can result in degenerative joint changes if not dealt with adequately. Early diagnosis is essential, but there is a high misdiagnosis rate. Sites of ACL rupture are shown in FIGURE 56.15 .

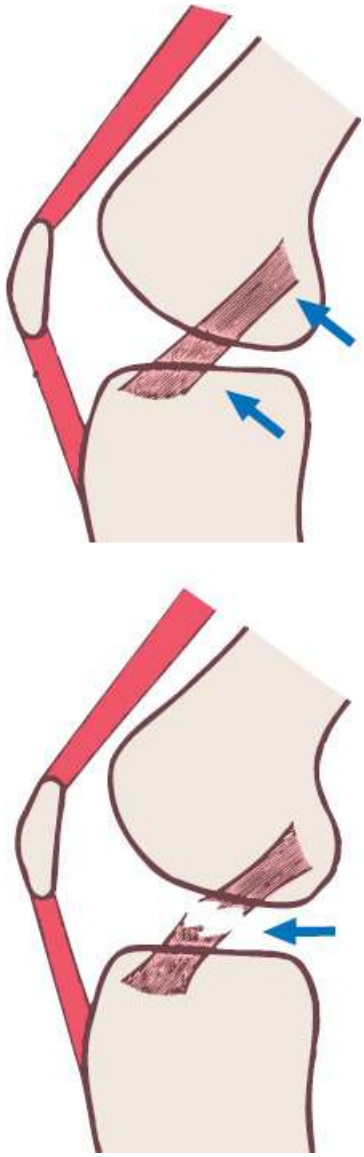

FIGURE 56.15 Sites of rupture of the anterior cruciate ligament

Mechanisms

- Sudden change in direction with leg in momentum
- Internal tibial rotation on a flexed knee (commonest) (e.g. during pivoting)
- Marked valgus force (e.g. a rugby tackle)
- May be associated with collateral ligament tears and meniscus injuries. The so-called ‘unhappy triad’ is a ruptured ACL, medial meniscus tear and medial collateral ligament tear.

Clinical features

- Onset of severe pain, especially in early minutes after a sporting injury, such as landing from a jump, or a forced valgus rotational strain of the knee when another player falls across the abducted leg
- Immediate effusion of blood, usually within 30 minutes
- Common sports: contact sports—rugby, football and soccer, basketball, volleyball, skiing
- Differential diagnosis is a subluxed or dislocated patella
- Subsequent history of pain and ‘giving way’ of the knee

Examination

- Gross effusion
- Diffuse joint-line tenderness
- Joint may be locked due to effusion, anterior cruciate tag or associated meniscal (usually medial) tear
- Ligament tests:

    anterior drawer: negative or positive

    pivot shift test: positive (only if instability)

    Lachman test: lacking an end point

Note: It may be necessary to examine the knee under anaesthesia, with or without arthroscopy, to assess the extent of injury.

The Lachman test

This test is emphasised because it is a sensitive and reliable test for the integrity of the ACL. It is an anterior draw test with the knee at 15–20° of flexion. At 90° of flexion, the draw may be negative but the anterior cruciate torn.

Method—Lachman test

1. The examiner should be positioned on the same side of the examination couch as the knee to be tested.
2. The knee is held at 15–20° of flexion by placing a hand under the distal thigh and

lifting the knee into 15–20° of flexion.

3. The patient is asked to relax, allowing the knee to ‘fall back’ into the steadying hand and roll slightly into external rotation.

4. The anterior draw is performed with the second hand grasping the proximal tibia from the medial side (see FIG. 56.16) while the thigh is held steady by the other hand. The examiner’s knee can be used to steady the thigh.

5. The feel of the end point of the draw is carefully noted. Normally there is an obvious jar felt as the anterior cruciate tightens. In an anterior cruciate deficient knee there is excess movement and no firm end point. The amount of draw is compared with the opposite knee. Movement greater than 5 mm is usually considered abnormal.

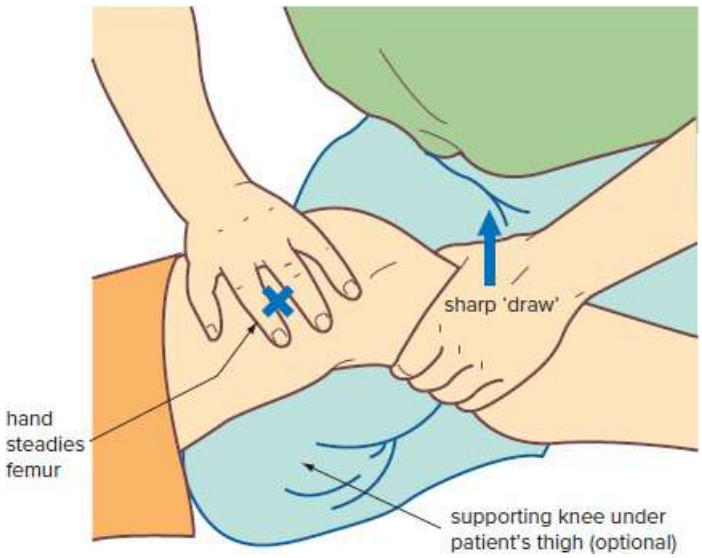

FIGURE 56.16 The Lachman test

Functional instability due to anterior cruciate deficiency is best elicited with the pivot shift test. This is more difficult to perform than the Lachman test.

Pivot shift test

This is an important test for anterolateral rotatory instability. It is positive when anterior cruciate injuries are sufficient to produce a functional instability.

Method—Pivot shift test

1. The tibia is held in internal rotation by grasping the ankle firmly, with the knee in full extension.

2. A valgus force is applied to the knee with the hand placed on the lateral aspect of the knee just below it (this maximises subluxation in the presence of an ACL tear).
3. The knee is then flexed from 0–90°, listening for a ‘clunk’ of reduction. The test is positive when there is a sudden change of rhythm during flexion that corresponds to relocation of the subluxed knee. This usually occurs between 30° and 45° of flexion.
4. From this flexed position, the knee is extended, seeking a click into subluxation. This is called a positive jerk test.

Management[18]

Management depends on the finding by the surgeon. Surgical repair is reserved for complete ligament tears. This usually involves reconstruction of the ligament using patellar or preferably hamstring tendons. Early reconstruction is appropriate in younger patients who participate in high levels of sporting activity for whom it can be predicted that functional instability will be a problem. In less active people, a conservative approach is appropriate. The ACL may be trimmed. Cruciate reconstruction can then be undertaken if the knee becomes clinically unstable. The presence of an ACL injury with a significant medial ligament injury will necessitate reconstructive surgery, but this is probably best delayed for some weeks as the subsequent incidence of knee stiffness is high.

Posterior cruciate ligament rupture

Mechanisms

- Direct blow to the anterior tibia in flexed knee
- Severe hyperextension injury
- Ligament fatigue plus extra stress on knee

Clinical features

- Posterior (popliteal) pain, radiating to calf
- Usually no or minimal swelling
- Minimal disability apart from limitation of running or jumping
- Pain running downhill
- Recurvatum
- Posterior sag or draw

- MRI has a high predictive value

Management

- Usually managed conservatively with immobilisation and protection for 6 weeks
- Graduated weight-bearing and exercises

Medial collateral ligament rupture

Mechanisms

- Direct valgus force to knee—lateral side knee (e.g. rugby tackle from side)
- External tibial rotation (e.g. two soccer players kicking ball simultaneously)

Clinical features

These depend on the degree of tear (1st, 2nd or 3rd degree):

- pain on medial knee
- aggravated by twisting or valgus stress
- localised swelling over medial aspect
- pseudo-locking—hamstring strain
- ± effusion
- no end point on valgus stress testing (3rd degree) (see FIG. 56.9A)

Note: Check lateral meniscus if MCL tear. Pellegrini–Stieda syndrome—calcification in haematoma at upper (femoral) origin of MCL—may follow.

Management

If an isolated event, this common injury responds to conservative treatment with early limited motion hinged bracing to prevent opening of the medial joint line. Six weeks of limited motion brace at 20–70° followed by knee rehabilitation usually returns the athlete to full sporting activity within 12 weeks.

Note: The same principles of diagnosis and management apply to the less common rupture of the lateral collateral ligament, which is caused by a direct varus force to the medial side of the knee. However, lateral ligament injuries tend to involve the cruciate ligament and reconstruction of both ligaments is usually necessary.[15]

Complex regional pain syndrome I

Localised complex regional pain syndrome I (also known as reflex sympathetic dystrophy) can follow a direct fall onto the knee. (See CHAPTER 82 .)

Symptoms

- Hypersensitivity
- Full extension, loss of flexion
- Possible increased sweating
- Tenderness of the joint

Overuse syndromes

The knee is very prone to overuse disorders. The pain develops gradually without swelling, is aggravated by activity and relieved with rest. It can usually be traced back to a change in the sportsperson's training schedule, footwear or technique, or to related factors. It may also be related to biomechanical abnormalities ranging from hip disorders to feet disorders.

Overuse injuries include:

- patellofemoral pain syndrome ('jogger's knee', 'runner's knee')
- patellar tendinopathy ('jumper's knee')
- anserinus tendinopathy/bursitis
- semimembranous tendinopathy/bursitis
- biceps femoris tendinopathy
- quadriceps tendinopathy/rupture
- popliteus tendinopathy
- iliotibial band friction syndrome ('runner's knee')
- the hamstrung knee
- synovial plica syndrome
- infrapatellar fat pad inflammation

It is amazing how often palpation identifies localised areas of inflammation (tendinopathy or

bursitis) around the knee, especially from overuse in athletes and in the obese elderly (see FIG. 56.17).

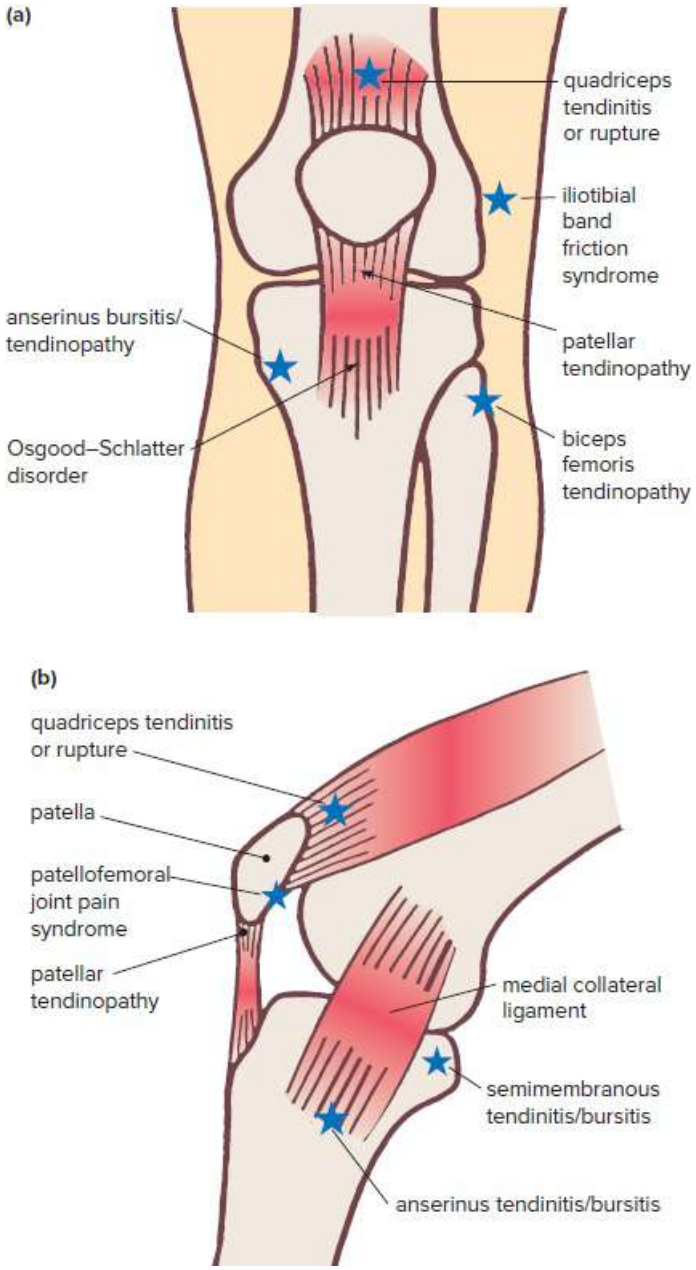

FIGURE 56.17 Typical painful areas around the knee in overuse syndromes: **(a)** anterior aspect, **(b)** medial aspect

Patellofemoral pain syndrome

This refers to idiopathic pain arising from the anterior knee. The syndrome, also known as chondromalacia patellae or anterior knee pain syndrome and referred to as ‘jogger’s knee’, ‘runner’s knee’ or ‘cyclist’s knee’, is the most common overuse injury of the knee. There is usually no specific history of trauma. It may be related to biomechanical abnormalities and abnormal position and tracking of the patella (e.g. patella alta). It usually presents in females aged 13–15 years with faulty knee mechanisms or in people aged 50–70 years with osteoarthritis of the patellofemoral joint.[19]

Clinical features

- Pain behind or adjacent to the patella or deep in the knee
- Pain aggravated during activities that require flexion of the knee under loading:

  climbing stairs

  walking down slopes or stairs

  squatting

  prolonged sitting
- The ‘movie theatre’ sign: using aisle seat to stretch knee
- Palpable crepitus around patella may be present

Signs (chondromalacia patellae)

Patellofemoral crepitation during knee flexion and extension is often palpable, and pain may be reproduced by compression of the patella onto the femur as it is pushed from side to side with the knee straight or flexed (Perkins test).

Method for special sign—patella grind test

See FIGURE 56.18 .

- Have the patient supine with the knee extended.
- Grasp the superior pole of the patella and displace it inferiorly.
- Maintain this position and apply patellofemoral compression.
- Ask the patient to contract the quadriceps (it is a good idea to get the patient to practise quadriceps contraction before applying the test).
- A positive sign is reproduction of the pain under the patella and hesitancy in contracting the muscle.

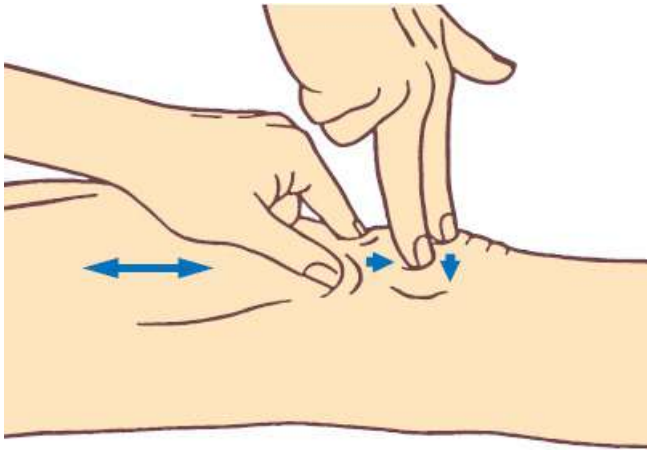

FIGURE 56.18 Special sign of the patellofemoral pain syndrome

Treatment

- Give reassurance and supportive therapy.
- Reduce any aggravating activity.
- Refer to a physiotherapist.
- Correct any underlying biomechanical abnormalities such as pes planus (flat feet) by use of orthotics and correct footwear.
- Employ quadriceps (especially) and hamstring exercises.[20]
- Paracetamol for analgesia: consider course (trial) of NSAIDs.

Patellar tendinopathy ('jumper's knee')

'Jumper's knee', or patellar tendinopathy (see FIG. 56.2 , earlier in this chapter), is a common disorder of athletes involved in repetitive jumping sports, such as high jumping, basketball, netball, volleyball and soccer. It probably starts as an inflammatory response around a small tear.

Clinical features

- Gradual onset of anterior pain
- Pain localised to below knee (in patellar tendon)
- Pain eased by rest, returns with activity
- Pain with jumping

The diagnosis is often missed because of the difficulty of localising signs. The condition is best diagnosed by eliciting localised tenderness at the inferior pole of the patella with the patella tilted. There may be localised swelling.

Method

- Lay the patient supine in a relaxed manner with the head on a pillow, arms by the side and quadriceps relaxed (a must).
- The knee should be fully extended.
- Tilt the patella by exerting pressure over its superior pole. This lifts the inferior pole.
- Now palpate the surface under the inferior pole. This allows palpation of the deeper fibres of the patellar tendon (see FIG. 56.19).
- Compare with the normal side.
- Very sharp pain is usually produced in the patient with patellar tendinopathy.

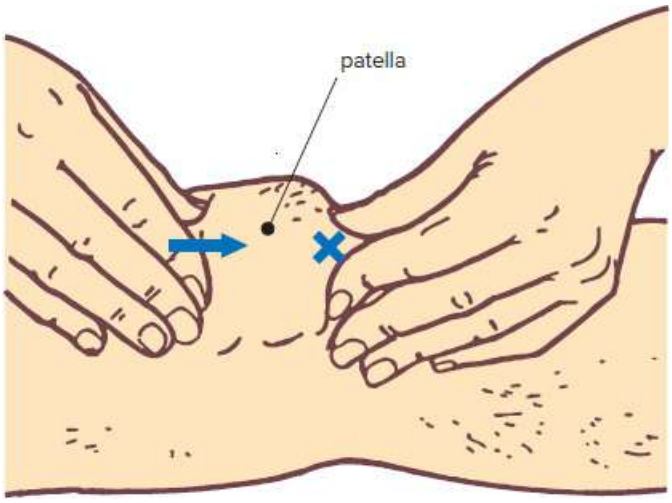

FIGURE 56.19 Patellar tendinopathy: method of palpation

Management

Early conservative treatment, including rest from the offending stresses, is effective. Referral to a physiotherapist for exercise-based rehabilitation is appropriate. This includes adequate warm-up and warm-down. Training modification includes calf, hamstring and quadriceps muscle stretching. Modified footwear and a patellar tendon strap may be helpful in some cases. The use of NSAIDs and corticosteroid injections is disappointing. Chronic cases may require surgery.

Anserinus tendinopathy/bursitis

Localised tenderness is found over the medial tibial condyle where the tendons of the sartorius, gracilis and semitendinosus insert into the bone. It is distal to the joint line. It is a common cause of knee pain in the middle-aged or elderly, especially the overweight woman. Pain is aggravated by resisted knee flexion.

Semimembranous tendinopathy/bursitis

This inflamed area is sited either at the tendon insertion or in the bursa between the tendon and the medial head of the gastrocnemius. It is an uncommon problem. The bursa occurs on the medial side of the popliteal fossa between the medial head of the gastrocnemius and the semimembranous tendon. It often communicates with the knee joint and, if so, treat knee joint pathology. If not, one can give an injection of depot triamcinolone or betamethasone.

Biceps femoris tendinopathy/bursitis

The tendon and/or the bursa that lies between the tendon insertion and the fibular collateral ligament at the head of the fibula may become inflamed due to overuse. It is usually encountered in sprinters.

Popliteus tendinopathy

Tenosynovitis of the popliteus tendon may cause localised pain in the posterior or the posterolateral aspect of the knee. Tenderness to palpation is elicited with the knee flexed to 90°.

Iliotibial band syndrome

Inflammation develops over the lateral aspect of the knee where the iliotibial band passes over the lateral femoral condyle. An inflamed bursa can occur deep to the band. The problem, which is caused by friction of the iliotibial band on the bone, is common in long-distance runners, especially when running up and down hills, and in cyclists. It presents with well-localised lateral knee pain of gradual onset. Palpation reveals tenderness over the lateral condyle 1–2 cm above the joint line.

Treatment of tendinopathy and bursitis (small area)

Generally (apart from patellar tendinopathy), the treatment is an injection of local anaesthetic and long-acting corticosteroids into and deep to the localised area of tenderness. In addition, it is important to restrict the offending activity and refer for physiotherapy for stretching exercises. Attention to biomechanical factors and footwear is important.

If conservative methods fail for iliotibial tract tendinopathy, surgical excision of the affected fibres may cure the problem.

Prepatellar bursitis

Repetitive low-grade direct trauma, such as frequent kneeling, can cause inflammation with swelling of the bursa, which lies between the anterior surface of the patella and the skin. ‘Housemaid’s knee’, or ‘carpet layer’s knee’, can be difficult to treat if rest from the trauma does not allow it to subside. If persistent and infection excluded, drain the fluid with a 23 gauge needle and then introduce 0.5–1 mL of long-acting corticosteroid. The presence of a bursa ‘mouse’ and persistent bursitis usually mean that surgical intervention is required.

Acute bursitis may also be caused by acute infection, or one of the inflammatory arthropathies (e.g. gout, seronegative spondyloarthropathies). If septic, arrange urgent hospital admission.

Infrapatellar bursitis

‘Clergyman’s knee’ is produced by the same mechanisms as prepatellar bursitis and can be involved with inflammatory disorders or infection. Treatment is also the same.

Patellar dislocatim

Refer to CHAPTER 124 .

The hamstrung knee

Cross describes this condition in young active sportspeople (second decade)[8] as one that causes bilateral knee pain and possibly a limp. It is caused by a failure to warm up properly and stretch the hamstring muscles, which become tender and tight during the growth spurt. A 6-week program of straight leg raising and hamstring stretching will alleviate the pain completely.

Synovial plica syndrome

This syndrome results from a synovial fold (an embryological remnant) being caught between the patella and the femur during walking or running. It causes an acute ‘catching’ knee pain of the medial patellofemoral joint (see FIG. 56.2 , earlier in this chapter) and sometimes a small effusion. It generally settles without treatment.

Infrapatellar fat pad inflammation

Hoffa fat pad syndrome follows acute compression of the fat pad, which extends across the lower patella deep to the patellar tendon and into the knee joint (see FIG. 56.2 , earlier in this chapter), during a jump or other similar trauma, producing local pain and tenderness similar to the sensation of kneeling on a drawing pin.[19]

The pain usually settles without therapy over a period of days or weeks. There is localised tenderness and it can be confused with patellar tendinopathy.

Osteochondritis dissecans: adult form

The adult form occurs more often in males and may be the result of cysts of osteoarthritis fracturing into the joint. Up to 30% are bilateral. Symptoms depend on whether the osteochondral fragment becomes separated. A loose fragment may produce locking or collapse of the knee.

Loose bodies

The large knee joint is a ‘haven’ for intra-articular loose bodies, which may be formed from bone, cartilage or osteochondral fragments following injury (‘chip’ fragment), osteochondritis dissecans, osteoarthritis, synovial chondromatosis or other conditions. They may be asymptomatic but usually cause clicking or locking with swelling. Diagnosis is by X-ray and surgical removal is necessary for recurrent problems.

The knee ‘mouse’

This common complaint is usually a result of a pedunculated fibrous lump in the prepatellar bursa, often secondary to trauma, such as falls onto the knee.

Arthritic conditions

Osteoarthritis

Osteoarthritis is a very common problem of the knee joint. Symptoms usually appear in middle life or later. It is more common in women, obese people and in those with knee deformities (e.g. genu varum) or previous trauma, especially meniscal tears. The degenerative changes may involve either the lateral or the medial tibiofemoral compartment, the patellofemoral joint or any combination of these sites.

Clinical features

- Slowly increasing joint pain and stiffness
- Aggravated by activities such as twisting, bending, prolonged walking, standing or squatting
- Descending stairs is usually more painful than ascending stairs (suggestive of patellofemoral osteoarthritis)
- Pain may occur after rest, especially prolonged flexion
- Minimal effusion and variable crepitus
- Restricted flexion but usually full extension

- Often quadriceps wasting and tender over medial joint line
- Diagnosis confirmed by X-ray (weight-bearing view)

Management options

- Relative rest
- Weight loss
- Analgesics and/or judicious use of NSAIDs
- Glucosamine: there is inadequate evidence to support its use[21]
- Walking aids and other supports
- Physiotherapy (e.g. hydrotherapy, quadriceps exercises, mobilisation and stretching techniques)
- Viscosupplementation: intra-articular injection of hylans improves pain and function compared to placebo,[22] particularly at 5–13 weeks after injection.
- Intra-articular injections of corticosteroids are generally not recommended, but a single injection for severe pain can be very effective
- Surgery is an option for severe pain and stiffness. This includes arthroscopic debridement and wash out, osteotomy and arthrodesis. Hemiarthroplasty is used especially for the medial compartment with focal arthritis and varus deformity. Total knee replacement remains the gold standard for longstanding severe OA (see FIG. 56.20)

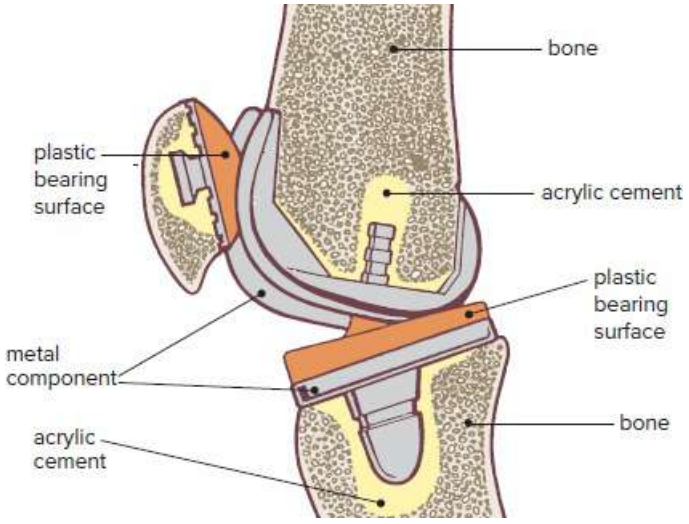

FIGURE 56.20 Total joint replacement of knee (example)

Rheumatoid arthritis

The knee is frequently affected by rheumatoid arthritis (RA), although it rarely presents as monoarticular knee pain. RA shows the typical features of inflammation—pain and stiffness that is worse after resting. Morning stiffness is a feature.

Note: The spondyloarthropathies have a similar clinical pattern to RA.

Synovectomy is a useful option with persistent boggy thickening of synovial membrane but without destruction of the articular cartilage.[2]

Baker cyst

A popliteal cyst (Baker cyst) is a herniation of a chronic knee effusion between the heads of the gastrocnemius muscle and is usually associated with osteoarthritis (most common), rheumatoid arthritis or internal derangement of the knee. It presents as a mass behind the knee and may or may not be tender or painful.

It tends to fluctuate in size.

A Baker cyst indicates intra-articular pathology and indicates a full assessment of the knee joint.

Rupture may result in pain and swelling in the calf, mimicking DVT.

Treat underlying knee inflammation (synovitis).

Surgical removal of the cyst is advisable for persistent problems.

Septic arthritis

This tends to be more common in the knee than in other joints. Septic (pyogenic) arthritis should be suspected when the person complains of intense joint pain, malaise and fever. In the presence of acute pyogenic infection, the joint is held rigidly. The differential diagnosis includes gout and pseudogout (chondrocalcinosis). Refer urgently to hospital.

Principles of management

Most painful knee conditions are not serious and, providing a firm diagnosis is made and internal knee disruption or other serious illness discounted, a simple management plan as outlined leads to steady relief. For more serious injuries the primary goal is to minimise the adverse consequences of forced inactivity.

- First aid: RICE (avoid heat in first 48 hours).
- Lose weight if overweight.

- Adequate support for ligament sprains—supportive elastic tubular (Tubigrip) bandage or a firm elastic bandage over Velband.
- Simple analgesics—paracetamol (acetaminophen).
- Judicious use of NSAIDs and corticosteroid injections.
- Physiotherapy to achieve strength and stability.
- Attend to biomechanical abnormalities, inappropriate footwear and athletic techniques.
- Orthotics and braces to suit the individual patient.
- Specialised exercise techniques (e.g. the McConnell technique).[2]
- Quadriceps exercises: these simple exercises are amazingly effective.

Quadriceps exercises (examples)

- Instruct the patient to tighten the muscles in front of the thighs (as though about to lift the leg at the hip and bend the foot back but keeping the leg straight). The patient should hold the hand over the lower quadriceps to ensure it is felt to tighten. This tightening and relaxing exercise should be performed at least 6 times every 2 hours or so until it becomes a habit. It can be done sitting, standing or lying (see FIG. 56.21).
- Sitting on a chair the patient places a weight of 2–5 kg around the ankle (e.g. a plastic bag with sand or coins in a sock) and lifts the leg to the horizontal and then gently lowers it.

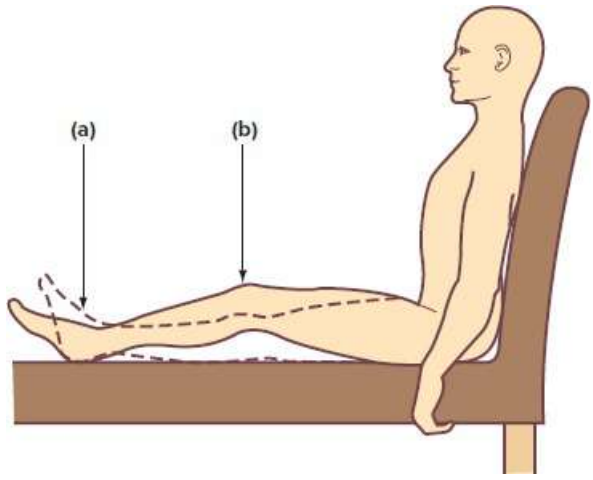

FIGURE 56.21 A quadriceps exercise: with outstretched legs the quadriceps muscle is slowly and deliberately tightened by straightening the knee to position **(a)** from the relaxed position **(b)**

When to refer

- Early referral is required for knees ‘at risk’ following acute injuries where one or more of the following are present:

  locked knee

  haemarthrosis

  instability

- Clinical evidence of a torn cruciate ligament, third degree tear of the collateral ligaments or torn meniscus Page 694
- Undiagnosed acute or chronic knee pain
- Recurrent subluxation or dislocation of the patella
- Suspected septic arthritis
- Presence of troublesome intra-articular loose body
- Severe osteoarthritis where knee replacement is being considered

Practice tips

- The absence of an effusion does not rule out the presence of severe knee injury.
- Examine the hip and lumbosacral spine if examination of the knee is normal but knee pain is the complaint.
- Always think of an osteoid osteoma in a young boy with severe bone pain in a leg (especially at night) that responds well to aspirin or paracetamol or other NSAID.
- Tears of the meniscus can occur, especially in middle age, without a history of significant preceding trauma.
- An audible ‘pop’ or ‘crack’ in the knee with an immediate effusion (in association with trauma) is an ACL tear until proved otherwise.
- Haemarthrosis following an injury should be regarded as an anterior cruciate tear until proved otherwise.
- The ‘movie theatre’ sign, whereby the patient seeks an aisle seat to stretch the knee, is usually due to patellofemoral pain syndrome.
- The ‘bed’ sign, when pain is experienced when the knees touch while in bed, is

suggestive of a medial meniscal cleavage tear.

- A positive squat test (medial pain on full squatting) indicates a tear of the posterior horn of the medial meniscus.
- Joint aspiration should not be performed on the young athlete with an acute knee injury.
- If an older female patient presents with the sudden onset of severe knee pain, think of osteonecrosis.
- Reserve intra-articular corticosteroid injections for inflammatory conditions such as rheumatoid arthritis or a crystal arthropathy: regular injections for osteoarthritis are to be avoided. Do not give the injections when the inflammation is acute and diffuse or in the early stages of injury.
- Many inflammatory conditions around the knee joint, such as bursitis or tendinopathy, respond to a local injection of local anaesthetic and corticosteroid, but avoid giving injections into the tendon, especially the patellar tendon.
- Keep in mind the technique of autologous cartilage transplantation: in this technique, cartilage cells (chondrocytes) are taken from the patient, multiplied in a laboratory and eventually implanted into the damaged area. It can be used for damage in any major joint, especially the knee, being ideal for osteochondritis dissecans.

Patient education resources

Hand-out sheets from *Murtagh's Patient Education* 8th edition:

- Baker's cyst
- Exercises for your knee
- Knee: anterior knee pain
- Knee: osteoarthritis
- Osgood–Schlatter disorder

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57 Pain in the foot and ankle

The victim goes to bed and sleeps in good health. About two o'clock in the morning he is awakened by a severe pain in the great toe; more rarely in the heel, ankle, or instep … The part affected cannot bear the weight of the bed clothes nor the jar of a person walking in the room. The night is spent in torture.

THOMAS SYDENHAM (1624–1689) ON GOUT

Pain in the foot (podalgia) and ankle problems are common occurrences in general practice. Various characteristics of the pain can give an indication of its cause, such as the description of gout by Thomas Sydenham. There are many traumatic causes of podalgia and ankle dysfunction, especially fractures and torn ligaments, but this chapter will focus mainly on everyday problems that develop spontaneously or through overuse. Forefoot pain is common, especially in the elderly. The forefoot comprises the toes to the middle of the metatarsals and all of the supporting structures. Metatarsalgia is a term used to describe pain in the distal aspect of one or more of the metatarsal bones during weight-bearing.[1]

Key facts and checkpoints

- Foot deformities such as flat feet (pes planus) are often painless.
- Foot strain (broadly: overuse injuries) is probably the commonest cause of podalgia.[2]
- A common deformity of the toes is hallux valgus, with or without bunion formation.
- Osteoarthritis is a common sequel to hallux valgus.
- Osteoarthritis affecting the ankle is relatively uncommon.
- All of the distal joints of the foot may be involved in arthritic disorders.
- Many foot and ankle problems are caused or exacerbated by unsuitable footwear and lack of foot care.
- Ankle sprains are the most common injury in sport, representing about 25% of

injuries.

- Severe sprains of the lateral ligaments of the ankle due to an inversion force may be associated with various fractures.
- Bunions and hammer toes are generally best treated by surgery.

A diagnostic approach

A summary of the diagnostic strategy model is presented in TABLE 57.1 .

Table 57.1 The painful foot and ankle: diagnostic strategy model

Probability diagnosis
Acute or chronic foot strain
Sprained ankle
Osteoarthritis (esp. great toe)
Plantar fasciitis
Achilles tendinopathy
Tibialis posterior tendinopathy
Wart, corn or callus
Ingrowing toenail/paronychia
Serious disorders not to be missed
Vascular insufficiency: • small vessel disease
Neoplasia: • osteoid osteoma • osteosarcoma • synovial sarcoma
Severe infections (rare): • septic arthritis • actinomycosis • osteomyelitis
Rheumatoid arthritis
Peripheral neuropathy
Complex regional pain syndromes
Ruptured Achilles tendon

Ruptured tibialis posterior tendon

Pitfalls (often missed)

Foreign body (esp. children)
Gout
Morton neuroma
Tarsal tunnel syndrome
Deep peroneal nerve entrapment
Chilblains
Stress fracture (e.g. navicular)
Erythema nodosum
Rarities:

- spondyloarthropathies
- osteochondritis: navicular (Köhler), metatarsal head (Freiberg), calcaneum (Sever)
- glomus tumour (under nail)
- Paget disease

Seven masquerades checklist

Depression (?)
Diabetes
Drugs
Spinal dysfunction

Is the patient trying to tell me something?

A non-organic cause warrants consideration with any painful condition.

Probability diagnosis

Common causes include osteoarthritis, especially of the first metatarsophalangeal (MTP) joint, acute or chronic foot strain, plantar fasciitis, plantar skin conditions such as warts, corns and calluses and various toenail problems.

Serious disorders not to be missed

The very important serious disorders to consider include:

- vascular disease—affecting small vessels
- diabetic neuropathy

- osteoid osteoma
- rheumatoid arthritis
- complex regional pain syndrome I

Vascular causes

The main problem is ischaemic pain that occurs only in the foot. The commonest cause is atheroma. Vascular causes include:

- acute arterial obstruction
- chilblains
- atherosclerosis, especially small vessel disease
- functional vasospasm (Raynaud)—rare

Symptoms:

- Claudication (rare in isolation)
- Sensory disturbances, especially numbness at rest or on walking
- Rest pain—at night, interfering with sleep, precipitated by elevation, relieved by dependency

For treatment refer to CHAPTER 55 .

Complex regional pain syndrome I

Also known as reflex sympathetic dystrophy or Sudeck atrophy, regional pain syndrome is characterised by severe pain, swelling and disability of the feet. It is a neurovascular disorder resulting in hyperaemia and osteoporosis that may be a sequela of trauma (often trivial) and prolonged immobilisation. Complex regional pain syndrome I usually lasts 2 years and recovery to normality usually follows.

The clinical features include sudden onset in middle-aged patients, pain worse at night, stiff joints and skin warm and red. X-rays that show patchy decalcification of bone are diagnostic. Treatment includes reassurance, analgesics, mobility in preference to rest, and physiotherapy.

Osteoid osteoma

Osteoid osteomas are rare but important little ‘brain teasers’ of benign tumours that typically occur in older children and adolescents. Males are affected twice as often as females. Any bone (except those of the skull) can be affected but the tibia and femur are the main sites. Nocturnal pain is a prominent symptom with pain relief by aspirin being a feature.

Diagnosis is dependent on clinical suspicion and then X-ray, which shows a small sclerotic lesion with a radiolucent centre. Treatment is by surgical excision.

Pitfalls

There are many traps in the diagnosis and management of problems presenting with a painful foot. Common problems require consideration—these include gouty arthritis, chilblains, a stress fracture and a foreign body in the foot, especially in children. Nerve entrapment, as outlined in CHAPTER 55 , is uncommon but Morton neuroma is reasonably common.

Less common disorders include complex regional pain syndrome, which is often misdiagnosed, the spondyloarthropathies (psoriasis, reactive arthritis, ankylosing spondylitis and the inflammatory bowel disorders) and osteochondritis of the calcaneus, navicular bone and metatarsal head. If there is an exquisitely tender small purple–red spot beneath a toenail, a glomus tumour (a benign hamartoma) is the diagnosis. It is worth noting that most of these conditions are diagnosed by X-rays.

General pitfalls

- Failing to order X-rays of the foot.
- Failing to order X-rays of the ankle following injury.
- Failing to appreciate the potential for painful problems caused by diabetes—neuropathy and small vessel disease.
- Neglecting the fact that most of the arthritides can manifest in joints in the foot, especially the forefoot.
- Regarding the sprained ankle in adults and children as an innocuous injury: associated injuries include chondral fractures to the dome of the talus, impaction fractures around the medial recess of the ankle, avulsion fractures of the lateral malleolus and base of fifth metatarsal.
- Misdiagnosing a stress fracture of the navicular which, like the scaphoid fracture, causes delayed union and non-union. Cast immobilisation for 8 weeks initially may prevent the need for surgery.

- Misdiagnosing a complete rupture of the Achilles tendon because the patient can plantar flex the foot.
- Overlooking tibialis posterior tendinopathy as a cause of ankle pain.

Seven masquerades checklist

The checklist has four conditions that should be considered, especially diabetes and spinal dysfunction. Diabetes may be responsible for a simple type of atherosclerotic pattern, possibly complicated by infection and ulceration. The neuropathy of diabetes can cause a burning pain

with paraesthesia. It has a ‘sock’-type pattern as opposed to the dermatome pattern of nerve root pressure arising from the lumbosacral spine. The common S1 pain is experienced on the outer border of the foot, into the fifth toe and on the outer sole and heel of the foot.

Drugs and anaemia could indirectly cause pain through vascular insufficiency. The drugs that could cause vasospasm include beta blockers and ergotamine. An alcoholic neuropathy also has to be considered.

Red flag pointers for foot pain

- Pain in forefoot disturbing sleep
- Fever and systemic illness with bone pain
- Localised tenderness away from heel in child
- ‘Burning’ feet

Psychogenic considerations

Any painful condition can be closely associated with psychogenic disorders, including depression.

The clinical approach

History

This is very important, as always, since various characteristics of the pain can give an indication of its cause. Questions should address the quality of the pain, its distribution, mode of onset, periodicity, relation to weight-bearing and associated features such as swelling or colour change. It is relevant to enquire about pain in other joints such as the hand and spine, including the sacroiliac joints, which might indicate that the foot pain is part of a polyarthritis. A history of diarrhoea, psoriasis, urethritis or iritis may suggest that one of the spondyloarthropathies has to be excluded.

Key questions

The practitioner should address the following questions:

- Does the pain arise from a local condition or is it part of a generalised disease?
- Is there a history of psoriasis, chronic diarrhoea or colitis, urethritis or iritis?

- Is pain also present in other joints, thus indicating the foot pain is part of a polyarthritis, such as rheumatoid arthritis?
- Is the problem related to unsuitable footwear?
- Does the nature of the pain point to the cause?

  throbbing pain → inflammation

  burning pain → nerve entrapment, diabetic neuropathy or regional pain syndrome

  severe episodic pain → gout

  pain worse at night → ischaemia (small vessel disease), regional pain syndrome, cramps or osteoid osteoma

  pain worse at night, relieved by aspirin → osteoid osteoma

  pain worse on standing after sitting and getting out of bed → plantar fasciitis

For ankle injuries it is important to ask about the nature of the injury:

- Did the foot twist in (invert) or twist out (evert)?
- Was the foot pointing down or up at the time of injury?
- Point with one finger to where it hurts (the finger-pointing sign).
- What happened immediately after the injury?
- Were you able to walk straight away?
- What happened when you cooled off?

If there has been a fall onto the foot from a height, consider the possibility of a fracture of the calcaneus or talus or disruption of the syndesmosis between the tibia and fibula. Also check the lumbar spine.

Examination

Inspection

Inspect the feet with the patient standing, sitting, walking (in shoes and barefooted) and lying down (note plantar surfaces). Inspect the footwear (normally, a shoe wears first on the outer posterior margin of the heel).

Note:

- any gait abnormalities, including limping and abnormal toe in or toe out
- deformities, such as hammer toes, bunions—medial (hallux valgus) and lateral (Tailor bunion)—and claw toes
- swellings, including callosities
- muscle wasting
- skin changes and signs of ischaemia

Palpation

Systematic palpation is very useful as most structures in the foot are accessible to palpation.

Movements (active and passive)

The joints to test are:

- ankle (talar) joint
- hindfoot (subtalar) joint
- midfoot (midtarsal) joint

Movements

- Plantar flexion (normal—50°) and dorsiflexion (20°) of foot (see FIG. 57.1)
- Inversion and eversion of hindfoot (mainly subtalar joint)—hold heel and abduct and adduct (see FIG. 57.2)
- Inversion and eversion of forefoot (midtarsal joint)—hold heel in one hand to fix hindfoot, hold forefoot in the other and abduct and adduct (rotation movement) (see FIG. 57.3)
- Test other joints individually (e.g. MTP, midtarsal)

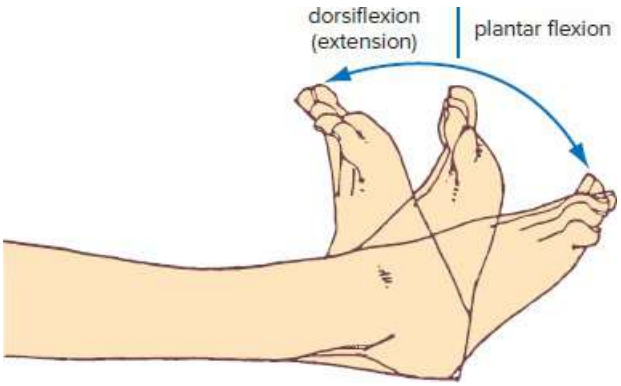


FIGURE 57.1 Dorsiflexion and plantar flexion of the ankle joint

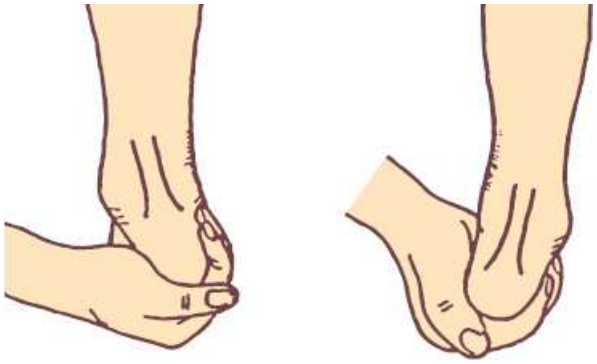


FIGURE 57.2 Testing inversion and eversion of the hindfoot

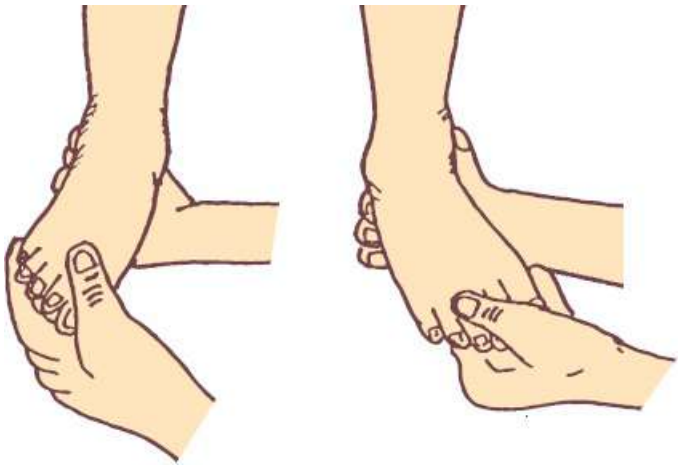


FIGURE 57.3 Testing eversion and inversion of the forefoot

Special tests

- Achilles tendon, including calf squeeze (Thompson or Simmond test)
- Compress MTP joints from above and below
- Compress metatarsals mediolaterally between thumb and forefinger
- Press upwards from sole of foot just proximal to third and fourth MTP joints—Morton test
- Check circulation—test dorsalis pedis and posterior tibial pulses
- Neurological examination, including tests for L4, L5 and S1 nerve root function

Investigations

The choice of investigations depends on the clinical features elicited by the history and examination. Select from the following list:

- for systemic diseases:

    blood glucose

    RA tests

    ESR/CRP

    HLA-B_{27}

- serum uric acid

- radiology:

    X-ray ± stress and weight-bearing views

    radionuclide scans (for bone or joint pathology)

    CT or MRI (especially helpful) scans

    ultrasound (operator dependent)

- nerve conduction studies

Note: High-resolution ultrasound is used to diagnose disorders of the Achilles and posterior tibialis tendons and to locate foreign bodies such as splinters of wood and glass.

Radionuclide scanning may detect avascular necrosis in bones, stress fractures, osteoid osteomas, inflammatory osteoarthritis and similar lesions.[3]

Foot and ankle pain in children

Apart from the common problem of trauma, special problems in children include:

- foreign bodies in the foot
- tumours (e.g. osteoid osteoma, osteosarcoma, Ewing tumour)
- plantar warts
- osteomyelitis/septic arthritis
- ingrowing toenails

- osteochondritis/aseptic necrosis
- osteochondritis dissecans of talus (in adolescents)
- pitted keratolysis and juvenile plantar dermatosis (adolescents)
- stress fractures

Think of osteoid osteoma in children with night pain.

Osteochondritis/aseptic necrosis

Three important bones to keep in mind are:

- the calcaneum—Sever disease
- the navicular—Köhler disease
- the head of the second metatarsal—Freiberg disease

Sever disease is traction osteochondritis, while the other disorders are a 'crushing' osteochondritis with avascular necrosis.

Sever disease of the heel

This is calcaneal apophysitis, which presents in a child (usually a boy) aged 7–15 years (average of 10 years) with a painful tender heel at the insertion of the tendoachilles. It is diagnosed by X-ray. The only treatment is to ensure that the child avoids wearing flat-heeled shoes and wears a slightly raised heel. Strenuous sporting activities should be restricted for 12 weeks and then reviewed.

Köhler disease of the navicular

This disorder causes a painful limp (usually mild) with some swelling and tenderness around the navicular in a child (usually a boy) aged 3–6 years, although it is seen sometimes in older children. Complete recovery occurs with temporary rest. Sometimes supportive strapping is helpful.

Freiberg disease

This problem affects the head of the second metatarsal (rarely the third), which feels tender and swollen on palpation. It is more common in girls aged 12–16 years and can present in young adults as pain aggravated by standing on the forefoot. Plain X-ray shows the characteristic collapse of the metatarsal head. The treatment is restriction of activity, protective footwear and protective padding.

Sprained ankle in a child

Children rarely sprain ligaments so it is important to assess apparent strains carefully, including an X-ray looking for an avulsion fracture.

The little athlete

The ‘little athlete’ can suffer a variety of injuries from accidents and overuse. Diffuse heel pain, which is common, is most often related to Sever apophysitis of the calcaneum. Occasionally, a juvenile-type plantar fasciitis may occur. Little athletes can develop tendinitis around the ankle, either on the lateral side (peroneals) or medially (tibialis posterior). Occasionally, a stress fracture of the metatarsals or other bones can occur.[4] Special attention must be paid to any developmental structural abnormalities and to footwear.

General foot and ankle problems

Foot and ankle problems in the elderly

Foot problems are more prevalent in old age. Some are due to a generalised disease, such as diabetes or peripheral vascular disease, while others, such as bunions, hammer toes, calluses and corns, atrophy of the heel fat-pad and Morton neuroma, increase with ageing. The transverse arch may flatten out and the protective pads under the metatarsals may atrophy, resulting in painful callosities.

Unfortunately, many elderly people regard foot problems as a normal process but these problems actually require considerable care and attention, especially in the presence of peripheral vascular disease, diabetes or rheumatoid arthritis. Deformed toenails (onychogryphosis) are also common albeit not a painful condition.

Flat foot occurring in middle age is usually due to stretching or rupture of the tibialis posterior tendon.[5]

Sprained ankle

Two main ankle ligaments are subject to heavy inversion or eversion stresses, namely the lateral ligaments and the medial ligaments respectively. Most of the ankle ‘sprains’ or tears involve the lateral ligaments (up to 90%) while the stronger, tauter medial (deltoid) ligament is less prone to injury. It is important not to misdiagnose a complete rupture of the lateral ligaments.

Most sprains occur when the ankle is plantar flexed and inverted, such as when landing awkwardly after jumping or stepping on uneven ground. It is a very common sporting injury.

Clinical features (sprained lateral ligaments)

- Ankle ‘gives way’

- Difficulty in weight-bearing
- Discomfort varies from mild to severe
- Bruising (may take 12–24 hours) indicates more severe injury
- May have functional instability: ankle gives way on uneven ground

Physical examination

Perform as soon as possible:

- note swelling and bruising
- palpate over bony landmarks and three lateral ligaments
- test general joint laxity and range of motion
- a common finding is a rounded swelling in front of the lateral malleolus (the ‘signe de la coquille d’oeuf’)
- test stability in AP plane (anterior draw sign)

Table 57.2 Classification of ankle sprains

Grade	Functional/clinical	Ligamentous stability
I (mild)	Minimal pain and swelling Minimal bleeding Full range of motion heel and toe walking	Minor ligamentous injury with only a partial tear of the ligament Stable ankle joint Normal stress X-ray
II (moderate)	Moderate to severe pain and swelling Considerable bleeding Decreased range of motion Difficulty in weight-bearing and ambulation	Similar to grade I only more severe Partially unstable joint Stress X-ray: anterior draw 4–14 mm, talar tilt 5–10°
III (severe)	Minimal to severe pain and swelling Pronounced bleeding Minimal range of motion Unable to weight-bear	Complete ligamentous rupture with unstable joint Stress X-ray: anterior draw >15 mm, talar tilt >20°

Source: Adapted from Litt[8]

Is there an underlying fracture?

For a severe injury the possibility of a fracture—usually of the lateral malleolus or base of fifth metatarsal—must be considered. If the patient is able to walk without much discomfort straight after the injury a fracture is unlikely. X-ray according to the Ottawa ankle rules.

Indications for X-ray include:[6]

- inability to weight-bear immediately after injury
- marked swelling and bruising soon after injury
- marked tenderness over the bony landmarks
- marked pain on movement of the ankle
- crepitus on palpation or movement
- point tenderness over the base of the fifth metatarsal
- special circumstances (e.g. litigation potential)

Ottawa rules for ankle and foot X-ray[7]

These rules are a quick and reliable method of selecting which patients with ankle and foot injuries need X-rays to exclude a fracture.

Ankle injury

An X-ray of the ankle is necessary when the patient has pain over the medial or lateral malleolar zone *and* any one of the following findings:

- there is bone tenderness on palpation of the distal 6 cm of the fibula (posterior tip of lateral malleolus)
- there is bone tenderness on palpation of the distal 6 cm of the tibia (posterior tip of medial malleolus)
- there was an inability to bear weight (walk four steps) *both* immediately after injury and during the clinical examination

Foot injury

Refer for a foot X-ray (suspected midfoot fracture) if there is pain in the midfoot and any one of:

- bone tenderness at fifth metatarsal base
- bone tenderness at the navicular bone

- inability to weight-bear immediately after injury and when seen

Management

The treatment of ankle ligament sprains depends on the severity of the sprain. Most grade I and II sprains respond well to standard conservative measures and regain full, pain-free movement in 1–6 weeks, but controversy surrounds the most appropriate management of grade III sprains.

A 2002 Cochrane Systematic Review revealed that functional recovery for grade III strains was quicker in those treated by rehabilitation compared with surgery.[9]

Grade I–II sprains

R = Rest the injured part for 48 hours, depending on disability

I = Ice pack for 20 minutes every 3–4 hours when awake for the first 48 hours

C = Compression bandage (e.g. crepe bandage)

E = Elevate to hip level to minimise swelling

A = Analgesics (e.g. paracetamol ± codeine)

R = Review in 48 hours, then 7 days

S = Special strapping

Use partial weight-bearing with crutches for the first 48 hours or until standing is no longer painful, then encourage early full weight-bearing and full range of movement. This can be followed by isometric exercises.[10] Use warm soaks, dispense with ice packs after 48 hours. Walking in sand (e.g. along the beach) is excellent rehabilitation. Aim towards full activity by 2 weeks.

Grade III sprains

Initial management includes RICE (as above), analgesics and an X-ray to exclude an associated fracture. Refer the patient with a complete ankle tear.

Red flag

Be aware of the serious Lisfranc ligament disruption of the forefoot.

Heel pain

Important causes of heel pain in adults (see FIG. 57.4)[11] include:

- Achilles tendon disorders:
  - tendinopathy/peritendinitis
  - bursitis: postcalcaneal, retrocalcaneal
  - tendon tearing: partial, complete
- bruised heel
- tender heel pad:
  - usually atrophy
  - also inflammation
- neuropathies (e.g. diabetic, alcoholic)
- tenosynovitis (FHL, FDL)
- ‘pump bumps’—exostoses near achilles insertion due to stiff backs of shoes
- plantar fasciitis
- periostitis
- calcaneal apophysitis
- peroneal tendon dislocation
- nerve entrapments
  - tarsal tunnel
  - medial calcaneal nerve
  - nerve to abductor digiti minimi

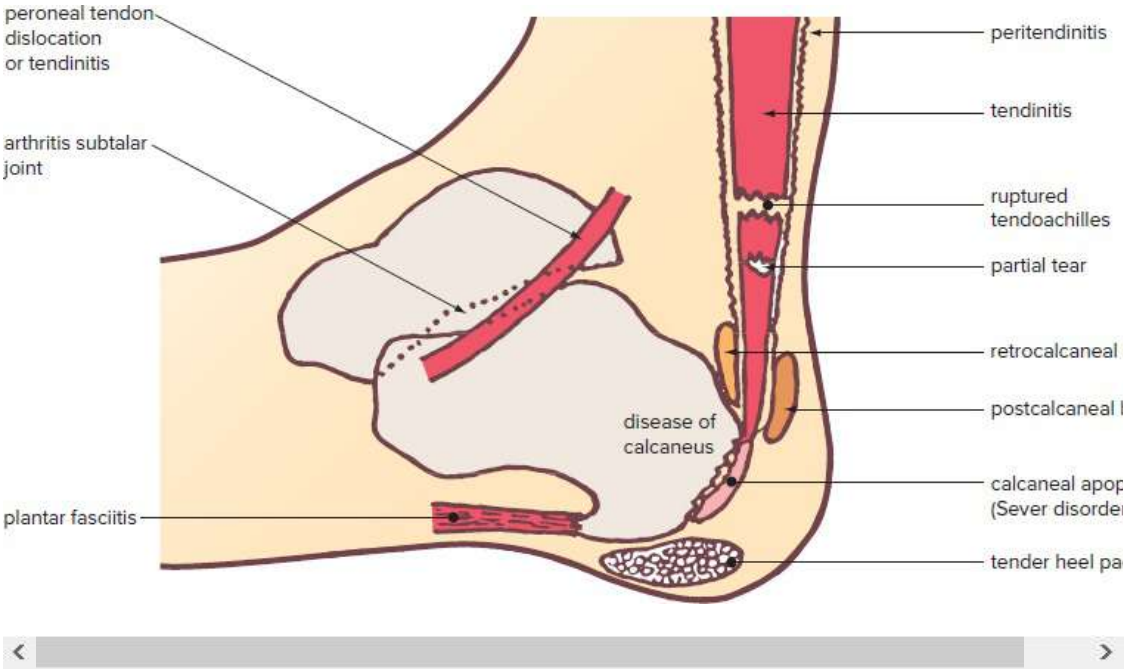


FIGURE 57.4 Important causes of the painful heel

Ultrasound examination is useful to differentiate the causes of Achilles tendon disorders.

Achilles tendinopathy[11]

The pathology is a combination of degenerative and inflammatory changes due to overuse and may occur either in the tendon itself or in the surrounding paratendon. It presents with tendon pain during and after weight-bearing activities with a tender local swelling of the tendon. The latter is called peritendinitis rather than tenosynovitis because there is no synovial sheath.

Management

- Relative rest
- Course of NSAIDs for acute pain
- Heel padding
- Consider heel ‘raisers’
- Consider continuous topical glyceryl trinitrate as patches
- Physiotherapy for stretching and an eccentric exercise program[11]
- Physiotherapy

Complete rupture of Achilles tendon[11]

Clinical features

- Sudden onset of intense pain
- Person usually falls over
- Feels more comfortable when acute phase passes
- Development of swelling and bruising
- Some difficulty walking, especially on tiptoe

Diagnosis

- Palpation of gap (best to test in first 2–3 hours as haematoma can fill gap)
- Positive Thompson test: compression of the calf muscles reveals an absent plantar reflex on the affected side (kneel on chair facing backwards)

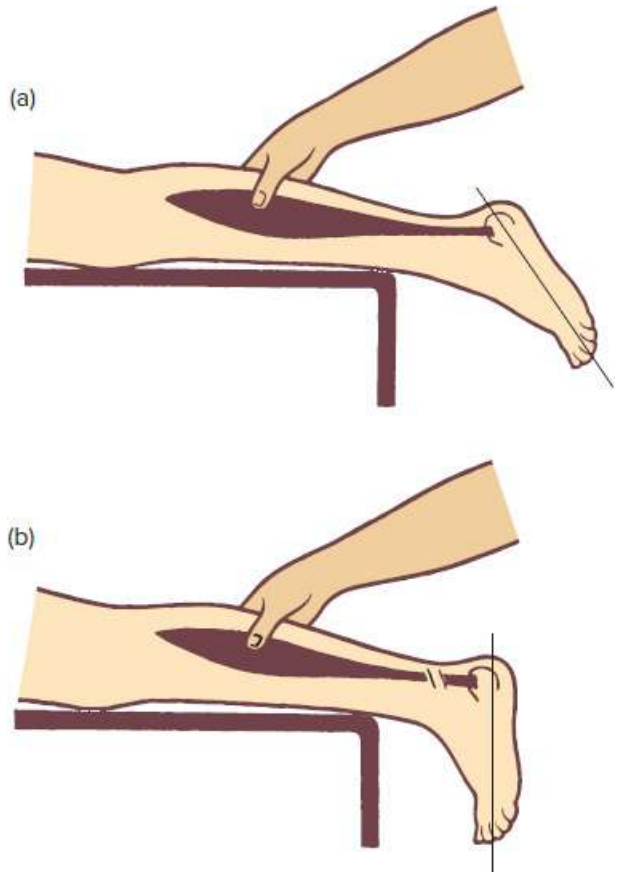


FIGURE 57.5 Calf squeeze test for ruptured Achilles tendon: **(a)** intact tendon, normal plantar flexion, **(b)** ruptured tendon, foot remains stationary

Treatment

- Early surgical repair (within 3 weeks)

Partial rupture

Similar history and clinical findings. Localised tenderness and very tender defect about the size of the tip of the finger.

Refer for evaluation—if gap, early surgical exploration and repair. Conservative treatment if no gap, including heel raise and crutches early.

Achilles tendon bursitis

Bursitis can occur at two sites:

- posterior and superficial—between skin and tendon
- deep (retrocalcaneal)—between calcaneus and tendon (see FIG. 57.4)

The former occurs mainly in young women from shoe friction and is readily palpated. Tenderness from the deep bursitis is elicited by squeezing in front of the tendon with the thumb and index finger: a swelling may be seen bulging on either side of the tendon.

Treatment

- Avoid shoe pressure (e.g. wear sandals)
- 1–2 cm heel raise inside the shoe
- Apply local heat and ultrasound
- NSAIDs
- Inject corticosteroid into bursa with a 25 gauge needle

Fat pad disorders

A tender heel pad or cushion causes a dull throbbing pain under the heel. It is localised more proximal to that of plantar fasciitis. Once established, it is very difficult to treat.

The fat pad, which consists of globules of fat encapsulated in multiple U-shaped septa, acts as a

hydraulic shock absorber on heel strike. It also contains significant nerve endings.[11] It can undergo atrophy, especially in the elderly, and also become inflamed.

Treatment

- Reduction of aggravating activity
- Weight loss (if applicable)
- Simple analgesics
- Orthotic (cushioning heel cup) ± foam insert
- Good footwear

Problems are treated with an orthotic or an insert and good footwear. Corticosteroids should be avoided as they can accelerate the atrophy.[12]

Plantar fasciitis

This common condition (also known as ‘policeman’s heel’) is characterised by pain of gradual onset on the plantar aspect of the heel, especially on the medial side; it usually occurs about 5 cm from the posterior end of the heel, although it can be experienced over a wide area beneath the heel. The pain radiates into the sole.

Clinical features

- Pain:
    - under the heel
    - first steps out of bed
    - relieved after walking
    - increasing towards the end of the day
    - worse after sitting
- May be bilateral—usually worse on one side
- Typically over 40 years
- Both sexes
- Sometimes history of injury or overuse
- Few studies have investigated relationship to footwear

Signs[12]

- Tenderness:

  localised to medial tuberosity

  may be more posterior

  may be lateral

  may be widespread

  not altered by tensing fascia (but this action may cause pain)

- Heel pad may bulge or appear atrophic
- Crepitus may be felt
- No abnormality of gait, heel strike or foot alignment
- Patient often obese

Treatment

Plantar fasciitis not associated with one of the spondyloarthritides tends to heal spontaneously in 12–24 months. It has a variable response to treatment with NSAIDs, injections, ultrasound and insoles. Rest from long walks and from running is important. Systematic reviews to date indicate that taping is effective for short-term relief. Plantar fascia-stretching exercises, when combined with prefabricated insoles and a short course of NSAIDs, are effective for short-term and long-term pain relief.[7] Another systematic review supports a conservative approach based on maximising comfort during the 3-month period of considerable discomfort.[9]

Protection

Symptomatic relief is obtained by protecting the heel with an orthotic pad to include the heel and arch of the foot (e.g. Rose insole). Otherwise, a pad made from sponge or sorbo rubber that raises the heel about 1 cm is suitable. A hole corresponding to the tender area should be cut out of the pad to avoid direct contact with the sole. The aim is to get all of the foot to take the stress.

Injection technique

Disabling plantar fasciitis can be treated by injecting local anaesthetic and long-acting corticosteroid into the site of maximal tenderness in the heel. However, a Cochrane review suggested minimal benefit, and only for the first month.[13] The injection is painful: an alternative is to inject the corticosteroid after a posterior tibial nerve block.

‘Cracked’ heels

- Soak feet for 30 minutes in warm water containing an oil such as Alpha Keri or Derma Oil.
- Pat dry, then apply a cream such as Nutraplus (10% urea) or Eulactol heel balm. Use hydrocortisone 0.5% cream for resistant cases.
- For severe cases, use sorbolene cream with 20% glycerol and 30% urea (test skin sensitivity first).

Arthritic conditions

Arthritis of the foot or ankle is a rather meaningless diagnosis and specificity is required. Typical sites of arthritic targets are shown in FIGURE 57.6 .

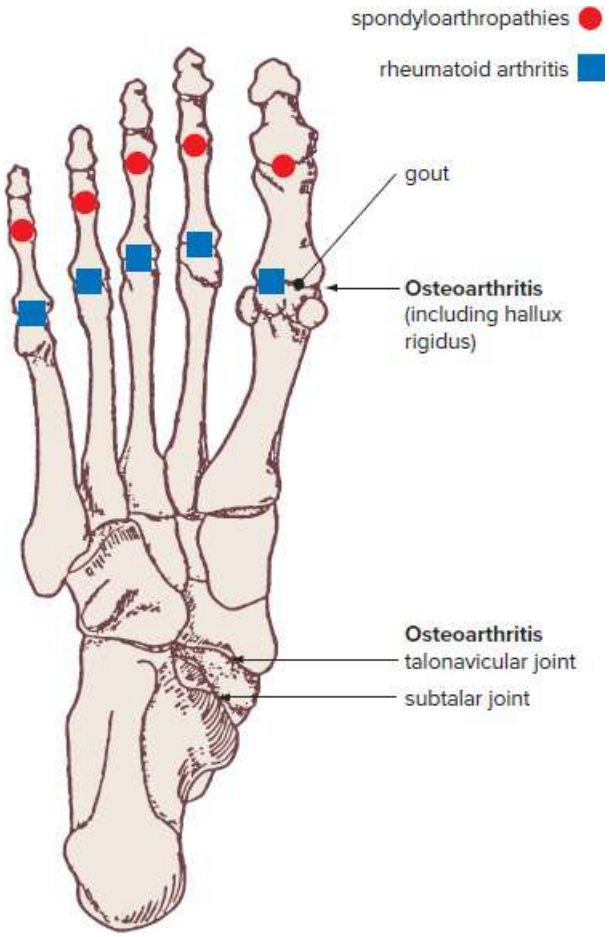


FIGURE 57.6 Typical sites of arthritic causes of podalgia on skeleton of right foot (plantar aspect)

Osteoarthritis

Osteoarthritis may occur in any of the joints of the foot, but it commonly involves the first MTP joint, leading to hallux rigidus. It can affect the subtalar joint, but the ankle joint proper is usually not affected by osteoarthritis.

Hallux rigidus

Osteoarthritis of the first MTP joint can lead to gradual loss of motion of the toe and considerable discomfort. Roomy protective footwear and relative rest is the basis of treatment, coupled with daily self-mobilisation (stretching toe into plantar flexion morning and night). Other measures include manipulation under general anaesthesia or surgery (arthrodesis or arthroplasty) for severe cases.

Rheumatoid arthritis

Rheumatoid arthritis is typically a symmetrical polyarthritis presenting with pain in the MTP joints. It may also affect the ankle, midtarsal and tarsometatarsal joints. The interphalangeal joints are seldom affected primarily. It causes pain and stiffness under the balls of the feet, especially first thing in the morning.

Gout

Gout typically affects the first MTP and should be considered with the sudden onset of pain, especially in the presence of redness, swelling and tenderness. It can affect any synovial joint and occasionally may be polyarticular. Gout is often dismissed by the patient as a ‘sprain’. A history of alcohol consumption or diuretic treatment is relevant (see CHAPTER 25).

Spondyloarthritides

This group of arthritic disorders (reactive arthritis, ankylosing spondylitis, psoriatic arthritis and arthritides associated with chronic bowel disorders) may involve peripheral joints. Other foot involvement includes plantar fasciitis, Achilles tendinitis and sausage-shaped toes due to tenosynovitis, and arthritis of the proximal interphalangeal joints.

General foot disorders

‘Burning’ feet

It is not uncommon for people, especially the elderly, to present with the complaint of ‘burning’ feet. A careful history is needed to elicit exactly what they mean by ‘burning’—is it real pain, a cold sensation or paraesthesia?

A checklist of causes is as follow:

- vascular: ischaemic rest pain from small vessel disease, chilblains or other cold reaction,

functional vasospasm (Raynaud phenomenon)

- diabetic neuropathy
- tarsal tunnel syndrome (see CHAPTER 55)
- complex regional pain syndrome I or II
- Morton neuroma (localised pain between toes)
- psychogenic, especially anxiety

It is worth considering tarsal tunnel syndrome if there is anterior burning pain in the forefoot with associated aching in the calf. It is usually present in menopausal women and worse at night. It is caused by entrapment of the posterior tibial nerve near the medial malleolus, and may be associated with rheumatoid arthritis. Treat with physiotherapy, a medial arch support and a corticosteroid injection before contemplating surgery.

Foot strain

Foot strain is probably the commonest cause of podalgia. A foot may be strained by abnormal stress, or by normal stress for which it is not prepared. In foot strain, the supporting ligaments become stretched, irritated and inflamed. It is commonly encountered in athletes who are relatively unfit or have a disorder such as flat feet, or in obese adults.

Symptoms and signs

- Aching pain in foot and calf during or after prolonged walking or standing
- Initial deep tenderness felt on medial border of plantar fascia (see FIG. 57.7)
- Worse with new shoes, especially a change to high heels

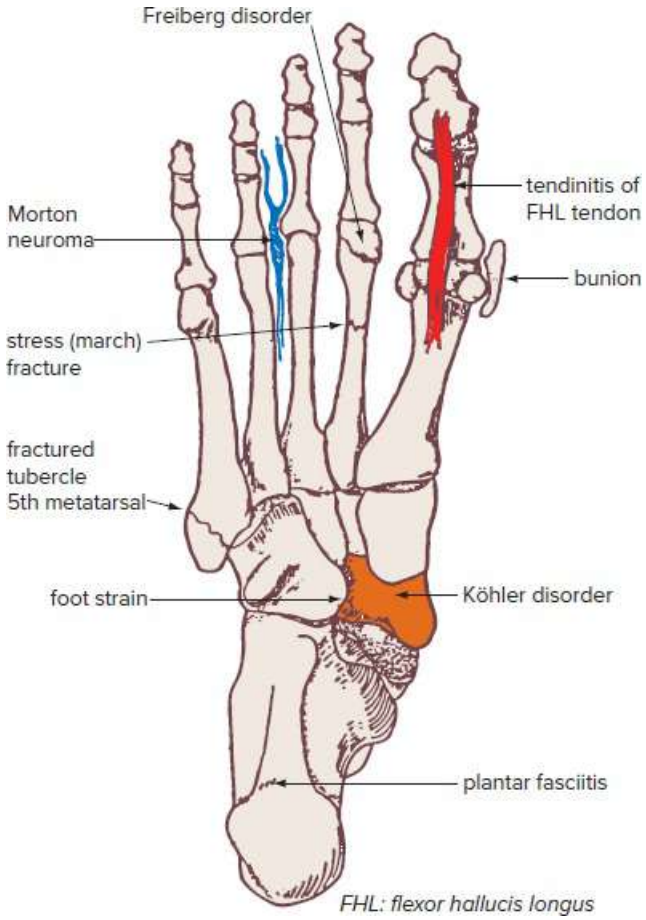


FIGURE 57.7 Typical sites of important causes of podalgia (other than arthritis): right foot

Acute foot strain

Acute ligamentous strain, such as occurs to the occasional athlete or to the person taking long unaccustomed walks. It is usually self-limiting and recovers rapidly with rest.

Chronic foot strain

Foot strain will become chronic with repeated excessive stress or with repeated normal stress on a mechanical abnormality. A common consequence is an everted foot, leading to flattening of the longitudinal arch on weight-bearing. It is important to establish whether the symptoms commenced after the patient began wearing a different type of footwear.

Treatment

The treatment is basically the same as that of the adult flat foot. Acute strain is treated with rest and by reducing walking to a minimum. Try the application of cold initially and then heat. The

management of chronic strain is based on an exercise program and orthotics, including arch supports, to correct any deformity.

Aching feet

- Avoid wearing high heels.
- Wear insoles to support the foot arch.
- Perform foot exercises.
- Soak the feet in a basin of warm water containing therapeutic salts (Epsom salts is suitable).
- Massage feet with baby oil followed by a special ribbed wooden foot massager.

Flat feet (pes planus)

Flat feet are normal in young children. No treatment is required in flat feet in which the arch is restored by standing on tiptoe (see CHAPTER 85). If painful, treat with exercises and insoles. Refer if concerned. Hind foot fusion can be performed for severe pain.

Claw foot (pes cavus)

High foot arch is usually of congenital origin. It may be secondary to various neurological conditions (and previously polio). The foot is inflexible and the toes may be ‘hammer’ or clawed. Treatment includes special orthotics with good shock-absorbing properties, appropriate footwear, foot exercises and padding under the metatarsal heads. Operative treatment involves soft tissue release or arthrodesis to strengthen toes.

Disorders of the ankle tendons

Inflammation of a tendon sheath surrounding the ankle may result from repetitive overuse, trauma such as a sprained ankle or unaccustomed stress, including sporting injuries.

Tenosynovitis commonly involves the tibialis posterior tendon over the medial compartment or the peroneal tendons over the lateral compartment. It may also affect the tibialis anterior and extensor digitorum longus tendons. Friction at the point where the tendons become angulated at the ankle causes the inflammation. The patient presents with pain, swelling and restricted movement. On examination there is swelling and tenderness where the tendon bulges out from behind and below the malleolus.

If necessary, the diagnosis can be confirmed by ultrasound or MRI imaging.

Complications include tenovaginitis, weakness, ganglion formation, subluxation or dislocation and rupture.

Treatment of tendinitis includes partial immobilisation (rarely in a cast) or an orthotic device to support the arch of the foot.

A carefully directed injection of corticosteroid into the tendon sheath can be very effective.

Peroneal tendinitis

This occurs along the course of the tendon from behind the lateral malleolus to the outer side of the foot and is common in athletes and ballet dancers. Pain is reproduced on palpation, on stretching the tendons by passive inversion of the foot or by resisting eversion of the foot.

Peroneal tendon dislocation

This is most commonly a dislocated leg tendon as a result of forceful dorsiflexion. An audible painless snapping sensation may be experienced. Surgical repair is necessary.

Tibialis posterior tendinopathy

This is a common problem, especially in middle-aged females, in ballet dancers and in those with pes planus with a valgus deformity. The tendon (see FIG. 57.8), which is an invertor of the foot, is attached to the navicular tuberosity.[14]

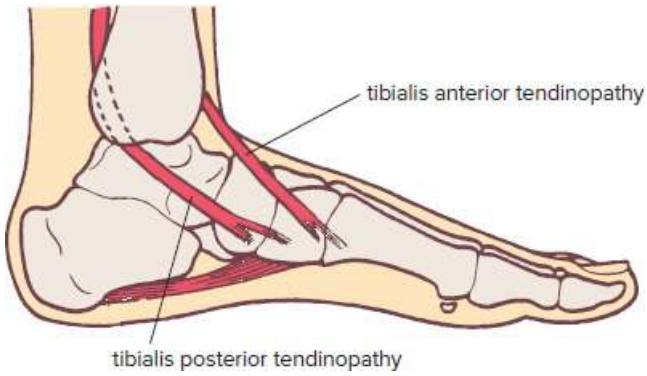


FIGURE 57.8 Medial aspect of the foot illustrating tendon disorders: tendinopathy of tibialis anterior and tibialis posterior

Clinical features[11,14]

- Pain and a feeling of weakness in the medial ankle and foot
- Pain aggravated by standing and walking
- Standing on toes is painful and difficult
- Pain on palpation anterior and inferior to the medial malleolus

- Pain on stretching into eversion, and resisted active inversion
- May cause tarsal tunnel syndrome

Diagnosis

Ultrasound examination—but MRI is the gold standard for delineating tendon tears and inflammation.[15]

Treatment

This is basically conservative with a good outcome in 12–24 months.

- Orthotic correction (bilateral) with semi-rigid orthosis to support faulty arch
- Exercises under physiotherapist guidance
- Remedial massage

Consider ultrasonic guided injection of corticosteroids into tendon sheath (but best avoided) and a surgical opinion for failed conservative management.

Tibialis posterior tendon dislocation

This can occur with forceful ankle dorsiflexion and inversion. The patient usually experiences pain and cannot weight-bear. The dislocated tendon may be seen overlying the medial malleolus. Immediate surgical repair is recommended.

Tibialis posterior tendon rupture

Rupture of the tibialis posterior tendon after inflammation, degeneration or trauma[16] is a relatively common and misdiagnosed disorder, especially in middle-aged females. It causes collapse of the longitudinal arch of the foot, leading to a flat foot.[5]

It is uncommon for patients to feel obvious discomfort at the moment of rupture. They may subsequently present with the sudden appearance of an ‘abnormal’ flat foot. There is gross eversion of the foot.

A simple test is the ‘too many toes’ test whereby more toes are seen on the affected side when the feet are viewed from about 3 m behind the patient.[5]

The single heel raise test is also diagnostic. The most useful investigation is an ultrasound examination. Minor cases can be treated conservatively with orthotics, but severe problems respond well to surgical correction.

Sesamoiditis[1]

The two sesamoids that lie beneath the head of the first metatarsal may develop painful conditions such as chondromalacia, osteoarthritis and stress fractures. A special ‘sesamoid’ X-ray assists diagnosis. A painful callus can develop over here in the elderly. Well-designed insoles are usually effective, as is surgical excision for persistent problems.

Metatarsalgia[1]

Metatarsalgia is a symptom rather than a disease and refers to pain and tenderness over the plantar heads of the metatarsals (the forefoot). Causes include foot deformities (especially with depression of the transverse arch), leading to painful strain, arthritis of the MTP joints, trauma, Morton neuroma, Freiberg disorder and entrapment neuropathy. However it can occur in normal feet after prolonged standing.

Depression of the transverse arch results in abnormal pressure on the second, third and fourth metatarsal heads with possible callus formation. Repetitive foot strain, pes cavus and high heels may cause a maldistribution of weight to the forefoot.

Treatment involves treating any known cause, advising proper footwear and perhaps a metatarsal bar. Flat-heeled shoes with ample width seldom cause problems in the metatarsal region.

Stress fractures[17]

Clinical features

- The aches or pains may be slow in onset or sudden
- Common in dancers, especially classical ballet, and in unfit people taking up exercise
- Examination is often unhelpful: swelling uncommon[15]
- Routine X-rays often unhelpful
- A bone scan is the only way to confirm the suspected diagnosis
- Basis of treatment is absolute rest for 6 or more weeks with strong supportive footwear
- A walking plaster is not recommended

Avulsion fracture of base of fifth metatarsal

Known also as a Jones fracture, it is usually a traumatic fracture but can be a stress fracture and associated with severe ankle sprains.

March fracture of metatarsal

Stress or fatigue fracture of the forefoot usually involves the neck of the second metatarsal (sometimes the third). Swelling typically occurs along the bone shaft. X-ray changes are often delayed. Treat conservatively with support from a firm elastic bandage; avoid painful activities. Resolution may take many months.

Tarsals, especially navicular

Stress fracture of the navicular, which is a disorder of athletes involved with running sports, presents as poorly localised midfoot pain during weight-bearing. Examination and plain X-ray are usually normal. It is a recently recognised serious disorder due to the advent of nuclear bone scans and CT scans. A protracted course of treatment can be expected.

Calcaneum

Stress fractures of the os calcis usually have an insidious onset. Osteoporosis is a predisposing factor, as is an increased training program.[17]

Morton neuroma[15]

Morton interdigital neuroma is probably misdiagnosed more often than any other painful condition of the forefoot. It is not a true neuroma but a fibrous enlargement of an interdigital nerve, and its aetiology is still uncertain. It is related to overuse and inappropriate footwear. The diagnosis is made on clinical grounds. An ultrasound examination may detect a neuroma.

Clinical features

- Usually presents in adults <50 years
- Four times more common in women
- Bilateral in 15% of cases
- Commonest between third and fourth metatarsal heads (see FIG. 57.9), and second and third (otherwise uncommon)
- Severe burning pain (sometimes sharp and shooting) between third and fourth or second and third toes
- Worse on weight-bearing on hard surfaces (standing and walking)
- Aggravated by wearing tight shoes
- Relieved by taking off shoe and squeezing the forefoot
- Localised tenderness between metatarsal heads

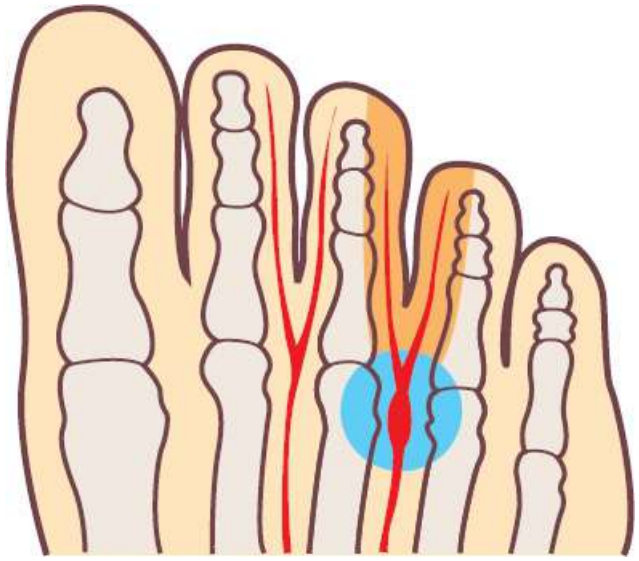


FIGURE 57.9 Morton neuroma: typical site of pain and paraesthenia distribution

Treatment

Early problems are treated conservatively by wearing loose shoes with a low heel and using a sponge rubber metatarsal pad. An orthosis with a dome under the affected interspace helps to spread the metatarsals and thus takes pressure off the nerve. Any biochemical abnormalities of the foot should be corrected. Most eventually require surgical excision, preferably with a dorsal approach. A corticosteroid injection can be considered.

‘Turf toe’

This is a sprain of the first metatarsophalangeal joint caused by a forced hyperextension (occasionally hyperflexion) injury to the joint. It is common in football players and athletes, e.g. jamming or stubbing the great toe. There is pain, swelling and limitation of movement. Plain X-rays are unhelpful, but isotopic scans and MRI may help to diagnose the injury.

Treatment is conservative with RICE, NSAIDs and relative rest. Surgical intervention may be required.

Hallux valgus

Hallux valgus with associated bunion formation and splaying of the forefoot is common. It may be a consequence of poor-fitting footwear.

A bunionette, also caused by pressure, may form over the fifth metatarsal.

Pain, if present, may be due to shoe pressure on an inflamed bunion, a hammer toe, metatarsalgia

or secondary arthritis of the first MTP joint.

Hallux valgus with bunions should be treated by correcting footwear prior to any surgical correction. Systematic evidence-based reviews found that preventive orthoses and night splints were unlikely to be beneficial but absorbable pin fixation was likely to be beneficial.[11]

Hammer toes[1]

Mainly involve the second toe with extended MTP joint, hyperflexed PIP joint and extended DIP joint. Painful corns will appear over the prominent joint. They respond well to surgery if problematic and are not helped by good footwear.

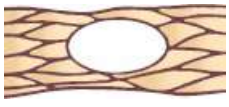
Claw toes

Often follows polio. The feature is extended MTP joint, flexion PIP and DIP. Refer for surgical opinion.

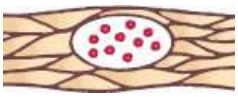
Calluses, corns and warts

The diagnosis of localised, tender lumps on the sole of the foot can be difficult. The differential diagnosis of callus, corn and wart is aided by an understanding of their morphology and the effect of paring these lumps (see TABLE 57.3).

Table 57.3 Comparison of the main causes of a lump on the sole of the foot

	Typical site	Nature	Effect of paring
Callus	Where skin is normally thick: beneath heads of metatarsals, heels, inframedial side of great toe	Hard, thickened skin	Normal skin 
Corn	Where skin is normally thin: on soles, fifth toe, dorsal projections of hammer toes	White, conical mass of keratin, flattened by pressure	Exposes white, avascular corn with concave surface 
Wart	Anywhere, mainly over metatarsal heads, base of toes and heels; has	Viral infections, with abrupt change from	Exposes bleeding points

bleeding points skin at edge



Calluses

A callus (see FIG. 57.10) is simply a localised area of hyperkeratosis related to some form of pressure and friction. It is very common under the metatarsal heads, especially the second.

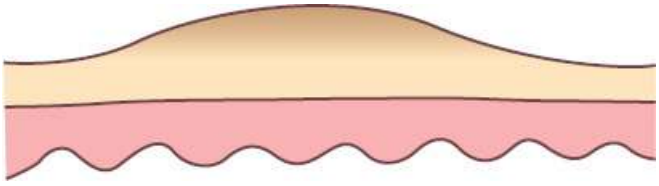


FIGURE 57.10 Callus

Treatment

No treatment is required if asymptomatic. Remove the cause. Proper footwear is essential—wide enough shoes and cushioned pads over ball of foot. Proper paring gives relief, also filing with callus files. If severe, apply daily applications of 10% salicylic acid in soft paraffin with regular paring.

Corns

A corn (see FIG. 57.11) is a small, localised, conical thickening. It is a horny plug of keratin in the epidermis. A corn develops in response to chronic irritation, usually over a bony prominence of the foot, e.g. outer distal fifth toe. It is associated with poorly fitting footwear, excessive activity or faulty intrinsic foot mechanics. It may resemble a plantar wart but gives a different appearance on paring.

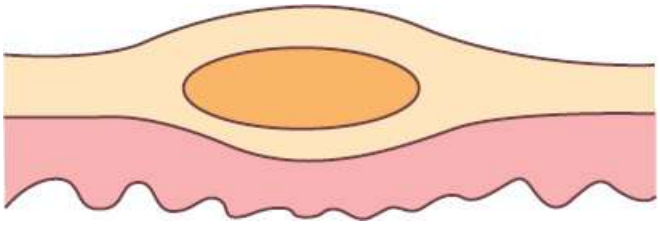


FIGURE 57.11 Corn

Treatment

Remove cause of friction and use wide shoes to allow the foot to expand to its full width. Soften corn with a few daily applications of 15% salicylic acid in collodion or commercial ‘corn removers’ with salicylic acid and then pare. For soft corns between the toes (usually last toe-web) keep the toe-webs separated with lamb’s wool or a cigarette filter tip at all times and dust with a foot powder.

Plantar warts

A plantar wart (see FIGS. 57.12 and 57.13 and CHAPTER 116) is more invasive, and paring reveals multiple small, pinpoint bleeding spots.

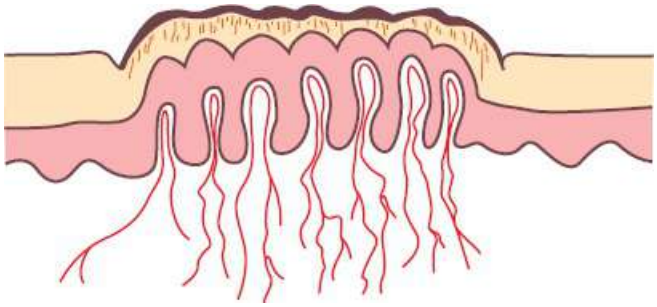


FIGURE 57.12 Plantar wart

FIGURE 57.13 Plantar warts on the sole of the foot and toes showing a mosaic pattern

Methods of removal[18]

There are many treatments for this common and at times frustrating problem. A good rule is to avoid scalpel excision, diathermy and electrocautery because of the problem of scarring. One of the problems with the removal of plantar warts is the 'iceberg' configuration—not all the wart may be removed.

- Salicylic acid 17%, lactic acid 17% in collodion:

  apply daily, dry and cover

- Liquid nitrogen:

  pare wart (either a 21 gauge blade, or a punch biopsy held horizontal to skin and rotated)

  apply liquid nitrogen

  repeat weekly for up to 3 weeks

Can be painful and the results are often disappointing.

- Topical chemotherapy:

  soak feet in warm water, then pare wart (particularly in children)

  apply Upton's paste or salicylic acid (up to 27%) gel or cream to wart each night and cover

  review if necessary

(Upton's paste comprises trichloroacetic acid 1 part, salicylic acid 6 parts, glycerin 2 parts.)

- Topical chemotherapy and liquid nitrogen:

  pare wart

  apply paste of 70% salicylic acid in raw linseed oil (or wool fat). Do NOT give the jar to the patient.

  occlude for 1 week

  pare on review, then apply liquid nitrogen and review

- Curettage under local anaesthetic:

  pare the wart vigorously to reveal its extent

  thoroughly curette the entire wart with a dermal curette

  hold the foot dependent over kidney dish until bleeding stops (this always stops spontaneously and avoids a bleed later on the way home)

  apply 50% trichloroacetic acid to the base

Occlusion method

Occlusion with topical chemotherapy: a method of using salicylic acid alone or in a paste under a special occlusive dressing is described.

Equipment

- 2.5 cm (width) elastic adhesive tape
- 30% salicylic acid in Lassar's paste of plasticine consistency

Method

1. Cut two lengths of adhesive tape, one about 5 cm and the other shorter.

2. Fold the shorter length in half, sticky side out (see FIG. 57.14A).

3. Cut a half-circle at the folded edge to accommodate the wart.

4. Press this tape down so that the hole is over the wart.

5. Roll a small ball of the paste in the palm of the hand and then press it into the wart.

6. Cover the tape, paste and wart with the longer strip of tape (see FIG. 57.14B).

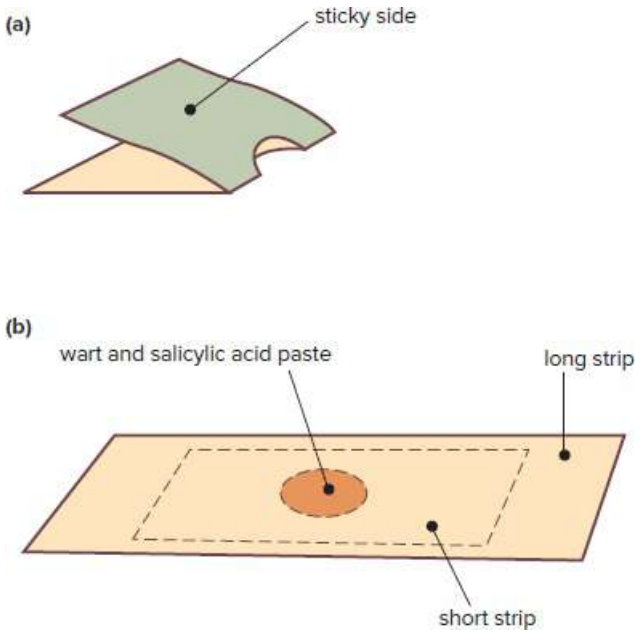


FIGURE 57.14 Treatment of plantar wart: **(a)** 'window' to fit the wart is cut out of shoulder of elastic adhesive tape; **(b)** larger strip covers the wart and shoulder strip

This paste should be reapplied twice weekly for 2–3 weeks. The reapplication is achieved by peeling back the longer strip to expose the wart, adding a fresh ball of paste to the wart and then recovering with the upper tape.

The plantar wart invariably crumbles and vanishes. If the wart is particularly stubborn, 50% salicylic acid can be used.

Ingrown toenail (onychocryptosis)

Ingrown toenail is a very common condition, especially in adolescent boys. Although not so common in adults, it may follow injury or deformity of the nail bed. It is typically located along the lateral edges of the great toenail and represents an imbalance between the soft tissues of the nail fold and the growing nail edge. The basic cause is a redundant skinfold. It is exacerbated by faulty nail trimming, constricting shoes and poor hygiene. A skin breach is followed by

infection, then oedema and granulation tissue of the nail fold.[5]

Initial management on presentation[17]

First-line management should be conservative. Gently lift the nail edge and pack moistened cotton wool soaked in 70% alcohol beneath the nail. Remove any nail spicules. Pack daily until healed. If bacterial infection, treat with a topical antiseptic, e.g. povidone–iodine 10% ointment under occlusion. Oral antibiotics will be required for infection such as cellulitis or suppuration.

Treat any granulation tissue with curettage or electrocautery (under local anaesthetic) and/or a silver nitrate cautery stick.

Prevention

All patients should be instructed on correct foot and nail care. Foot hygiene includes foot baths, avoiding nylon socks and frequent changes of cotton or wool socks. Cotton wool pledgets can be placed beneath the nail edge to assist separation.

It is important to fashion the toenails so that the corners project beyond the skin (see FIG. 57.15). The end of the nail (not the corners) should be cut squarely so that the nail can grow out from the nail fold. Then each day, after a shower or bath, use the pads of both thumbs to pull the nail folds as indicated.

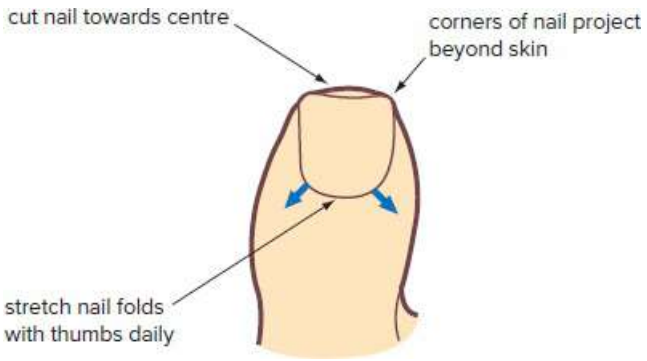


FIGURE 57.15 Method of fashioning toenails

Treatment—the spiral tape method[18]

This simple technique involves the application of strong adhesive tape such as Elastoplast or Leukosilk 12.5 mm to retract the skin off the ingrowing nail. At first, use the thumb pads, despite the discomfort, to retract the skin. The tape is then passed around the plantar surface to anchor the tape in loops around the proximal aspect of the toe (see FIG. 57.16). The application of Friar's Balsam to the distal 'anchor' gives a better grip. This process is repeated 2–4 times weekly until the problem settles.

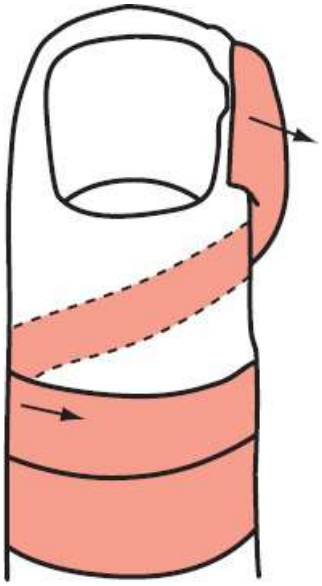


FIGURE 57.16 The spiral tape method for the ingrowing toenail

Treatment—surgical[18]

1. *Excision of ellipse of skin.* This 'army method' transposes the skinfold away from the nail. The skin heals, the nail grows normally and the toe retains its normal anatomy.

2. *Electrocautery.* This is similar in principle to the preceding method but is simple, quick and very effective with minimal after-pain, especially for severe ingrowing with much granulation tissue. Under digital block the electrocautery needle removes a large wedge of skin and granulation tissue so that the ingrown nail stands free of skin (see FIG. 57.17).

3. *Skin wedge excision.* Another similar method under digital block is to dissect away all the skinfold adjacent to the nail, starting from the nail base, extending proximally for about 4 mm and then sweeping around the side of the nail to under its tip, using a 3–4 mm margin all the way.

4. *Wedge of nail excision and phenolisation.* This method uses 80% phenol (concentrated solution) to treat the nail bed following excision with scissors of a wedge for about one quarter of the length (rather than a standard wedge resection) of the ingrown nail. A cotton wool stick soaked in phenol is introduced deep into the space of the nail bed. *Warning:* Take care not to spill the phenol onto the surrounding skin as it is very corrosive.

5. Punch biopsy method. Under digital anaesthetic, a punch biopsy instrument of adequate size (4, 5 or 6–8) to accommodate the spicule of affected nail and granulation tissue is used to push directly towards the nail matrix. It is then rotated over the matrix by a perpendicular pressure so all tissue is removed. A sterile doubled layer of vaseline gauze is applied, followed by a compression dressing.

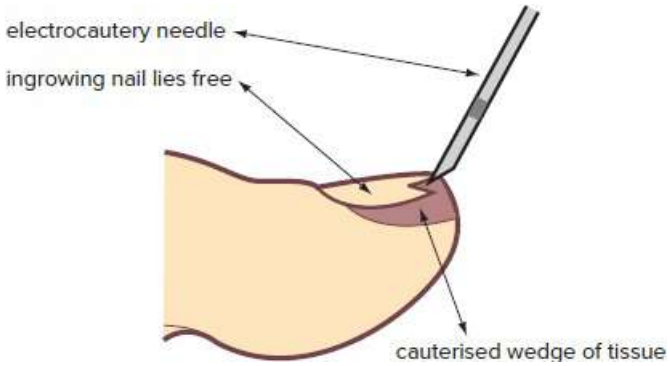


FIGURE 57.17 Treatment of ingrown toenail: electrocautery of wedge of tissue

Paronychia

Initial treatment:

- antiseptic (e.g. Betadine-soaked) dressing
- elevation of nail fold to drain pus
- application of petroleum gauze dressing
- antibiotics if extensive or cellulitis developing

Sometimes the nail requires avulsion to establish free drainage of a periungual abscess. Refer to CHAPTER 119 .

Practice tips

- Good-quality X-rays are mandatory in all severely sprained ankle injuries.
- If in doubt about the diagnosis of a painful foot, X-ray.
- Children rarely sprain ligaments. All joint injuries causing pain and swelling in children need to be X-rayed.
- Think of the rare problem of a dislocating peroneal tendon if a sharp click and stab of pain is experienced just behind and below the lateral malleolus.
- Paraesthesia of part or whole of the foot may be caused by peripheral neuropathy, tarsal tunnel syndrome, mononeuritis (e.g. diabetes mellitus), rheumatoid arthritis or a nerve root lesion from the lumbosacral spine.

- Avoid giving injections of corticosteroids into the Achilles tendon.
- Avoid invasive procedures such as surgical excision, diathermy or electrocautery for plantar warts. Be aware of the limitations of liquid nitrogen.
- High-resolution ultrasound can help diagnose Achilles tendon disorders.
- Keep in mind the possibility of pain around the sesamoid bones of the first metatarsal.
- Beware of acral lentiginous melanoma on the sole of the foot, especially if amelanotic (see CHAPTER 117).

Patient education resources

Hand-out sheets from *Murtagh's Patient Education* 8th edition:

- Achilles tendinopathy
- Bunions
- Calluses, corns and warts on feet
- Flat feet
- Ingrowing toenails
- Plantar fasciitis
- Sprained ankle

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58 Walking difficulty and leg swelling

Would ye not think his cunning to be great that could restore this cripple to his legs again?

WILLIAM SHAKESPEARE (1564–1616), *KING HENRY VI*

The clinical evaluation of the person presenting with difficulty walking can be very complex, especially for abnormal gaits caused by neurological conditions. Not all gaits fall into a single category; gait disturbances may be multifactorial, especially in the elderly.

Non-neurological conditions are the most common cause of walking difficulties. They include various arthritic conditions of the lower limbs, usually presenting as a limp, other mechanical factors, such as swelling of the legs, disorders of circulation such as intermittent claudication, and general debility (e.g. malignancy, anaemia and endocrine disorders such as hyperparathyroidism).

It is important for the general practitioner not to overlook hypokalaemia and drugs or the myopathies as a cause of walking difficulty. The drugs that require special consideration include alcohol, corticosteroids, chloroquine, colchicine, the statins, gemfibrozil, diuretics, beta blockers and general anaesthetic agents.

Abnormal gaits

It is convenient to classify abnormal gaits as painless or painful (antalgic). With antalgic gaits the rhythm is disturbed; with painless abnormal gaits the contour is affected. One type of skeletal mechanical abnormality is described as arthrogenic (due particularly to hip disorders) and a second type as osteogenic (due to a shortened limb).

Neurogenic gaits and myogenic gaits are considered together, under the heading ‘Neurological disorders of gait’.

Psychogenic or ‘hysterical’ gait may have to be considered if the gait is bizarre, inconsistent or seems greatly exaggerated. Falls are rare. On the other hand, loss of confidence, especially in the elderly, is an important cause of gait disturbance. However, many abnormal gaits that are caused by neurological disease may also appear bizarre, and caution is advised. Doubtful cases should be referred for an expert opinion.