Complications of total knee arthroplasty

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INTRODUCTION

Total knee arthroplasty (TKA) is widely considered a safe and effective procedure for patients with end-stage osteoarthritis or inflammatory arthritis of the knee. Nevertheless, complications may occur during and after TKA. These include anesthesia-related risks, exacerbation of comorbid medical issues, medication and allergic reactions, and complications related more specifically to TKA.

Complications related to TKA, although uncommon, range from minor problems to devastating, life-threatening events. The incidence of some of these complications may potentially be reduced if the procedure is performed by a higher-volume surgeon and hospital, but this finding is not consistent among studies [1-4]. Efforts should be made to minimize the risk of complications with appropriate patient selection and optimization, meticulous surgical technique, and attentive postoperative management. This topic discusses complications of TKA. The indications for, alternatives to, and surgical techniques for TKA are presented separately. (See "Total knee arthroplasty".)

PERIOPERATIVE COMPLICATIONS

The major perioperative complications associated with TKA are discussed below. Other complications associated with any major surgery, such as anesthesia-related risks, allergic

and other medication reactions, and those related to comorbid medical conditions, are discussed separately. (See "Overview of anesthesia" and "Perioperative anaphylaxis: Recognition and emergency management".)

Blood loss — Perioperative blood loss during TKA can be minimized by using blood-saving techniques (tourniquet, topical agents, systemic agents). Using these strategies, intraoperative blood loss is generally low. Following transfusion guidelines and perioperative protocols to reduce bleeding (ie, tranexamic acid and local infiltration analgesia), the rate of intraoperative transfusion can be reduced to nearly 0 percent [5]. (See "Total knee arthroplasty", section on 'Minimizing perioperative blood loss'.)

Thromboembolism — The development of deep vein thrombosis (DVT) with the potential to propagate a potentially lethal pulmonary embolus (PE) is one of the most feared complications of TKA. The reported incidence of DVT following TKA without prophylaxis ranges from 40 to 88 percent [6-8]. The incidences of asymptomatic PE, symptomatic PE, and mortality range from 10 to 20 percent, 0.5 to 3 percent, and up to 2 percent, respectively.

By contrast, rates of venous thromboembolism (VTE) and PE among patients receiving prophylaxis following total hip or knee arthroplasty are much lower. In one randomized trial of 9711 patients, the incidence of symptomatic VTE was 3.45 percent in patients treated with aspirin and 1.82 percent in patients treated with enoxaparin [9]. Mortality and the incidence of major thromboembolic events were similar with aspirin and enoxaparin.

The choice of prophylaxis should be dictated by a careful analysis of the risk of DVT and PE versus the risk of bleeding in any given individual. The prevention, diagnosis, and treatment of DVT and PE after total joint arthroplasty (hip and knee) are discussed separately. (See "Prevention of venous thromboembolism in adults undergoing hip fracture repair or hip or knee replacement" and "Clinical presentation and diagnostic evaluation of the nonpregnant adult with suspected acute pulmonary embolism" and "Overview of the treatment of lower extremity deep vein thrombosis (DVT)" and "Acute pulmonary embolism in adults: Treatment overview and prognosis".)

Peroneal nerve palsy — The most common severe neurologic complication after TKA is peroneal nerve palsy [10]. Clinical manifestations of peroneal nerve injury include paresthesia, numbness, and extensor weakness (ie, foot drop) (table 1).

Patients at the highest risk are those with severe valgus deformity or flexion contracture. Intraoperatively, the nerve can be damaged by stretching due to correction of a valgus deformity or flexion contracture, inappropriate placement of a lateral retractor, inadvertent direct injection with local anesthetics, or prolonged tourniquet time >120 minutes. However, studies indicate that nerve injury from tourniquet use is quite rare, especially when used at lower tourniquet pressures and for shorter time periods [11,12]. Postoperatively, the patient can develop a peroneal nerve palsy from swelling, hematoma, or direct compression of the nerve (eg, leg externally rotated while lying in bed). Additionally, patients with previous spinal pathology may be more likely to develop peroneal nerve palsy due to the "double-crush phenomenon."

Initial management includes loosening tight dressings and flexing the knee to 30 degrees to relieve pressure on the nerve. Radiographs should also be ordered to ensure no prosthetic-related issues. Fortunately, the majority of patients have complete improvement in 12 to 18 months [10,13]. (See "Foot drop: Etiology, diagnosis, and treatment".)

Tourniquet-related ischemic injury — Tourniquet use, commonly used in TKA to reduce intraoperative blood loss, has been associated with ischemic injury [14]. Nevertheless, tourniquets are widely used and generally considered safe for TKA [15]. Higher cuff pressures and longer duration of cuff use are associated with increasing complications. Thus, the tourniquet should be used at the lowest pressure and for the least ischemic time possible. Some surgeons use 100 mmHg above systolic blood pressure (BP), while others may use twice the systolic BP as their cuff pressure setting. (See "Total knee arthroplasty", section on 'Tourniquet use' and "Clinical features and diagnosis of acute arterial occlusion of the lower extremities".)

Arterial injury — Vascular injuries in TKA are rare [16]. The main mechanisms of arterial injury are related to either thromboembolic or direct injury. Clinical features of arterial complications range broadly from acute hemorrhage or ischemia in the immediate postoperative period to persistent pain and swelling months after the procedure. (See "Clinical features and diagnosis of acute arterial occlusion of the lower extremities".)

In a review of the Nationwide Inpatient Sample in the United States, the incidence of popliteal artery injury following TKA was 0.057 percent [17]. This contrasts with an older series from a single institution in the United States that reported an incidence of arterial

complications during TKA of 0.17 percent (three popliteal artery transections, five popliteal artery pseudoaneurysms, 16 ischemic complications) [18]. In a Taiwanese review of over 100,000 patients who underwent TKA, only 15 cases of direct vascular injury were identified (0.013 percent) [19]. Mortality (33.3 versus 0.37 percent), length of hospital stay (19.43 versus 7.26 days), and incidence of periprosthetic joint infection were significantly higher in the group that suffered vascular injury compared with those who did not.

Wound healing problems — Because of the thin, soft tissue envelope around the knee, wound healing problems may occur and require prompt recognition and management to avoid severe complications, including infection and possible loss of the implant. Preoperative planning and evaluation of risk factors (eg, rheumatoid arthritis, diabetes mellitus, obesity, blood flow to the limb), especially in a knee with prior incisions, are critical. High-risk patients may require alterations in the wound closure technique and type of dressings used; each surgeon usually has their own preferences for management. (See "Risk factors for impaired wound healing and wound complications".)

Persistent drainage should be treated by exclusion of infection with aspiration and cultures, followed by surgical irrigation and debridement. Plastic surgery consultation should be obtained, as needed, to ensure soft tissue coverage of the prosthesis.

Surgical site infection — Surgical site infection or periprosthetic joint infection is a serious complication of TKA and is one of the most common reasons for revision [20]. Infections are considered acute if they occur within three to six weeks following the surgical procedure. Later infections can also occur, typically arising from a hematogenous source. (See 'Subacute and chronic periprosthetic infection' below.)

The incidence of infection following TKA is low, with one prospective study of 1969 knee arthroplasties reporting a global risk of infection of 1 percent during the study period [21]. Patients with diabetes are at increased risk for superficial and deep surgical site infection when compared with nondiabetics [22]. Other risk factors for infection include obesity, smoking, malnutrition, and inflammatory arthritis.

The clinical manifestations, diagnosis, prevention, and treatment of infection following TKA are discussed separately. (See "Prosthetic joint infection: Epidemiology, microbiology, clinical manifestations, and diagnosis" and "Prevention of prosthetic joint and other types of orthopedic hardware infection" and "Prosthetic joint infection: Treatment".)

Intraoperative fracture — Intraoperative fracture is a rare complication of TKA, with a reported incidence of 0.39 percent [23]. If these are recognized intraoperatively, they are left untreated if stable and are fixed if unstable. Outcomes are typically excellent.

Ligament injury — Ligament injuries during TKA are infrequent. The most common ligament injured is the medial collateral ligament, with a reported incidence of 1.2 percent [24]. If injured intraoperatively, it is typically treated by primary repair and hinged bracing or increasing constraint of the prosthesis [25].

Myocardial infarction — As with other major noncardiac surgeries, patients undergoing TKA are at increased risk of myocardial infarction (MI). The MI risk following TKA is highest two to four weeks following the procedure [26,27]. The risk is highest in patients 80 years or older [28]. Patients who undergo a staged knee arthroplasty and experience a specific systemic complication (eg, myocardial infarction, other cardiac, respiratory, urinary) after the first procedure are at increased risk of recurrence of that complication following the second operation [29]. (See "Evaluation of cardiac risk prior to noncardiac surgery" and "Management of cardiac risk for noncardiac surgery" and "Cardiovascular problems in the post-anesthesia care unit (PACU)" and "Perioperative myocardial infarction or injury after noncardiac surgery".)

INTERMEDIATE AND LATE COMPLICATIONS

Aseptic loosening — Loosening of the implant, which can occur in the postoperative period or later, has emerged as one of the most common modes of failure after TKA [30]. A higher rate of loosening has been observed in younger (<50 years) patients; therefore, TKA should be undertaken cautiously in this age group [31]. (See "Total knee arthroplasty", section on 'Preoperative evaluation'.)

Aseptic failure of TKAs may occur through several mechanisms, including polyethylene wear-induced osteolysis and component loosening (which may be due to osteolysis, excessive stress on components, poor fixation, poor component design, and other reasons). (See 'Osteolysis' below and "Complications of total hip arthroplasty", section on 'Osteolysis and wear'.)

The diagnosis of aseptic loosening is made by evidence of progressive radiolucency (>2 mm) on serial radiographs. A bone scan may also play a role in the diagnosis [32]. With

development of metal artifact reduction sequences (MARS), the use of magnetic resonance imaging (MRI) is also increasing [33]. When aseptic loosening is suspected, the most critical aspect of the workup is ruling out the possibility of prosthetic joint infection. Laboratory studies, including white blood cell count and C-reactive protein, are obtained. If either of these is elevated or if there is a strong suspicion of infection despite normal studies, aspiration of the joint for cell count, Gram stain, cultures, and crystals are performed. Once infection is ruled out, the patient with symptomatic aseptic prosthetic failure may be a candidate for revision TKA.

Joint instability — Instability after knee replacement is another major factor that can lead to revision surgery [34]. Instability can occur in flexion, extension, or both.

Instability is associated with numerous patient factors, including rheumatoid arthritis, connective tissue diseases, severe osteoporosis, neuropathy/neuromuscular diseases, and obesity [35]. Instability can occur due to difficulty balancing the knee intraoperatively either resulting from severe deformity, contractures, or ligament injury.

Generally, patients will present with pain and/or persistent effusions. Revision TKA to a more constrained implant is often required, although bracing may be considered as an alternative.

Subacute and chronic periprosthetic infection — Infections can happen months to years after TKA, typically hematogenous in origin. The clinical manifestations, diagnosis, prevention, and treatment of infection following TKA are discussed separately.

- (See "Prosthetic joint infection: Epidemiology, microbiology, clinical manifestations, and diagnosis".)
- (See "Prevention of prosthetic joint and other types of orthopedic hardware infection".)
- (See "Prosthetic joint infection: Treatment".)

Patellofemoral disorders — Patellofemoral complications, as a group, are a common reason for reoperation after TKA. With the exception of loosening of the patellar component, patellar complications can occur regardless of whether the patient had patellar resurfacing or not. Patellofemoral complications include patellar instability, loosening of the patellar component, patellar component failure, patella fracture, patella clunk syndrome, rupture of the extensor mechanism, and anterior knee pain.

- **Patellofemoral instability** – Patellofemoral instability may manifest as subluxation or dislocation of the patella. Incidence varies between 1 and 20 percent [36]. The diagnosis is made by radiographs including a tangential (eg, "sunrise" or Merchant) view of the patella. Occasionally, a computed tomography (CT) scan is obtained to determine component position (the femoral component requires several degrees of external rotation to have proper patellofemoral tracking). Treatment depends upon the etiology of the instability and may include a surgical release of tight lateral soft tissues, patellofemoral realignment procedures, or revision of malpositioned components.

- **Patellar component loosening** – Loosening of the patellar component may be associated with osteolysis or with migration of the prosthesis and is often secondary to another condition. Among the associated disorders are instability, fracture, component malposition, osteoporosis, avascular necrosis, and poor cement technique [36]. The diagnosis is made with standard radiographs. Asymptomatic patients are observed, and symptomatic patients may undergo revision.

- **Patella fracture** – Patella fracture had a reported incidence of 0.3 percent in one study of 2887 knees [37]. Fracture may be related to prosthesis design and positioning, surgical techniques, avascular necrosis of the patella, excessive knee flexion, or trauma. The diagnosis of patella fracture is made with radiographs. A tangential view of the patella is recommended in addition to routine anteroposterior (AP) and lateral views to detect sagittal (vertical) fractures that could be inapparent on AP and lateral views.

  Treatment depends upon the severity of the fracture, the status of the patellar component (loose versus well fixed), and the status of the extensor mechanism (ability to perform a straight leg raise indicates an intact extensor mechanism). Treatment may vary from nonoperative (if the components are well fixed, if there is a minimally displaced fracture, and if the extensor mechanism is intact) to operative (eg, open reduction and internal fixation of the fracture with or without component revision).

- **Extensor mechanism rupture** – Rupture of the extensor mechanism (quadriceps or patellar tendon) is a feared complication but, fortunately, is rare. Prevalence rates range from 1 to 10 percent, with the patellar tendon being the most common site of rupture [38]. Patients typically present with pain followed by an inability to actively extend the knee. The initial workup should include a plain radiograph to exclude fractures around the prosthesis. A MARS, MRI scan, or CT scan may be used to diagnose extensor

mechanism rupture. Surgical repair is the treatment of choice. Several different techniques have been reported including direct repair or autologous, allogeneic, or synthetic tendon grafts [39]. Physical therapy with a goal of maintaining knee extension and, thus, minimizing the risk of developing an irreversible knee flexion contracture is recommended while awaiting reoperation.

- **Patella clunk syndrome** – The patella clunk syndrome is diagnosed clinically and refers to a clunk felt as the knee is actively extended from 60 to 30 degrees, resulting from the formation of fibrous tissue on the underside of the quadriceps tendon [40]. The syndrome was predominantly seen with early designs of posterior cruciate substituting prostheses. The incidence of patella clunk has decreased with changes in component design.

- **Patellar component failure** – Patellar component failure was typically associated with metal-backed patellar components. This failure-prone design has, for the most part, been abandoned in favor of prosthetic patellar components made entirely of polyethylene.

- **Anterior knee pain** – Pain arising from the front of the knee is often attributed to the patella or patellofemoral joint pathology, such as those listed above, or to the patella not being replaced [41]. This is commonly treated by replacement of the patella surface in patients who did not have the patella replaced during the original surgery, although with mixed success rates.

Periprosthetic fracture — Fractures may occur in the patella. They may also occur around the femoral or tibial component. (See 'Intraoperative fracture' above and 'Patellofemoral disorders' above.)

Periprosthetic fractures occur more commonly in patients with osteoporosis, rheumatoid arthritis, and arthrofibrotic knees and may follow revision arthroplasty.

- **Femur** – Supracondylar femoral fractures may be associated with notching of the anterior femur at the time of surgery [42]. Minimally displaced, well-aligned fractures with well-fixed components are treated nonoperatively with casting or bracing. Displaced fractures are reduced and fixed with plates and screws or with intramedullary rods. If the component is loose, it is revised.

- **Tibia** – Tibial fractures around a TKA are rare. Like supracondylar femoral fractures, these are also treated nonoperatively or operatively depending upon the degree of displacement, the alignment, and the status of the implant.

Polyethylene wear — Wear is a normal phenomenon due to friction between the femoral component and the polyethylene of the tibial and patellar components [43]. However, accelerated wear may occur because of patient-dependent factors (eg, activity level, weight), surgical technique (eg, related to the mechanical alignment of the prosthesis), prosthetic design, and quality control issues. Newer, highly crosslinked polyethylenes have been utilized more commonly in TKA, and these have been associated with lower rates of loosening and the need for revision surgery [44].

Patients with polyethylene wear may be asymptomatic or symptomatic, with pain, swelling, and increasing deformity in the knee. The diagnosis is made by plain radiographs, which demonstrate joint space narrowing when compared with historical radiographs. Treatment may include continued observation, polyethylene liner exchange, or revision TKA if associated with osteolysis and/or component loosening. (See 'Osteolysis' below.)

Osteolysis — Osteolysis, or bone loss, may occur as a result of polyethylene wear and is one of the causes of aseptic loosening. (See 'Aseptic loosening' above.)

If osteolysis is associated with implant loosening, revision surgery may be necessary. If the implants are stable, the condition should be observed with serial radiographs at a minimum.

Arthrofibrosis — Arthrofibrosis refers to a postoperative limitation of range of motion resulting from scar tissue formation that may result in functional impairment. Although there are no universally accepted criteria to diagnose stiffness, studies have shown that patients require the following amounts of knee flexion for different activities: 67 degrees to complete the swing phase of gait, 83 degrees to ascend stairs, 100 degrees to descend stairs, 93 degrees to rise from a standard chair, and up to 105 degrees to rise from a low chair [45,46]. Stiffness may be caused by patient-related (preoperative) factors, technical (intraoperative) factors, and numerous postoperative factors (patient compliance with therapy, heterotopic bone, infection, pain syndromes). The best predictor of postoperative stiffness is preoperative range of motion [47].

Treatments include manipulation under anesthesia, arthroscopic lysis of adhesions, and revision knee replacement. Manipulation under anesthesia is safest and most effective if performed within the first three postoperative months. It remains controversial whether the use of continuous passive motion may prevent a recurrence of stiffness. Revision knee replacement is not often performed to treat arthrofibrosis unless the stiffness is secondary to malpositioning of the implants. (See "Total knee arthroplasty".)

Persistent pain and patient dissatisfaction — Although outcomes after TKA are generally favorable, many patients continue to report clinically significant pain and/or dissatisfaction. In one series of 1703 primary total knee replacements, 19 percent of patients were dissatisfied with their outcome [48]. Similarly, in a systematic review of high-quality prospective studies of patients with osteoarthritis undergoing TKA, approximately 20 percent of patients reported moderate to severe knee pain following surgery [49]. Efforts to identify the explanations for these suboptimal pain outcomes are active areas of research. Possible explanations for such persistent pain complaints include inappropriately managed patient expectations, technical failures of the procedure, pain from other sources, poor pain-coping skills or pain-catastrophizing states, and metal hypersensitivity.

Metal hypersensitivity — A topic of debate in TKA is the influence of the implant materials on the outcome of TKA [50,51]. Certain individuals appear to be hypersensitive to metals in the device, typically cobalt, chromium, or nickel. Symptoms can include persistent pain, effusions, or possibly cutaneous reactions. It is important to exclude more common forms of failure (eg, loosening, infection, instability) prior to making this diagnosis. Testing is controversial but includes skin patch testing and in vitro lymphocyte transformation testing. No evidence supports widespread testing at this time, but testing may be considered in patients with a history of metal hypersensitivity. There does seem to be some preliminary evidence of a linkage between metal sensitivity and implant failure [52].

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Total knee arthroplasty".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or email these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Deciding to have a knee replacement (The Basics)")
- Beyond the Basics topics (see "Patient education: Total knee replacement (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Complications of total knee arthroplasty (TKA)** – Complications during and after total knee replacement are uncommon and can often be prevented with appropriate patient selection and optimization, meticulous surgical technique, and attentive postoperative management. Complications related specifically to TKA range from minor problems to devastating, life-threatening events. (See 'Introduction' above.)
- **Perioperative complications** – As with other major noncardiac surgeries, other complications can occur, including cardiopulmonary complications, anesthesia-related risks, allergic and other medication reactions, and those related to comorbid medical conditions. Following TKA, the highest risk for myocardial infarction is two to four weeks after the procedure. (See 'Perioperative complications' above.)
    - **Blood loss** – Perioperative blood loss during TKA can be minimized by using blood-

saving techniques (tourniquet, topical agents, systemic agents). Using these strategies, intraoperative blood loss is generally low. (See 'Blood loss' above.)

- **Thromboembolism** – Thromboembolism is one of the most feared complications of TKA. The incidence of deep vein thrombosis (DVT) following TKA is high in patients who do not receive prophylaxis. (See 'Thromboembolism' above.)

- **Peroneal nerve palsy** – The most common severe neurologic complication after TKA is peroneal nerve palsy. Clinical manifestations include paresthesia, numbness, and extensor weakness (ie, foot drop). Patients at the highest risk are those with severe valgus deformity or flexion contracture. (See 'Peroneal nerve palsy' above.)

- **Wound healing problems and surgical site infections** – Wound healing problems occur because of the thin, soft tissue envelope around the knee. Preoperative planning and evaluation of risk factors, especially in a knee with prior incisions, are critical. Prompt recognition and management of wound problems are important to avoid infection and possible loss of the implant. Infection is a serious complication of TKA that can occur in the perioperative period or months to years later, although the incidence is low. Risk factors include diabetes, obesity, smoking, malnutrition, and inflammatory arthritis. (See 'Wound healing problems' above and "Total knee arthroplasty", section on 'Preoperative evaluation' and 'Surgical site infection' above and 'Subacute and chronic periprosthetic infection' above.)

- **Other complications** – Other rare complications include perioperative tourniquet-related ischemic injury and arterial injury. Intraoperative or postoperative periprosthetic fracture and ligament injuries are also infrequent. Periprosthetic fractures, which occur more commonly in patients with osteoporosis or rheumatoid arthritis, may occur around the femoral component, the tibial component, or the patella. (See 'Tourniquet-related ischemic injury' above and 'Arterial injury' above and 'Intraoperative fracture' above and 'Ligament injury' above and 'Periprosthetic fracture' above.)

- **Intermediate and late complications**

  - **Aseptic loosening, osteolysis, and joint instability** – Aseptic loosening, which can occur early or late, is one of the most common causes of failure and often requires revision surgery. Osteolysis, or bone loss, may occur as a result of polyethylene wear

and is one of the causes of aseptic loosening. Joint instability is another major factor that can lead to revision surgery. (See 'Aseptic loosening' above and 'Osteolysis' above and 'Joint instability' above.)

- **Patellofemoral disorders** – Patellofemoral complications are another common reason for reoperation after TKA. These include patellar instability, loosening of the patellar component, patellar component failure, patella fracture, patella clunk syndrome, and rupture of the extensor mechanism. (See 'Patellofemoral disorders' above.)

- **Arthrofibrosis** – Arthrofibrosis refers to a postoperative limitation of range of motion resulting from scar tissue formation that may result in functional impairment. Treatments include manipulation under anesthesia, arthroscopic lysis of adhesions, and revision knee replacement. Manipulation under anesthesia is safest and most effective if performed within the first three postoperative months. (See 'Arthrofibrosis' above.)

- **Persistent pain and patient dissatisfaction** – Although outcomes after TKA are generally favorable, up to one in five patients has persistent pain and is not satisfied after TKA. Possible explanations for such persistent pain complaints include inappropriately managed patient expectations, technical failures of the procedure, pain from other sources, poor pain-coping skills or pain-catastrophizing states, and metal hypersensitivity. (See 'Persistent pain and patient dissatisfaction' above and "Total knee arthroplasty", section on 'Expected outcomes and informed consent'.)

- **Metal hypersensitivity** – A topic of debate in TKA is the influence of the implant materials on the outcome of TKA. Certain individuals appear to be hypersensitive to metals in the device, typically cobalt, chromium, or nickel. Symptoms can include persistent pain, effusions, or possibly cutaneous reactions. (See 'Metal hypersensitivity' above.)

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GRAPHICS

Lower-extremity peripheral nerve syndromes

Nerve	Site of injury	Cause	Symptoms	Signs
Common peroneal	Fibular neck, just below the knee	Prolonged lying, leg crossing, squatting, leg cast; vasculitis	Foot drop, paresthesias and/or sensory loss over dorsum of foot and lateral shin	Weakness on foo dorsiflexion and eversion; sensory loss on dorsum of foot; reflexes normal
Deep peroneal	Ankle or fibular neck, just below the knee	Prolonged lying, leg crossing, squatting, leg cast; vasculitis; tight-fitting shoe rim or strap	Foot drop, ankle pain, minimal weakness and sensory loss over web space between digits 1 and 2	Weakness on dorsiflexion and sensory loss over web space between digits 1 and 2; reflexes normal
Posterior tibial	Tarsal tunnel of ankle	Fracture or dislocation of talus, calcaneus, medial malleolus, rheumatoid arthritis, tumor	Aching, burning, numbness, tingling on sole of foot, distal foot, toes, and occasionally heel	Positive Tinel sig over nerve posterior to medial malleolus sensory loss on sole of foot; atrophy of foot muscles if severe
Sciatic	Sciatic notch/gluteal region	Trauma (hip dislocation, fracture, or replacement), prolonged bed rest, deep-seated pelvic mass, piriformis syndrome	Leg pain and weakness affecting most lower leg muscles and hamstrings	Weakness in dorsiflexion, inversion, eversion, plantarflexion, and knee flexion; sensory loss in peroneal, tibial, and sural territories; may spare medial calf and arch of foot; normal knee reflex; absent

				ankle reflex
	Mid-thigh	Femur fracture, mass, vasculitis	Similar to above but sparing hamstrings	Similar to above, but preserved knee flexion strength
Femoral	Pelvis and anterior thigh	Hip or pelvic fracture, hip replacement, lithotomy position, diabetes mellitus	Difficulty lifting leg and extending knee; falls due to knee giving out; may or may not have numbness over thigh and medial calf	Quadriceps weakness, hip flexion weakness sensory loss over anterior and medial thigh extending down medial shin to arch of foot; reduced or unobtainable knee jerk
Lateral femoral cutaneous	Inguinal ligament (meralgia paresthetica)	Obesity, tight-fitting belts, diabetes mellitus, idiopathic	Paresthesias and pain radiating down the lateral thigh to knee	Sensory loss on lateral thigh

Graphic 78221 Version 4.0

Contributor Disclosures

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