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Tibial and fibular fractures (Including horse rider's knee)

For proximal fractures of the tibia see also the separate [Knee Fractures and Dislocations](#) article. For distal fractures of the tibia and fibula, see also the separate [Ankle Fractures](#) article.

Of the two bones of the lower leg, the tibia is the only weight-bearing bone. Fractures of the tibia are often associated with fracture of the fibula (displaced fractures usually involve both the tibia and fibula). The skin and subcutaneous tissue over the anterior and medial tibia are very thin and therefore lower leg fractures are often open. Even in closed fractures, the soft tissue can become compromised. The fibula is well covered by soft tissue except at the lateral malleolus.

Epidemiology

The overall incidence of tibial shaft fractures is 16.9 per 100,000 people per year^[1]. It occurs more frequently in men, with an incidence of 21.5 per 100,000 people per year. Men tend to sustain tibial shaft fractures between the ages of 10 to 20 years. The most common age group among women to sustain this fracture is between 20 and 30 years

Tibial fractures in adults are usually caused by direct blows or falls on to the tibial shaft. Spiral fractures of the tibia and fibula may be caused by violent twisting injuries, usually from contact sports. The fibula and tibia are connected via an interosseous membrane, which attaches to a ridge on the medial surface of the fibula. There is very limited mobility between this syndesmosis and the fibula is often fractured along with the tibia. Most heal without complication.

Pre-hospital care

- Full assessment of associated injuries and immediate resuscitation if necessary.
- Careful neurovascular assessment in case of any compromise.
- Application of a sterile dressing to any open wounds.
- Splinting of the injury.
- Provision of appropriate and adequate pain relief.

Assessment

- Diagnosis is usually obvious with deformity, localised swelling and tenderness. All wounds near to the fracture site suggest compound injuries.
- X-rays: must show the whole length of the tibia and fibula. Check for associated injuries to the knee and ankle.
- CT scans may be required if X-rays are inadequate to make a definitive assessment, and for proximal tibial fractures.
- Bone scanning and MRI scans are more sensitive in diagnosing stress fractures (X-ray findings are not usually seen until 2–8 weeks of symptoms and X-rays are often not very sensitive during the early stages of symptoms).

Complications^[1]

Displaced tibial shaft fractures may be complicated by injury to the popliteal artery and compartment syndromes. Fractures of the proximal fibula may be associated with injury to the common peroneal nerve (distal pulses and sensation should therefore be checked and monitored regularly). Potential complications include:

- Neurovascular compromise: popliteal artery injury is very serious and easily missed.
- [Compartment syndrome](#).

- Peroneal nerve injury:
 - The common peroneal nerve crosses the fibular neck and is susceptible to injury from a fibular neck fracture, the pressure of a splint or during surgical repair.
 - Peroneal nerve injury may result in foot drop and sensation abnormalities.
- Infection.
- [Gangrene](#).
- Skin loss.
- [Osteomyelitis](#).
- Delayed union, non-union, malunion.
- Amputation.
- [Osteoarthritis](#).
- [Fat embolism](#).

See also the separate [Complications from Fractures](#) article.

Prognosis

- Prognosis is generally good but is dependent on the degree of soft tissue injury and bony comminution.
- The prognosis is good for isolated fibular fractures.

Stress fractures of the tibia^[2]

- Those at risk include army recruits, runners and ballet dancers. There has often been an increase in intensity of training in the weeks or months leading up to the injury.
- [Medial tibial stress syndrome](#) is a frequent overuse lower extremity injury in athletes and military personnel. It refers to exercise-induced pain over the anterior tibia and is an early stress injury in the continuum of tibial stress fractures^[3]. It is often called 'shin splints'.

- Often they are not initially evident on X-ray but a bone scan will show increased bone activity at the site of the fracture. Later X-rays may show periosteal new bone, with a small transverse defect in the bone cortex.
- Tibial stress fracture presents with pain in the front of the leg. Pain is initially after exercise, then during and after exercise and then pain without exercise. Examination may reveal warmth, local tenderness and swelling.
- Management is to avoid the stressful physical activity for 8-10 weeks, and then a gradual return to the activity.
- Persisting symptoms suggestive of stress fracture require orthopaedic follow-up.

Horse rider's knee

- Frontal impact at the level of the proximal tibiofibular joint may result in posterior dislocation of the fibular head.
- Proximal tibiofibular joint dislocation is a rare injury and accounts for less than 1% of all knee injuries^[4]. It can be caused by various activities, including football, ballet dancing, equestrian jumping, parachuting and snowboarding.
- Reduction usually requires manipulation under, for example, spinal anaesthesia.

Tibial shaft fractures^[1]

- Tibial shaft fractures are often caused by high-energy trauma with severe concomitant soft tissue injuries.
- Isolated fractures of the tibia are unusual except in children.
- Tibial fractures in children can often be treated by closed techniques.
- Intramedullary nailing is often used for treating fractures of the adult tibial shaft.
- There is a risk that the intact fibula will act to hold the fragments apart and so increase the likelihood of non-union, in which case the fibula may need to be divided.

- One-incision double-plating is a safe and effective alternative for treatment of distal tibia and fibula fractures.

Management

- Undisplaced transverse tibial shaft fractures:
 - Analgesia and immobilisation in a long leg plaster of Paris (POP) backslab.
 - Spiral and oblique fractures: immobilised in a long leg POP backslab. They are potentially unstable.
 - Refer to the orthopaedic team for admission.
- Displaced fractures:
 - Give IV analgesia, immobilise in a long leg POP backslab and refer to the orthopaedic team. May require manipulation under anaesthesia or closed intramedullary nailing.
 - Badly comminuted or segmental fractures may require open reduction and internal fixation.
 - Urgent orthopaedic referral is required for any case of suspected vascular injury, sensory deficit or gross swelling.
- **Compound fractures:**
 - Treatment includes irrigation of the wound with saline, covering the wound with a moist sterile dressing, and giving intravenous antibiotics (eg, cefuroxime but this depends on local guidelines) and tetanus toxoid if indicated.
 - Refer to the orthopaedic team for urgent wound cleaning, debridement and fixation with closed intramedullary nailing or external fixation.

Distal tibial fracture (pilon fracture) ^[5]

- 'Pilon' is pestle in French and this analogy is used to describe the high-energy compression force of the tibia as it acts as a pestle, grinding into the talus.

- These fractures are 1% to 10% of tibial fractures and are often associated with severe bone comminution and soft tissue compromise. They may have associated fibular fractures.
- Patients with non-displaced fractures without articular involvement, or those who are non-ambulatory at baseline or not medically fit for surgery may be treated with cast immobilisation and weight-bearing restrictions.
- High rates of wound complications were associated with early open fixation through compromised soft tissue, highlighting the importance of careful soft tissue evaluation and handling, especially in severe pilon fractures. Treatment has shifted to a staged procedure, beginning with ankle-spanning external fixation to restore length and alignment of the pilon fracture, followed by definitive internal fixation once the soft tissue swelling subsides.

Toddler's fracture^[6]

- Undisplaced spiral fractures of the tibial shaft in children under 7 years old often follow minimal trauma and may not be visible on initial X-ray.
- Can be difficult to diagnose but should be suspected whenever a child presents with a limp or fails to bear weight on the leg.
- Treatment consists of immobilisation for a few weeks to protect the limb and to relieve pain.
- Subperiosteal bone formation is usually apparent on X-rays by two weeks.

Fibular shaft fractures^[7]

- These occur in combination with a tibial fracture or in isolation as a result of a direct blow or from twisting injuries.
- Proximal fibular injuries may cause damage to the common peroneal nerve, causing weakness of ankle dorsiflexion and reduced sensation of the lateral aspect of the forefoot.

Management

- Undisplaced proximal or fibular shaft fractures: analgesia and elevation. Support in a tubigrip or padded bandage.
- If unable to weight-bear, use a below-knee POP for comfort with crutches until weight-bearing is possible. Arrange orthopaedic follow-up.
- Comminuted or displaced fractures: refer to the orthopaedic team.

Stress fractures of the fibula^[8]

- Stress fractures of the fibula are relatively common, typically affecting the fibular neck of military recruits and athletes following vigorous training.
- Treat symptomatically with rest and analgesia.

Maisonneuve fracture^[9]

- Transmitted forces may fracture the proximal fibula following an ankle injury.
- This usually involves fracture of the medial malleolus and fracture of the proximal fibula or fibular shaft.
- It implies damage to the distal tibiofibular syndesmosis.
- Examine the proximal fibula in all ankle injuries and X-ray if locally tender.
- Management requires surgery followed by a short non-weight-bearing cast for six weeks.

Further reading

- [Taberner M, van Dyk N, Allen T, et al](#); Physical preparation and return to sport of the football player with a tibia-fibula fracture: applying the 'control-chaos continuum'. *BMJ Open Sport Exerc Med.* 2019 Oct 30;5(1):e000639. doi: 10.1136/bmjsem-2019-000639. eCollection 2019.
- [Zeng L, Wang Y, He D, et al](#); The effectiveness of a self-made modular elastic compression device for patients with a fracture of the tibia and fibula. *J Orthop Surg Res.* 2020 Apr 16;15(1):153. doi: 10.1186/s13018-020-01678-7.

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