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Assessment and management of foot and ankle fractures

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Aims and intended learning outcomes

The aim of this article is to discuss the mechanism of injury, assessment techniques, initial management and discharge needs of patients with fractures to the foot or ankle attending A&E departments and/or minor injury units. It excludes in-patient and peri-operative management as these areas are comprehensively dealt with in standard orthopaedic textbooks. After reading this article, you should be able to:

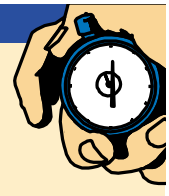
- Describe the normal anatomy of the foot and ankle.
- Discuss the assessment process, including history taking, examination, and initial management for patients with fractures of the foot or ankle.
- Outline the treatment of common foot and ankle fractures.
- Identify potential complications of injuries or treatment of foot and ankle fractures.
- Reflect on the role and responsibility of nurses discharging patients with foot and ankle fractures.

Introduction

The ankle is a major weight-bearing joint, with the foot supporting the total body weight, and through its arch acts as a shock absorber when walking, running or jumping (Wardrope and English 1998). Ankle injuries account for approximately 5 per cent of the workload in an A&E department (Wardrope and English 1998), and patients with injuries to the ankle or foot present with pain and varying degrees of reduced function. Most of these patients will have a simple ankle sprain, but a few might have limb-threatening injuries, and it is only through a thorough history and examination that the severity of the injury can be identified (Wardrope and English 1998). Box 1 shows the range and number of patients with ankle problems seen in one year in an average A&E department (50,000 new patients).

As can be seen in Box 1, soft tissue injuries to the ankle are more common than fractures. It is outside the scope of this article to discuss these injuries and readers are encouraged to consult a general orthopaedic or A&E textbook for further information. However, it should be noted that fractures do not occur without significant disruptions to the soft tissues, including blood vessels, muscles, and ligaments (Dandy and Edwards 1998). By the time the patient is seen in A&E, many of the soft tissues will appear normal.

TIME OUT 1



Understanding the normal anatomy is essential to enable accurate assessment of the foot and ankle. Before reading on, look at Figure 1 and identify the bones of the foot and ankle. Having identified the bones on the diagram, identify them by drawing them on your own foot and ankle or on the foot and ankle of a colleague.

In brief

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Summary
Injuries to the foot and ankle are common presentations in A&E, and while these are rarely life-threatening, incorrect diagnosis and management can have serious consequences for patients. This article discusses the causes, assessment and treatment of patients with these fractures.

Key words
- A&E nursing
- Fractures
- Nursing: care

These key words are based on subject headings from the British Nursing Index. This article has been subject to double-blind review.

Online archive

For related articles visit our online archive at: www.nursing-standard.co.uk and search using the key words above.

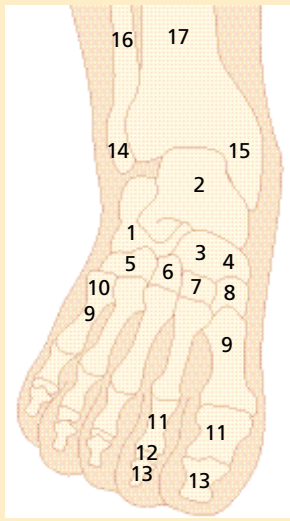
Orthopaedics

Box 1. Range and number of patients with ankle problems seen in one year in an A&E department

Simple ankle sprain	2,200
Severe ankle sprain	260
Ankle fracture	470
Soft tissue infection	160
Non-trauma	80
Tendon ruptures	5
Osteomyelitis	1

(Wardrope and English 1998)

Figure 1. Bones of the foot and ankle



1. Calcaneum
2. Talus
3. Navicular
4. Tuberosity of navicular
5. Cuboid
6. Lateral cuneiform
7. Intermediate cuneiform
8. Medial cuneiform
9. Metatarsals
10. Tuberosity (styloid) of fifth metatarsal bone
11. Proximal phalanges
12. Middle phalanges
13. Distal phalanges
14. Lateral malleolus
15. Medial malleolus
16. Fibula
17. Tibia

Figure 2. Medial view of the ankle joint

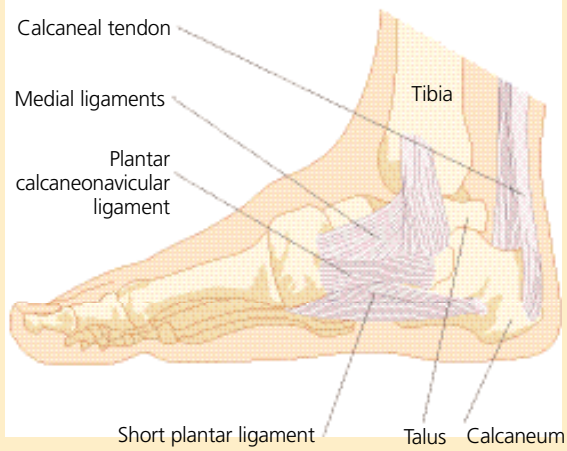
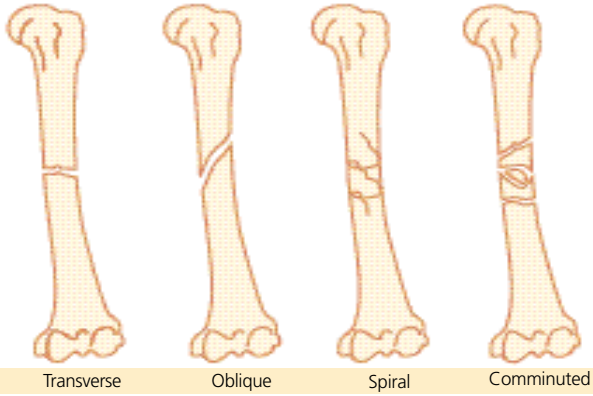


Figure 3. Classification of fractures



Anatomy of the foot and ankle

Ankle The ankle is a synovial joint, which is often classified as a hinged joint, where movement occurs in one plane only (Dandy and Edwards 1998). The numbers in brackets correspond to those in Figure 1, which should be referred to when reading this section. At the back of the foot is the calcaneum (heel) (1), which carries most of the body's weight when standing. The ankle joint is formed by the talus (2) and the lateral (14) and medial (15) malleoli. The stability of the ankle is obtained from numerous strong ligaments that surround the ankle joint (Figure 2).

Tibia The tibia (17) carries most of the weight and terminates in the medial malleolus (15). The fibula (16) is more or less non-weight bearing and terminates at the ankle to form the lateral malleolus (14).

Mid-foot The mid-foot is made up of the navicular bone (3), the cuboid (5) bone plus the three cuneiform bones: lateral cuneiform (6), intermediate cuneiform (7) and the medial cuneiform (8). The mid-foot gives the foot its characteristic arch, which is supported by strong ligaments.

Forefoot The forefoot consists of the five metatarsal bones (9). These are numbered with the first metatarsal by the big toe and the fifth by the little toe. Metatarsals are long bones, with a head, shaft and a base (10). The toes are called phalanges. The big toe (hallux) consists of only two bones: the proximal (11) and the distal (13) phalanges, whereas the other four toes have an additional middle phalanx (12). The foot contains numerous joints, which are usually described according to the bones. For example, the joint between the distal and middle phalanxes is called the distal interphalangeal joint, the joint between the proximal and middle phalanx is the proximal interphalangeal joint, and the joints between the phalanges and the metatarsals are the metatarsophalangeal joints.

Describing a fracture

A fracture can be defined as: 'a loss of continuity of the margins of a bone' (Unwin and Jones 1995), although some patients might think that a fracture and a break are different. When assessing and documenting an injury, it is important to describe the fracture clearly, as an open (skin is broken) or closed (skin is intact) fracture. Some textbooks might describe open fractures as compound, and further classify these as compound from within, where the fractured end of a bone breaks through the skin, as opposed to a compound fracture where the skin was damaged during the injury (Dandy and Edwards 1998). Fractures can be further described in terms of the shape of the bone fragments (Figure 3).

TIME OUT 2

Describe the following fractures: transverse, spiral, oblique, comminuted, crush, greenstick, pathological, stress/fatigue and avulsion. Make a list of the possible mechanisms of injury for each type of fracture. Now compare your answers with the definitions and mechanisms of injury outlined in Table 1.

Bone healing

Patients will be shocked and anxious when told they have a fracture, and they are often keen to find out how long the fracture will take to heal. Dandy and Edwards (1998) explain that a fracture has only healed when it is strong enough to take its normal load. This process varies and is influenced by several things, but as a general rule fractures heal in eight weeks. Tibial shaft fractures can take up to 16 weeks to heal, whereas fractures in children usually heal in about four weeks (Dandy and Edwards 1998).

Assessment

Most foot and ankle injuries seen in A&E are sprains – tears and stretching of ligaments around a joint (Holt 2002a) – but the aim of an initial assessment is to recognise injuries that require immediate treatment (Wardrope and English 1998). To enable this, a systematic method of assessment is needed. The following system is recommended for assessing musculoskeletal injuries (Wardrope and English 1998):

- History taking, including social history.
- Examination.
- Initial management.

History taking

Taking a detailed history is an important part of patient assessment. Many errors and legal issues occur as a result of poor history taking and documentation. To reduce errors, the nurse should aim to (Wardrope and English 1998):

- Obtain a good history.
- Obtain a better history.
- Obtain the best possible history. For example, 'Dancing in high heel shoes 12 hours ago. Twisted right ankle. Able to carry on dancing. Woke up this morning with a painful, swollen lateral aspect of ankle. Now unable to bear weight. Has taken ibuprofen with minimal effect'. This history tells you more than 'twisted right ankle last night, unable to bear weight', and can assist in identifying the likely injury.

Table 1. Definition of fractures and usual mechanism of injury

Fracture type	Definition	Mechanism of injury
Transverse	Across the bone	Direct blow or pure angular force to the bone
Spiral	Encircle the bone in a spiral around the bone diameter	Violent twisting movement along the axis of the bone
Oblique	At an angle to the length of the bone	As above
Comminuted	The bones are splintered into two or more fragments	Usually by direct trauma
Crush	The bone is crushed	Commonly seen in heel fractures through a fall or direct trauma
Greenstick	Seen in children. The fracture is incomplete, as it affects the cortex on one side of the bone only. The other side remains intact	Several, for example, fall, twisting movement or direct trauma
Pathological	Caused by a disease process in the bone, for example, cancer	Often no, or very little, history of trauma. Patient might break a bone by turning over in bed
Stress/fatigue	Caused by repeated cyclical over use. Common sites: second metatarsals (known as march fracture)	No trauma. Might also occur in tibia in long distance runners
Avulsion	Bone ends are pulled off	Caused by overstretching the ligaments

(Dandy and Edwards 1998, Holt 2000a, Unwin and Jones 1995)

The patient's clinical history should always include:

- Mechanism of injury.
- Symptoms.
- Previous injury and pertinent past medical history.

Mechanism of injury Note as much information as possible about the mechanism of injury, as valuable clues to the diagnosis can be obtained (Guly 1996). Questions should include where, when, how, why and what happened next? When did the injury happen? This is especially important to anticipate the severity of injury. A patient, who injured his or her ankle yesterday and seeks help today as he or she is now unable to weight-bear, is likely to have a less severe injury than a patient who is unable to weight-bear immediately after the injury (Wardrope and English 1998). Ascertaining the time of injury might also help distinguish between acute and chronic problems.

Where did the injury happen? Patients with open fractures sustained on a dirty and/or gritty road surface might have a higher risk of contamination. Was the injury caused by a road traffic accident? If it was, the nurse needs to establish how long the patient was trapped and consider the temperature

at the time of injury, as the patient could be hypothermic. Did the injury happen at work? If so, was protective footwear worn?

How and why did the injury happen? An older person might have tripped, but the fall might also have occurred secondary to a cerebrovascular accident (CVA) or cardiac arrhythmia. Patients who cannot provide a clear history of the accident might need a full examination of all body systems, not just the musculo-skeletal system. Ask the patient to demonstrate the position of the foot and ankle during the injury, with the non-injured limb. This will give you clues as to what structures might have been injured.

What happened next? Was the patient able to walk immediately after the accident? This is an important factor when deciding on whether or not to X-ray the patient. Did the patient apply ice packs and/or receive any other first aid before arrival in A&E?

Symptoms It is essential to assess the patient's gait as the foot supports the weight of the body. If a patient is limping, a note should be made of the severity of the limp, for example, weight-bearing on heel only (Guly 1996). Patients might say they heard or felt a crack, thinking that this implies a bone cracking. However, a study of 464 patients found no relationship between a cracking sound or feeling and the existence of a fracture (Reid *et al* 1996). Other typical symptoms associated with foot or ankle injury include:

- Bruising – takes time to develop, and might not be present initially. Pay particular attention to bruises on the sole of the foot as this could indicate an injury higher up, with the blood gravitating towards and pooling in the foot.
- Swelling – might take up to 24 hours to develop fully (Unwin and Jones 1995). Swelling that develops rapidly often indicates a more severe injury than swelling that occurs gradually (Nurse and Rimmer 2002). It is important to remember that swelling can be excessive and might threaten limb function.
- Pain – is one of the most common and significant symptoms of injury, and is often related to the severity of the injury (Unwin and Jones 1995). Pain is a useful diagnostic tool when there is no clear history of trauma (Guly 1996). Some patients might have referred pain from an injury or illness elsewhere in the body, and palpation of the bones can aid differentiation between actual bone pain and referred pain (Guly 1996).
- Deformity – any obvious deformity may indicate a dislocation with possible threat to limb function, and immediate intervention is essential. However, some deformities might be normal for that patient, and the opposite limb should be compared routinely for all foot and ankle injuries.

Previous injury and pertinent past medical history Patients should be asked about previous injuries to the ankle and foot. A history of recurrent inversion injuries to the ankle can indicate instability of the ligaments on the lateral side (Guly 1996). Similarly, a painful, swollen, red head of the first metatarsal in patients taking certain diuretics might indicate an acute episode of gout (Wardrope and English 1998).

Social history The patient's social circumstances should be assessed as early as possible to help discharge planning. How will an older patient, living alone with an upstairs toilet, cope on crutches? Who will do the shopping? (Dandy and Edwards 1998). Early referral to an occupational therapist and/or social worker may enable services to be put in place by the time the patient is ready for discharge. For example, a referral at 4pm on a Friday after treatment has been completed, might lead to unnecessary hospitalisation for an older patient.

Examination

Nurses assess patients and are familiar with asking questions in their daily work (Clarke 1999). Taking a history and examining a patient is more than just data collection – it is a fundamental step in developing therapeutic nurse-patient relationships. Patients can often tell if a nurse is inexperienced, and a calm and methodical approach should be used to prevent a fumbling, unstructured examination, which might also miss out key points (Dandy and Edwards 1998). A useful method of examination is the look-feel-move principle (Wardrope and English 1998).

Look Any orthopaedic assessment should start with exposing both limbs up to the joint above the injury, that is, the knee. Dandy and Edwards (1998) argue that more information can be gained by inspection than by palpation and movement combined. This is also a good opportunity to assess the patient's gait. Is he or she walking? Note any deformity, swelling, bruising or scars that might indicate a previous injury. Is there a wound? If so, note the amount of bleeding and apply a dressing. Is there any discoloration between the two feet? If so, a vascular problem should be suspected.

Feel The aim of palpation is to determine the maximum point of tenderness. Avoid the obvious painful area until last, or the patient's co-operation will probably be lost. Palpation should be undertaken gently. Start at the knee and follow the fibula and tibia to the ankle. Palpate both malleoli, then the base of fifth metatarsal followed by the foot. Make sure you palpate all the metatarsophalangeal joints, toes and bones in the mid-foot (cuboid, navicular and cuneiforms) and do not forget the heel. Try to distinguish between bony and soft tissue tenderness. This is important

when determining the need for X-ray (Wardrope and English 1998). Finally, assess the neurovascular status of the foot. Gently feel the skin temperature of the foot while comparing it with the other side. A cold foot might indicate ischaemia, whereas a hot foot could indicate infection. Check for a pulse and note capillary refill, which should be less than two seconds. Check each toe for sensation. Is it the same in each toe? The absence of pulses is an emergency and the patient must be seen by medical staff immediately (Unwin and Jones 1995).

TIME OUT 3

Look at the normal ankle and foot movements in Figure 4, then demonstrate these using your own limb. If possible, ask a colleague to assess you.

Move Movements of the foot and ankle are undertaken actively by the patient and passively by the examiner. If you suspect that the patient has a fracture, do not undertake passive movements. You will only increase his or her pain. Movements above or below the injured site should also be assessed and all movements compared with movement in the uninjured side.

Initial management

A fractured/dislocated ankle is one of the limb-threatening conditions that a nurse working in A&E should be able to recognise (Figure 5).

The ankle will look obviously deformed and swollen, and the skin may appear white and tense, if bone ends are pressing hard against the skin. The skin's viability is threatened as the neurovascular supply is disrupted (Mackway-Jones 1997), leading to necrosis. Patients with these fractures must never be sent directly to X-ray. It is vital to reduce the dislocation first (usually undertaken by a doctor, although nurses working in some minor injury units might do this), immobilise the limb and put it in plaster of Paris (PoP) or another splint, before taking an X-ray. A fractured/dislocated ankle can disrupt normal neurovascular supply to the foot. The patient's foot pulses and sensation should be assessed during the initial assessment and after reduction (Holt 2000a, Unwin and Jones 1995). It may be helpful to mark the location of the pulse for future monitoring.

TIME OUT 4

Patients with foot and ankle fractures are often in severe pain. Describe the pain scoring and intervention strategies that the assessment nurse can undertake in A&E.

Figure 4. Ankle movements

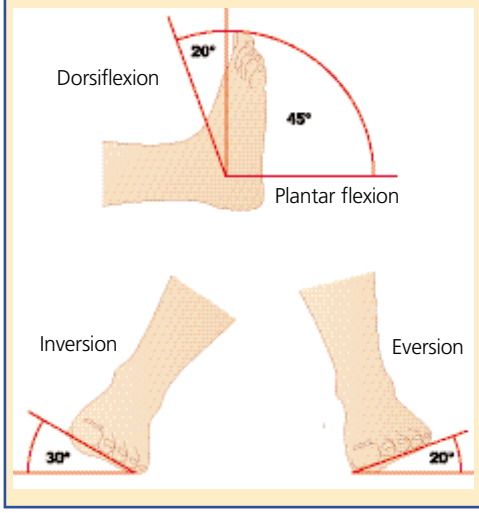


Figure 5. X-ray of fractured/dislocated ankle

Pain intervention Assessment of a patient's pain should be undertaken on arrival to A&E. There are several pain assessment tools available, but the 'pain ruler' identified by the Manchester Triage Group (Mackway-Jones 1997) has been specifically adapted for use in emergency departments.

Patients should be given analgesia as soon as possible, to reduce pain and to enable a better examination of the limb to be undertaken.

Limb elevation, reassurance and ice packs are useful non-pharmacological pain intervention strategies that the assessment nurse can use (Walsh 1999a). Ice packs should never be placed directly onto the skin and should be wrapped in a towel to prevent cold burns. The ice pack should be left in place for ten minutes (Wardrope and English 1998).

Orthopaedics

Box 2. Tetanus guidelines

- Five doses of the tetanus vaccine are considered to give life-long immunity
- A combined tetanus and low-dose diphtheria vaccine has replaced the single antigen tetanus vaccine for adults and adolescents, as diphtheria immunity is low in the older UK population
- Boosters are only given if the patient has not had a full five-dose course and is due a further dose, or if the immunisation status is unknown. A dose of human immunoglobulin should be given if the wound is contaminated

Splints Splinting a fracture helps to reduce pain by stabilising the bone ends (Holt 2000a). A rigid plastic splint is useful for short-term immobilisation (Wardrope and English 1998) and has the additional advantage of being easily removed for X-ray.

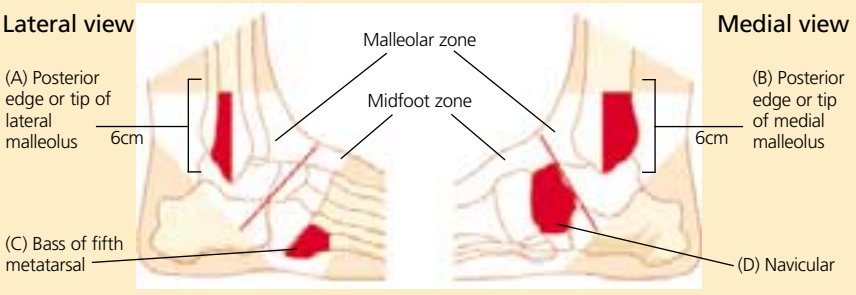
If the fracture is open, the risk of contamination is high. The wound must be covered, and a povidine-iodine dressing is often used because of its antibacterial properties (Holt 2000a). Povidine-iodine can be toxic to tissues, but it can be used as a short-term measure when diluted to a 5 per cent concentration (Holt 2000b).

Tetanus A record of the patient's tetanus immunisation status should be made. Tetanus is caused by *Clostridium tetani* – an anaerobic bacterium that lives particularly well in devitalised tissues. Its neurotoxins block the sympathetic nervous system, leading to severe muscle spasm with potentially fatal consequences (Walsh 1999b). Spores are found in soil and faeces, and in contaminated wounds.

Wounds caused by crush injury or extensive devitalised tissues are at particular risk of tetanus infection (Holt 2000b). Most people in the UK have received tetanus immunisation, but older people and some immigrants might not have been immunised. An anti-tetanus booster used to be given every ten years, but the guidelines were changed recently by the Department of Health (Box 2) (DoH 2002).

X-rays Sending patients for X-rays before they are seen by a nurse practitioner or doctor has been found to reduce the overall waiting times, improve quality of care and make better use of nurses' skills and time (Ward 1999). A set of guidelines known as the Ottawa ankle rules was developed to aid decisions regarding whether an ankle or foot X-ray is required (Steill *et al* 1995) (Figure 6).

Figure 6. Ottawa ankle rules



An ankle radiographic series is only required if there is any pain in the malleolar zone and any of these findings:
- Bone tenderness at A or
- Bone tenderness at B or
- Inability to bear weight both immediately and in A&E

A foot radiographic series is only required if there is any pain in the midfoot zone and any of these findings:
- Bone tenderness at C or
- Bone tenderness at D or
- Inability to bear weight both immediately and in A&E

(Steill *et al* 1995, by permission of BMJ Publishing Group)

Common ankle fractures

The most common mechanism of injury to the ankle is an inversion injury (Figure 4) (Guly 1996), which the patient might describe as 'went over ankle' (Wardrope and English 1998). Inversion of the ankle often occurs in combination with other movements, for example, dorsiflexion or rotation. Consequently, it is important to establish what the patient was doing at the time, as injuries that occur with greater force, such as while running, are likely to result in more severe damage than those sustained when walking (Unwin and Jones 1995).

Several ankle classification systems have been developed. The Lauge-Hansen classification is a complicated system based on the mechanism of injury and associated ligament injuries (Solomon *et al* 2001), and is most useful for planning reductions (Solomon *et al* 2001). The Danis-Weber classification is a simpler system (Vander Griend *et al* 1991), which is based on the level of the fracture of the fibula. This system is useful for planning surgical interventions (Vander Griend *et al* 1991). However, a simpler and more useful system for use in A&E is the descriptive system (Vander Griend *et al* 1991):
- Isolated fractures to one malleolus.
- Bimalleolar fracture.
- Trimalleolar fracture.

Treatment of ankle fractures is primarily based on the location of the fracture in relation to the ankle mortise joint line, which is the joint line made up of the talus and both malleoli (Figure 7). As a general rule, fractures above the joint line are unstable and need referral. X-rays should be assessed for talar tilt or talar shift (Figure 7), which indicate an unstable fracture (Unwin and Jones 1995).

Isolated malleolus fracture An isolated, undisplaced fracture to the lateral malleolus below the joint line (Figure 8) is treated using a plaster backslab and followed up in fracture clinic. Patients will usually be non-weight bearing for a week or two, and then have a weight-bearing cast for up to six weeks (Unwin and Jones 1995). Displaced fractures, or fractures above the joint line, should be referred to an orthopaedic team and might need surgical repair.

Isolated fractures to the medial malleolus are rare, and are at risk of malunion. The forces required to fracture the medial malleolus are great. Treatment varies, but these fractures are internally fixed or treated conservatively in a plaster cast (MacRae and Kinninmonth 1997, Unwin and Jones, 1995).

Bimalleolar fractures Bimalleolar fractures indicate that two of the three malleoli (lateral, medial, posterior) have been fractured, with the lateral and medial malleoli being the most common (Figure 9) (Holt 2002a).

Figure 7. The ankle mortise with talar tilt and talar shift

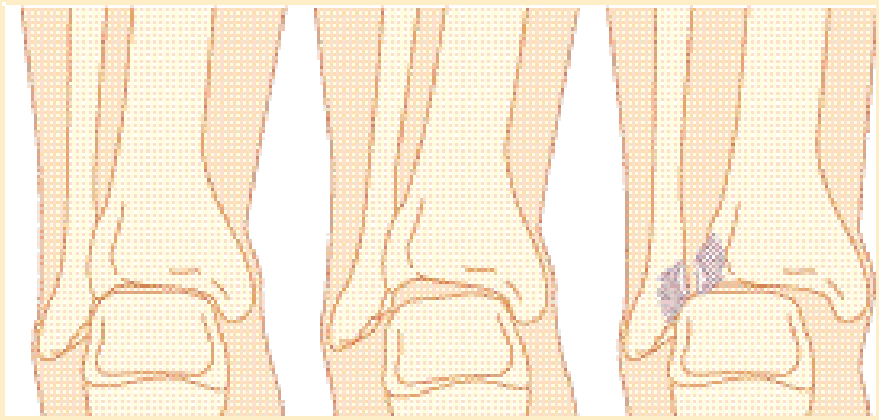


Figure 8. Isolated fracture

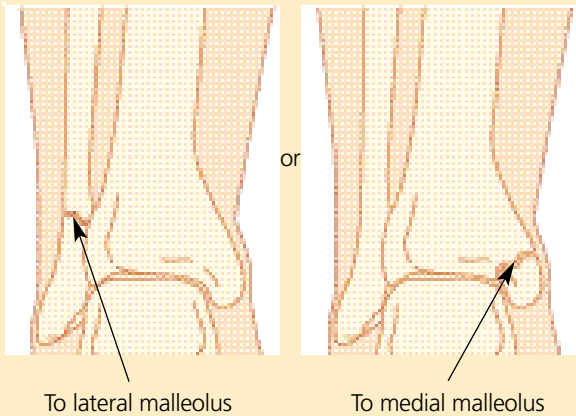
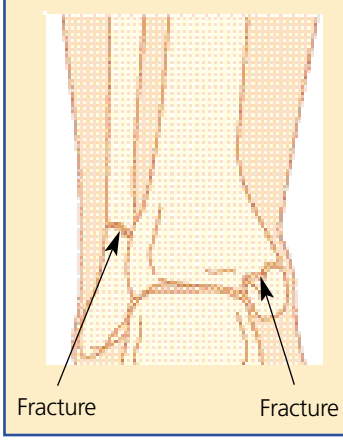


Figure 9. Bimalleolar fractures



Figures 8, 9 and 10 reprinted from *Practical Fracture Treatment*, McRae R (1994), by permission of the publisher WB Saunders.

Bimalleolar fractures are unstable and patients need to be referred to an orthopaedic surgeon. Treatment usually involves open reduction and internal fixation (Holt 2000a). A backslab should be applied in A&E before the patient is admitted for pain control.

Trimalleolar fractures A trimalleolar fracture (Figure 10) is a severe injury often associated with dislocation of the ankle (Holt 2000a), and requires immediate reduction. A trimalleolar fracture is treated by surgical fixation, and a backslab should be applied in A&E for pain management.

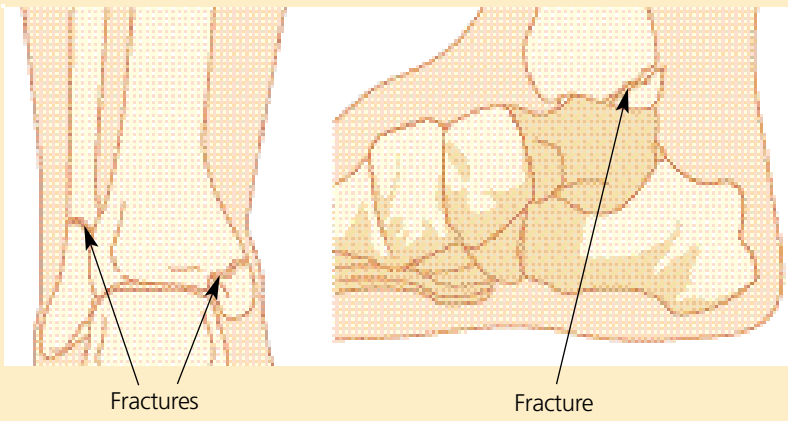
Fractures to the foot

The foot is shaped like an arch, supported by strong ligaments and tendons, with the heel and the heads of metatarsals providing contact with the ground when standing. Damage to any of these structures and loss of the arch can lead to permanent disability (Wardrope and English 1998).

Fractured talus A fracture to the talus is rare, as this bone is well supported by ligaments (Holt 2000a). These fractures can occur from twisting injuries, direct trauma or forceful dorsiflexion of the foot, for example, during a road traffic accident (Dandy and Edwards 1998). Sixty per cent of the surface of the talus is covered by cartilage, resulting in a poor blood supply (Holt 2000a), and avascular necrosis can occur (Dandy and Edwards 1998). Treatment depends on the severity and anatomical site of injury, but open reduction and internal fixation might be needed (Dandy and Edwards 1998). Occasionally, these fractures are managed conservatively using a below-knee plaster cast, but orthopaedic advice should be obtained (Holt 2000a).

Fractured calcaneum Fractures to the calcaneum usually result from a fall, although avulsion fractures also occur in women with osteoporosis (Holt 2000a). In falls over six feet, there might be associated crush fractures to the lumbar spine or tibial

Figure 10. Trimalleolar fractures



Figures 12 and 13 reprinted from *Accident and Emergency Radiology: A Survival Guide,* Raby N *et al* (1995), by permission of the publisher WB Saunders.

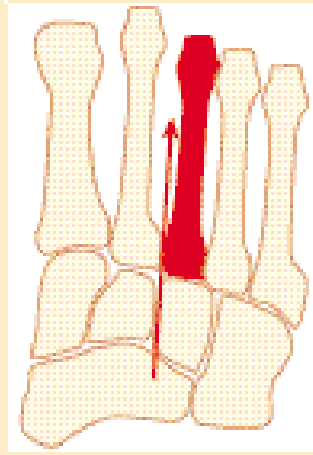
plateau (Wardrope and English 1998). In addition, fractures to other bones of the foot are not uncommon, and patients with suspected calcaneum fractures, or those who have fallen over six feet, must have a full examination of the spine and lower leg.

The calcaneum is made of cancellous bone, which crushes on impact, making calcaneum fractures difficult to restore, although grafting has been used (Dandy and Edwards 1998). The patient will experience pain and significant swelling and be unable to bear weight (Holt 2000a). Bruising will appear in a horseshoe pattern around the heel a day or so after the injury (Dandy and Edwards 1998). Undisplaced fractures are usually treated conservatively with rest, limb elevation and immobilisation in a plaster cast once the swelling has subsided (Dandy and Edwards 1998, Holt 2000a). If the subtalar joint is involved, the patient is often treated by internal fixation, but this can remain painful for up to two years (Dandy and Edwards 1998).

Navicular-cuboid-cuneiform fractures Fractures to the mid-foot bones are uncommon and usually occur as a result of direct force, for example, crush fractures, although avulsion fractures to the navicular can result from an inversion injury (Holt 2000a), hence its inclusion in the Ottawa ankle rules. Patients will have localised tenderness and swelling. These fractures are usually treated with a below-knee backslab and patients should be non-weight bearing (Holt 2000a), although avulsion fractures greater than 20 per cent of the articular surface of the navicular are internally fixed (Holt 2000a).

Figure 11. Foot X-ray of avulsion fracture to base of fifth metatarsal

Figure 12. Normal alignment of the tarsometatarsal joints

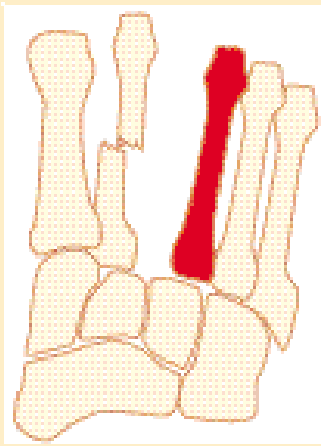


The medial margin of the base of the third metatarsal should be in line with the medial margin of the lateral cuneiform

Metatarsal fractures One of the most common metatarsal fractures, is an avulsion fracture to the base of the fifth metatarsal (Figure 11), resulting from an inversion/eversion injury to the foot (Dandy and Edwards 1998). This injury is frequently missed or wrongly diagnosed as a sprained ankle (Guly 1996). It is included in the Ottawa ankle rules, which prompts the examiner to palpate the bone and request appropriate foot X-ray views (Steill *et al* 1995). Patients commonly complain of a painful ankle and will be either partially or non-weight bearing. Management is usually conservative and ranges from compression bandaging to a below-knee backslab, depending on the severity of the pain (Unwin and Jones 1995). Walking aids are only provided if the patient cannot bear weight, as early mobilisation is important for rehabilitation (Wardrope and English 1998).

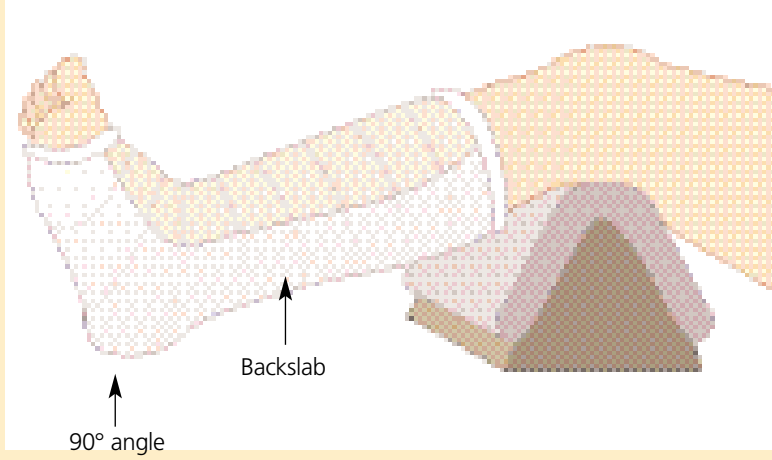
The avulsion fracture to the base of the fifth metatarsal should not be confused with the Jones fracture, which is a fracture to the shaft of the fifth metatarsal (Unwin and Jones 1995). This fracture is usually a stress fracture seen mainly in young, male athletes. Treatment is a non-weight bearing cast for approximately six weeks (Unwin and Jones 1995).

Figure 13. Fracture to the shaft of the second metatarsal with dislocation of the third, fourth and fifth metatarsals



Note that the medial margin of the third metatarsal is not in line with the medial margin of the lateral cuneiform

Figure 14. Below-knee backslab



Fractures to the head of the metatarsals usually occur as a result of crush injuries (Unwin and Jones 1995). It is essential that a clear patient history is obtained, especially in relation to the weight of the object dropped on the foot (Wardrope and English 1998). The foot will usually be swollen, bruised and tender and, depending on footwear, the skin might be broken. Treatment depends on severity of injury. In cases with minimal swelling, the patient is discharged and advised to rest, elevate the foot and use ice packs to reduce the swelling; they are also permitted to bear weight (Wardrope and English 1998). In more severe cases with excessive swelling, and tenderness and pain on extensive movements of the toes, patients may need to be admitted for observation of possible compartment syndrome (Wardrope and English 1998).

A rare but severe injury is tarsometatarsal dislocation, where dislocation occurs at the base of the metatarsals. This is known as Lisfranc's fracture (Holt 2000a, Raby *et al* 1995). These dislocations can be difficult to identify, but careful examination of the oblique view of the X-ray will demonstrate dislocation (Figures 12 and 13).

Plaster application

Plaster of Paris (PoP) is the preferred casting material used in A&E because of its good moulding properties and low cost. It should only be applied by personnel who are trained to do so (Prior and Miles 1999a). Before the application of PoP, padding should be applied evenly to the skin to protect bony prominences. As new fractures tend to swell, a PoP backslab is applied with the foot in 90° dorsiflexion (Unwin and Jones 1995) (Figure 14). A backslab is not as effective as a full PoP in stabilising a fracture, and occasionally a full PoP might be applied. In these circumstances, it is essential to split the PoP, including the padding, down one side to allow room for swelling, as this might otherwise cause compression (Unwin and Jones 1995). Although the PoP will go hard quite quickly, it takes 24-48 hours to dry completely (Prior and Mills 1999a), and the patient should be made aware of this to prevent accidental cracks in the cast.

If a skin wound is present, a small window can be cut in the cast to allow for easy inspection. Before discharging a patient with a PoP, the nurse should assess the limb for discoloration, 'pins and needles' (paraesthesia), numbness, paralysis, pain and presence of pulses to ensure that the neurovascular status of the foot is intact. The patient should be given a verbal explanation of potential complications combined with written observations to enable him or her to recognise any abnormalities early and seek help (Prior and Miles 1999a).

In addition to swelling, other complications of casting include:

- Pressure ulcers.
- Allergic reaction.
- Compartment syndrome.

TIME OUT 5

List the causes and signs and symptoms of pressure ulcers. What measures would you advise a patient to take to prevent pressure ulcer development following a foot or ankle injury.

Pressure ulcers and allergic reaction Patients with pressure ulcers might experience a burning sensation or pain, local heat, an offensive smell or staining

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Box 3. Signs and symptoms of compartment syndrome

- Severe pain
- Extremely painful movements, especially on passive extension
- Limb might be cool
- Patchy, pallor of the limb
- Tense, bulging muscle. Skin might look shiny
- Pulses: might be present and gradually weaken. Necrosis can occur while pulses are still present.

Absent pulses is a very late sign

(Adapted from Dandy and Edwards 1998, Prior and Miles 1999a and b, Unwin and Jones 1995)

of the cast (Prior and Miles 1999a). The cast should be removed, the skin cleansed, and any wounds treated. A new cast is then applied. If the patient develops an allergic reaction, which is indicated by severe itchiness or heat under the cast, it is important to change the type of padding as well as the casting material.

Compartment syndrome One of the most serious complications of casting is compartment syndrome, which is not restricted to patients in a cast. Patients with tibial shaft fractures, for example, have a high risk of developing compartment syndrome (Holt 2000a).

Muscles are contained within fascia compartments, of which there are four in the lower leg. As swelling increases, the pressure within the compartments rises, resulting in ischaemic muscles and nerves, which if left untreated can lead to permanent necrosis (Dandy and Edwards 1995, Holt 2000a). The signs and symptoms of compartment syndrome are listed in Box 3. Patients with compartment syndrome experience severe pain and/or reduced sensation that is not explained by the injury and is not controlled by normal doses of analgesia (Holt 2000a). If compartment syndrome is suspected, the PoP and padding must be removed and medical staff should be informed immediately. If the pressure continues to rise, the patient will need an emergency fasiotomy to divide the skin and compartments, and release the pressure.

Discharge advice

Older people need special attention before discharge, and the *National Service Framework for Older People* recommends that a specialist multidisciplinary falls service should be set up (DoH 2001). Following a fall, older patients should be assessed before discharge from A&E or at home by a member of the specialist falls service, for example, the occupational therapist, who could accompany the patient home and assess potential risks and provide equipment immediately (DoH 2001). A&E nurses should use any opportunity to investigate how an accident happened and give advice on accident prevention, which might include securing loose carpets (Hughes 2002, Walsh 1999a).

Patients with fractures to the foot or ankle should be encouraged to elevate the limb above the level of the heart and to exercise the toes and knee to prevent stiffness in these joints (Wardrope and English 1998). Ice packs (wrapped in a cloth) should be applied for ten minutes, three of four times a day to help reduce swelling (Wardrope and English 1998). Although commercially manufactured ice packs are available, patients can easily and cheaply make their own using either a bag of frozen peas or crushed ice in a plastic bag.

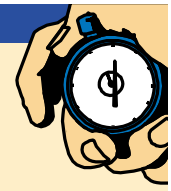
The majority of patients with fractures to the ankle or foot will be non-weight bearing and will need crutches on discharge. Elbow crutches should be used and axillary crutches should be avoided as they press on the radial nerve causing palsy to the arm (Dandy and Edwards 1998). A physiotherapy or occupational therapy assessment might be necessary, for example, to teach patients how to walk up and down stairs safely. A walking stick is useful when some weight can be put on the foot. A walking stick, when used correctly, can take up to one third of the body weight when the stick is put on the floor at the same time as the injured leg (Dandy and Edwards 1998). The stick should be held on the same side as the uninjured leg, although some right-handed patients might find this difficult if the right leg is injured (Dandy and Edwards 1998).

Patients should be given written discharge information explaining how to look after the injury, any treatment they received and possible follow-up arrangements. In addition, nurses should ensure that patients have adequate pain relief at home and tell patients that the GP will be informed of the diagnosis. Nurses should be sensitive to patients' psychological needs. What may seem like a 'minor' injury might for some patients mean a complete loss of independence. Nurses need to consider: how the patient is going to cope; his or her social support structure; how will a single mother with an infant manage on crutches? Any fears and anxieties about what lies ahead should be addressed before discharge.

Conclusion

The range of injuries sustained by patients attending A&E/minor injury units is extensive. A good understanding and application of normal anatomy, fracture healing and fracture treatment is essential. Although rare, limb-threatening injuries can present and nurses working in A&E/minor injury units must be able to recognise these promptly. The majority of lower limb complaints are 'minor' in nature, but the impact they can have on patients' daily living should not be underestimated

TIME OUT 6



Now that you have completed the article, you might like to write a practice profile. Guidelines to help you are on page 48.