

# Chapter 62 - 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 (1624-89)

Pain in the foot (podalgia) and ankle problems are a common occurrence 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. The main causes of foot pain are presented in [Table 62.1](#).

[1](#)

## Key facts and checkpoints

- Foot deformities such as flat feet (pes planus) are often painless.
- Foot strain 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 rare.
- All the distal joints of the foot may be involved in arthritic disorders.
- Many foot and ankle problems are caused 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.

**Table 62.1 Causes of foot pain (after Johnson) [1](#)**

### General

Arthritis—OA, gout, RA, seronegative spondyloarthropathies.

Diabetes—neuropathy [sensory (Charcot), motor, autonomic, single nerve], sepsis, vasculopathy.

Peripheral neuritis—alcohol, B12 deficiency.

Vascular—arteriosclerosis (claudication, gangrene), hemiplegia, Raynaud's, RSD (Sudeck's). Infections—cellulitis, septic arthritis, TB, actinomycetes.

Other: Paget's disease of bone, osteoid osteoma, hypermobility syndrome (including Marfan's).

### Ankle and hindfoot

Tendoachilles (bursitis, tendinitis, tear), posterior tibial tendinitis, rupture or subluxation, plantar fasciitis, sprain, bruised heel, phlebitis, cellulitis.

### Midtarsal

Acute or chronic foot strain, synovitis of subtaloid, tarsal coalition, hypomobility of transverse tarsal joints, osteochondritis of navicular (Kohler's), dorsal exostosis, peroneus brevis tendinitis, flexor hallucis longus tendinitis.

### Forefoot

Bunion, bunionette, Tailor's bunion, intermetatarsal bursitis, traumatic synovitis of MTP, sesamoiditis, march fracture, Freiberg's infarction.

### Toes

Hallux valgus, hallux rigidus, varus little toe, mallet toe, clawed toe, corn, wet corn, ingrown toenail, onychogryphosis, subungual exostosis, deep peroneal nerve entrapment, digital nerve entrapment (Morton's neuralgia).

### Sole

Callus, plantar wart, epidermoid cyst, foreign body, tarsal tunnel syndrome, Dupuytren's (Ledderhose's) contracture.

**OA:** osteoarthritis   **RA:** rheumatoid arthritis   **MTP:** metatarsophalangeal

# A diagnostic approach

A summary of the safety diagnostic model is presented in [Table 62.2](#).

**Table 62.2 The painful foot and ankle: diagnostic strategy model**

**Q. Probability diagnosis**

**A. Acute or chronic foot strain**

Sprained ankle  
Osteoarthritis, esp. great toe  
Plantar fasciitis  
Achilles tendinitis  
Wart, corn or callus  
Ingrowing toenail/paronychia

**Q. Serious disorders not to be missed**

**A. Vascular insufficiency**

- small vessel disease
- Neoplasia
- osteoid osteoma
- osteosarcoma
- Severe infections (rare)
- septic arthritis
- actinomycosis
- osteomyelitis
- Rheumatoid arthritis
- Peripheral neuropathy
- Reflex sympathetic dystrophy
- Ruptured Achilles tendon
- Ruptured tibialis posterior tendon

**Q. Pitfalls (often missed)**

**A. Foreign body (especially children)**

Gout  
Nerve entrapment

- Morton's neuroma
- tarsal tunnel syndrome
- deep peroneal nerve

Chilblains  
Stress fracture, e.g. navicular  
Erythema nodosum

**Rarities**

Spondyloarthropathies  
Reflex sympathetic dystrophy  
Osteochondritis

- navicular (Köhler's)
- metatarsal head (Freiberg)
- calcaneum (Sever's)

Glomus tumour (under nail)  
Paget's disease

**Q. Seven masquerades checklist**

A. Depression	?
Diabetes	x
Drugs	x
Anaemia	?
Thyroid disease	-

Spinal dysfunction  
UTI

x  
-

Q. Is the patient trying to tell me something?

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

## Probability diagnosis

Common causes include osteoarthritis, especially of the first metatarsophalangeal 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
- reflex sympathetic dystrophy

## 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's)—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.

[Click here](#) for further reference to treatment.

## Reflex sympathetic dystrophy (RSD)

RSD, also known as Sudeck's atrophy, 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. RSD usually lasts two 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 60](#), is uncommon but Morton's neuroma is reasonably common.

Less common disorders include RSD which is often misdiagnosed, the spondyloarthropathies (psoriasis, Reiter's disease, 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.

## 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 betablockers and ergotamine. An alcoholic neuropathy also has to be considered.

## 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 RSD
  - severe episodic pain → gout
  - pain worse at night → ischaemia (small vessel disease), RSD, 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.

# Physical examination

## Inspection

Inspect the feet with the patient standing, sitting, walking (in shoes and bare-footed) 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, e.g. hammer toes, bunions—medial (hallux valgus) and lateral (Tailor's bunion)—and claw toes
- swellings including callosities
- muscle wasting
- skin changes and signs of ischaemia

## Palpation

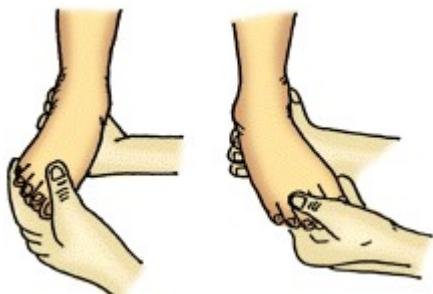
Systematic palpation is very useful as most structures in the foot are accessible to palpation.

## Movements (active and passive)

- plantar flexion (normal—50°) and dorsiflexion (20°) of ankle
- inversion and eversion of hindfoot (mainly subtalar joint)—hold heel and abduct and adduct ([Fig 62.1](#))
- 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) ([Fig 62.2](#))
- test other joints individually, e.g. metatarsophalangeal, midtarsal



**Fig. 62.1** Testing inversion and eversion of the hindfoot



**Fig. 62.2** Testing inversion and eversion of the forefoot

## Special tests

- Achilles tendon including calf squeeze (Thompson's or Simmond's test) ([Fig 121.11](#))
- compress metatarsophalangeal joints from above and below
- compress metatarsals mediolaterally between thumb and forefinger
- 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/C reactive protein
  - HLA B27
- Serum uric acid
- Radiology
  - X-ray ± stress and weight-bearing views
  - radionuclide scans
  - CT scans
  - ultrasound
- Nerve condition studies

**Note:** High-resolution ultrasound is used to diagnose disorders of the Achilles tendon 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. [4](#)

## 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's 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

## **Osteochondritis/aseptic necrosis**

Three important bones to keep in mind are:

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

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

### **Sever's disease of the heel**

This is calcaneal apophysitis which presents in a child (usually a boy) aged 8-12 (average of 10 years) with a painful tender heel at the insertion of 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.

### **Köhler's 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 resting. Sometimes a supportive strapping is helpful.

### **Freiberg's 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 and can present in young adults. Plain X-ray shows the characteristic collapse of the metatarsal head. The treatment is restriction of activity 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.

## **Skin disorders**

Two conditions commonly seen in teenagers are pitted keratolysis and juvenile plantar dermatosis.

### **Pitted keratolysis**

This malodorous condition known as 'stinky feet' or 'sneakers feet' is related to sweaty feet. Treatment includes keeping the feet dry and using an ointment such as Whitfield's or an imidazole or sodium fusidate to remove the responsible Corynebacterium organism. Change to all-leather shoes with charcoal liners.

### **Juvenile plantar dermatosis**

'Sweaty sock dermatitis' is a painful condition of weight-bearing areas of the feet. The affected skin is red, shiny, smooth and often cracked. It is rare in adults. The treatment is to change to leather or open shoes and to cotton socks. A simple emollient cream gives excellent relief.

## **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's 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. [3](#) Special attention must be paid to any developmental structural abnormalities and to footwear.

## **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's 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) is 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

There are two main ankle ligaments that 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 and is presented in more detail in [Chapter 121](#).

## Clinical features of sprained lateral ligaments

Common features:

- 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 ([Fig. 121.9](#))
- test general joint laxity and range of motion
- a common finding is a rounded swelling in front of lateral malleolus (the 'signe de la coquille d'oeuf')
- test stability in A-P plane (anterior draw sign)

## 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. However, as a rule, ankle injuries should be X-rayed.

# Heel pain

Important causes of heel pain in adults ([Fig. 62.3](#)) [6](#) include:

- Achilles tendon disorders
  - tendinitis/peri tendinitis ([Chap. 121](#))
  - bursitis
    - postcalcaneal
    - retrocalcaneal
  - tendon tearing ([Chap. 121](#))
    - partial
    - complete
- bruised heel
- tender heel pad
  - usually atrophy
  - also inflammation
- neuropathies, e.g. diabetic, alcoholic
- tenosynovitis (FHL, FDL)
- 'pump bumps'
- plantar fasciitis
- periostitis
- calcaneal apophysitis
- peroneal tendon dislocation
- nerve entrapments
  - tarsal tunnel
  - medial calcaneal nerve
  - nerve to abductor digiti minimi

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

## Achilles tendinitis/peri tendinitis

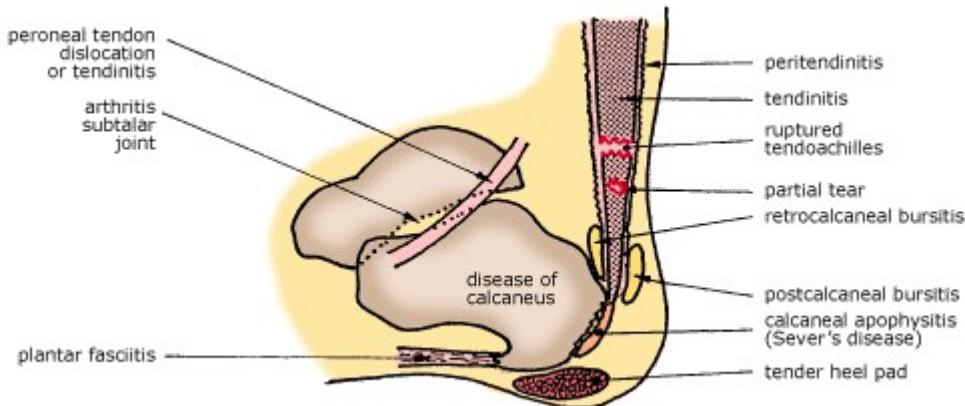
The inflammation is a combination of degenerative and inflammatory changes due to overuse and may occur either in the tendon itself or in the surrounding paratendon. The latter is called peritendinitis rather than tenosynovitis because there is no synovial sheath.

## Achilles tendon bursitis

Bursitis can occur at two sites:

- posterior and superficial—between skin and tendon
- deep (retrocalcaneal)—between calcaneus and tendon (Fig. 62.3)

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.



**Fig. 62.3** Important causes of the painful heel

## 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 g needle

## Fat-pad

### disorders

The fat-pad, which consists of globules of fat encapsulated in multiple U-shaped septi, acts as a hydraulic shock absorber on heel strike. It also contains significant nerve endings. [7](#) It can undergo atrophy, especially in the elderly, and also become inflamed. Problems are treated with an orthotic or an insert. Corticosteroids should be avoided as they can accelerate the atrophy. [6](#)

## Plantar fasciitis

This common condition (also known as 'policeman's heel') is characterised by pain 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.

## History

### y

- Pain:
  - under the heel
  - first steps out of bed
  - relieved after walking about
  - 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
- No constant relationship to footwear

## Signs [8](#)

- 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 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.

### Protection

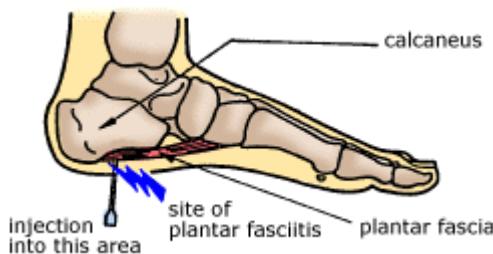
Symptomatic relief is obtained by protecting the heel with an orthotic pad to include the heel and arch of the foot, e.g. Rose insole. Otherwise, a pad made from sponge or sorbo rubber that raises the heel about 1 cm is suitable. A hole corresponding to the tender area should be cut out of the pad to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

### Injection technique

Plantar fasciitis can be treated by injecting local anaesthetic and long-acting corticosteroid into the site of maximal tenderness in the heel. An alternative is to inject the corticosteroid into the anaesthetised heel.

### Method

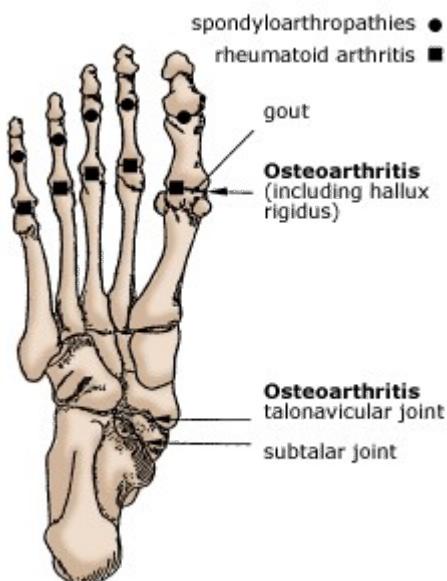
1. Perform a tibial nerve block. (The area of maximal tenderness should be marked prior to nerve block.)
2. When anaesthesia of the heel is present (about 10 minutes after the tibial nerve block), insert a 23 gauge needle with 1 mL of long-acting corticosteroid (e.g. methylprednisolone acetate) perpendicular to the sole of the foot at the premarked site (Fig 62.4). Insert the needle until a 'give' is felt as the plantar fascia is pierced.
3. Inject half the steroid against the periosteum in the space between the fascia and calcaneus.
4. Reposition the needle to infiltrate into the fascial attachments over a wider area.



**Fig. 62.4** Injection approach for plantar fasciitis

## 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 62.5.



**Fig. 62.5** 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 metatarsophalangeal joint (MTP), 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 metatarsophalangeal joints. It may also affect the ankle, mid-tarsal 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.

## Spondyloarthropathies

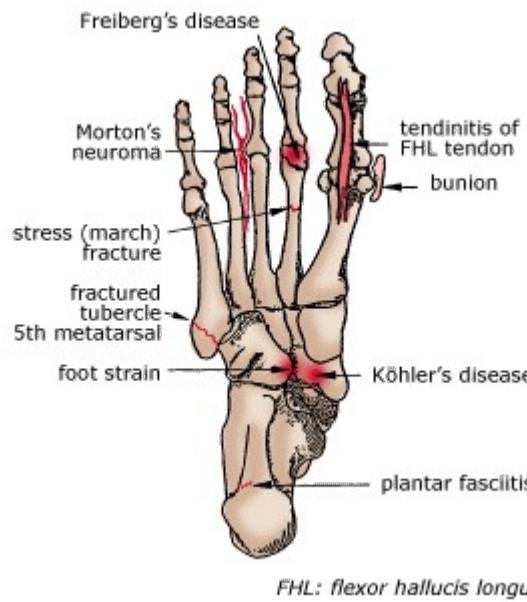
This group of arthritic disorders (Reiter's disease, ankylosing spondylitis, psoriatic arthritis and arthritides associated with chronic bowel disorders) may involve peripheral joints. Other foot involvement includes plantar fasciitis, Achilles tendinitis and sausage-shaped toes due to tenosynovitis,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

## 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 (Fig 62.6)
- worse with new shoes, especially a change to high heels



**Fig. 62.6** 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, is usually self-limiting. It 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.

## Tibialis posterior tendon rupture

Rupture of the tibialis posterior tendon after inflammation, degeneration or trauma [9](#) 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 metres behind the patient ([Fig. 62.7](#)). [5](#) The single heel raise test is also diagnostic. The most useful investigation is an ultrasound examination. Minor cases can be treated conservatively but severe problems respond well to surgical correction.



**Fig. 62.7** Tibialis posterior rupture (right foot): the 'too many toes' posterior view

## Sesamoiditis [10](#)

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. Painful callus can develop over here in the elderly. Well designed insoles are usually effective as is surgical excision for persistent problems.

## Metatarsalgia

Metatarsalgia is not a disease but refers to pain and tenderness over the plantar heads of metatarsals. Causes include foot deformities (especially with depression of the transverse arch), arthritis of the MTP joints, trauma, Morton's neuroma, Freiberg's disease and entrapment neuropathy.

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

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. [11](#)
- Routine X-rays often unhelpful.
- A bone scan is the only way to confirm the suspected diagnosis.
- Basis of treatment is absolute rest for six 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).

## 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

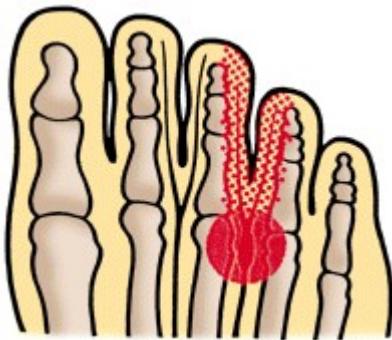
Stress fractures of the os calcis usually have an insidious onset. Osteoporosis is a predisposing factor as is an increased training program. [6](#)

## Morton's neuroma

Morton's neuroma is probably misdiagnosed more often than any other painful condition of the forefoot. It is not a true neuroma and its aetiology is still uncertain. The diagnosis is made on clinical grounds and special investigations are of no help. An ultrasound examination may exclude a cyst or ganglion but rarely shows a neuroma.

### Clinical features

- usually presents in adults < 50
- four times more common in women
- bilateral in 15% of cases
- commonest between third and fourth meta-tarsal heads ([Fig 62.8](#)), then 2-3 (otherwise uncommon)
- severe burning pain between third and fourth 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



**Fig. 62.8** Morton's neuroma: typical site and pain 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. Most eventually require surgical excision, preferably with a dorsal approach.

## 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 metatarsophalangeal joint.

Hallux valgus with bunions should be treated by correcting footwear prior to any surgical correction.

## Callus, corn and wart

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 ([Table 62.3](#)).

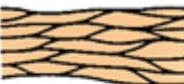
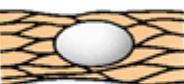
Typical site	Nature	Effect of paring
<b>Callus</b> where skin is normally thick: beneath heads of metatarsals, heels, inframedial side of great toe	hard, thickened skin	 normal skin
<b>Corn</b> where skin is normally thin: on soles, fifth toe, dorsal projections of hammer toes	white, conical mass of keratin flattened by pressure	 exposes white, avascular corn with concave surface
<b>Wart</b> anywhere, mainly over metatarsal heads, base of toes and heels; has bleeding points	viral infection, with abrupt change from skin at edge	 exposes bleeding points

Table 62.3 Comparison of the main causes of a lump on the sole of the foot

A callus (Fig. 62.9) 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.



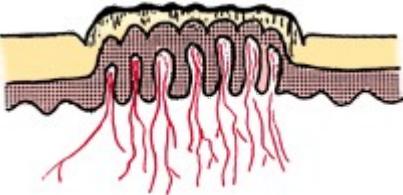
**Fig. 62.9** Callus

A corn (Fig. 62.10) is a small, localised, conical thickening. It may resemble a plantar wart but gives a different appearance on paring.



**Fig. 62.10** Corn

A wart (Fig. 62.11) is more invasive, and paring reveals multiple small, pinpoint bleeding spots.



**Fig. 62.11** Plantar wart

## Treatment

### Calluses

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

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 and then pare. For soft corns between the toes (usually last toe-web) keep the toe-webs separated with lamb's wool at all times and dust with a foot powder.

### Plantar warts

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.

### Methods of removal

- Liquid nitrogen
  - pare wart (a 21g blade is recommended)
  - apply liquid nitrogen
  - repeat weekly

Can be painful and the results are often disappointing.

- Topical chemotherapy
  - pare wart (particularly in children)
  - apply Upton's paste to wart each night and cover
  - review if necessary

(Upton's paste comprises trichloracetic 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
  - 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% trichloracetic acid to the base
- Occlusion with topical chemotherapy: a method of using salicylic acid in a paste under a special occlusive dressing is described.

### Equipment

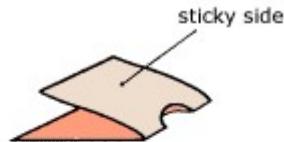
- 2.5 cm (width) elastic adhesive tape
- 30% salicylic acid in Lassar's paste of plasticine consistency

### Method

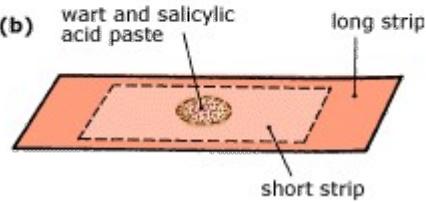
- Cut two lengths of adhesive tape, one about 5 cm and the other shorter.
- Fold the shorter length in half, sticky side out ([Fig 62.12 a](#)).
- Cut a half-circle at the folded edge to accommodate the wart.
- Press this tape down so that the hole is over the wart.
- Roll a small ball of the paste in the palm of the hand and then press it into the wart.
- Cover the tape, paste and wart with the longer strip of tape ([Fig 62.12 b](#)).
- This paste should be reapplied twice daily 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 re-covering with the upper tape.

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

(a)



(b)



**Fig. 62.12** 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

## 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 skin fold. 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](#)

### Treatment

#### 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 pledges 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 ([Fig 62.13](#)). 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.



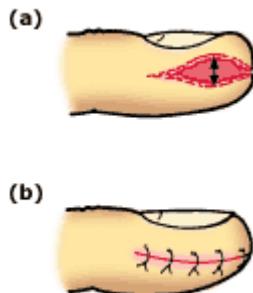
**Fig. 62.13** Method of fashioning toenails

### Surgical methods

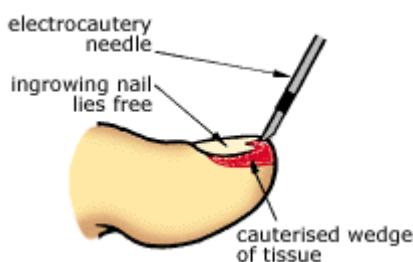
1. *Excision of ellipse of skin.* This 'army method' transposes the skin fold away from the nail. The skin heals, the nail grows normally and the toe retains its normal anatomy.  
Under digital block, an elliptical excision is made such that the skin fold is forced off the nail with a blunt instrument and held there by the wound closure ([Fig 62.14](#)). Any granulation tissue and debris should be removed with a curette.
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 ([Fig. 62.15](#)).
3. *Skin wedge excision.* Another similar method under digital block is to dissect away all the skin fold 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. Removal includes granulation and subcutaneous tissue. Bleeding points are cauterised and the raw area dressed. Dressings are necessary for the next 4-6 weeks.
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 ([Fig. 62.16](#)). Leave the stick in this site for 3 minutes (by the clock). Then remove and flush this pocket with isotonic saline or alcohol, then dry with a cotton wool stick. Dress with paraffin gauze, then with dry gauze. Re-dress as appropriate. The

success rate is almost 100%.

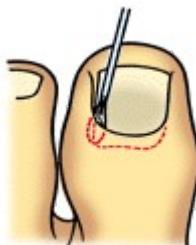
**Warning:** Take care not to spill the phenol onto the surrounding skin as it is very corrosive.



**Fig. 62.14** Treatment of ingrown toenail: excision of ellipse of skin



**Fig. 62.15** Treatment of ingrown toenail: electrocautery of wedge of tissue



**Fig. 62.16** Phenolisation method

## 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.

## 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.

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