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Ankle Injuries

The ankle is a weight-bearing joint where three bones meet - the tibia and fibula of the lower leg and the talus of the foot, which sits on top of the heel bone (calcaneus). Ligaments, strong bands of fibrous tissue capable only of slight stretch, hold the bones together. Tendons attach muscles to the bones to move the ankle joint, and are softer and more stretchy. Any of these structures - the bones, ligaments and tendons - can be injured, and this leaflet explains some of the common injuries that can occur to your ankle.

Note: this leaflet does not advise on how to distinguish what injury you have. Therefore, you should see a medical professional if you suspect that you have a fracture.

The ankle is a complicated joint and it is commonly injured. For most of our evolution, animals with a backbone and skeleton (vertebrates), such as human beings, have walked on four legs. When mankind evolved to walk on just two legs the ankle was given quite a lot of extra work to do, both in weight bearing and in balance. It's perhaps not surprising, then, that the ankle is prone to strains, sprains and fractures.

A **strain** refers to a painful condition of the ankle joint brought about by inflammation, overuse or simply awkward (or unbalanced) use. It includes inflammation of muscles and tendons such as the Achilles tendon at the back of the heel.

A **sprain** is an injury to the band which connects two or more bones to a joint. This band is called a ligament. A sprain is usually caused by the joint being forced suddenly outside its usual range of movement. Most sprains heal within a few weeks. A severe sprain may look and feel like a fracture, and it can be difficult for health professionals to tell the difference between the two.

A **fracture** is a break in one of the bones which make up the ankle joint. These are the leg bones (the tibia and fibula) and the heel and forefoot bones (the calcaneus and talus). Depending upon the exact cause of the fracture, one or more bones may be involved. Fractures cause sudden pain and usually cause significant swelling. Stress fractures are smaller cracks in the bone which also cause intense pain but with less dramatic swelling.

Ankle pain may also arise from existing conditions of the joint itself, such as arthritis or gout, which may be aggravated by movement, impact or strain.

What is a sprain?

A sprain is an injury to a ligament. Ligaments are strong band-like structures around joints, which attach bones together and give support to joints. A ligament can be injured, usually by being over-stretched during a sudden pull. The ligaments at the side of the ankle are the ones most commonly sprained.

A damaged ankle ligament causes inflammation, swelling, and bleeding (which shows as bruising) around the affected joint. Moving of the joint is painful. The picture shows a badly sprained ankle with fairly extensive bruising.



The severity of a sprain is graded according to how badly the ligament has been stretched and whether or not the ankle joint has been made unstable. The joint can become unstable when the damaged ligament is no longer able to give it the normal support:

- Grade I - mild stretching of the ligament without joint instability.
- Grade II - partial tear (rupture) of the ligament but without joint instability (or with mild instability).
- Grade III - a severe sprain: complete rupture of the ligament with instability of the joint.

High ankle sprain (syndesmosis sprain)

- This is one in which the ligament above the ankle joint is torn. This ligament links the two bones of the lower leg (the tibia and fibula).
- It is particularly seen in sports such as skiing and football where injury results from going 'over' on the ankle at speed.
- A high ankle sprain takes longer to heal compared to the usual type of ankle sprain, where the ligaments at the side of the joint are injured.
- A high ankle sprain may be suspected if the joint is still painful more than six weeks after the original injury.
- Another name for this type of sprain is syndesmosis sprain, because the ligament involved is also called a syndesmosis.

What is the aim of treatment?

The main aims of treatment are:

- To keep inflammation, swelling, and pain to a minimum.
- To be able to use the ankle joint normally again as quickly as possible.

Usually, the damaged ligament heals by itself over time. Some scar tissue may be produced where there has been a tearing of tissues.

What is the treatment of a sprained ankle?

The usual initial treatment is described as PRICE (**P**rotect, **R**est, **I**ce, **C**ompression, and **E**levation), together with avoiding HARM (**H**eat, **A**lcohol, **R**unning, and **M**assage). PRICE has been updated by the National Institute for Health and Care Excellence (NICE) to PRICE - adding in P for **P**rotection at the start.

These are commonly advised for the first 48-72 hours after a sprained ankle. This treatment must be balanced fairly early with early controlled weight-bearing and ensuring as normal a gait pattern as possible. This assists in retaining the power and balance of the muscles of the upper and lower legs and in maintaining a healthy posture. Painkillers may be needed.

For the first 48-72 hours think of:

- **RICE - Rest, Ice, Compression, Elevation.** To this has been added P for Protect.
- Do no HARM - no Heat, Alcohol, Running or Massage.

PRICE

- **Protect** from further injury (for example, by a support or high-top high-lace shoes).
- **Rest** the ankle joint for 48-72 hours following injury. For example, consider the use of crutches when wanting to be mobile. You need to protect the injured ankle from further injury. For example, use a bandage and/or ankle support, or a boot with high sides. It is important that the ankle is not rested for too long as this may delay recovery. In most cases, early controlled weight-bearing with the ankle well supported is preferable to complete rest.

- **Ice** should be applied as soon as possible after injury, for 10-30 minutes. (Less than 10 minutes has little effect. More than 30 minutes may damage the skin.) Make an ice pack by wrapping ice cubes in a plastic bag or towel, or by using a bag of frozen peas. Do not put ice directly next to skin, as it may cause ice burn. Gently press the ice pack on to the injured part. The cold is thought to reduce blood flow to the damaged ligament. This may limit pain, inflammation and bruising. Some doctors recommend re-applying for 15 minutes every two hours (during daytime) for the first 48-72 hours. Do not leave ice on while asleep.
- **Compression** with a bandage will limit swelling, and help to rest the joint. A tubular compression bandage or an elastic bandage can be used. The bandage should not be too tight - mild pressure that is not uncomfortable and does not stop blood flow is the aim. A pharmacist will advise on the correct size. Remove the bandage before going to sleep. You may be advised to remove the bandage for good after 48 hours, so that the joint can move.
- **Elevation** aims to limit and reduce any swelling. For example, keep the foot up on a chair to at least hip level when you are sitting. (It may be easier to lie on a sofa and to put your foot on some cushions.) When you are in bed, put your foot on a pillow.

Avoid HARM for 72 hours after injury

That is, avoid:

- **Heat** - for example, hot baths, saunas, heat packs. Heat encourages blood flow which will tend to increase bruising and inflammation. So, heat should be avoided when inflammation is developing. However, after about 72 hours, no further inflammation is likely to develop and heat can then be soothing.
- **Alcohol**, which can increase bleeding and swelling and decrease healing.
- **Running**, which may cause further damage.
- **Massage**, which may increase bleeding and swelling. However, after 72 hours, gentle massage may be soothing.

Other treatments

Your healthcare professional will advise. The advice may typically include:

- Do not stop moving the joint. Don't do anything that causes much pain, but gently get the joint moving again. The aim is to get the ankle joint moving in normal directions, and to prevent it becoming stiff.
- Consider wearing an ankle support until symptoms have gone. There are various forms of ankle supports which can be used - from an elasticated bandage to a specialised brace. The aim is to give some support to the joint whilst the damaged ligament is healing, but to allow the ankle to move to a reasonable degree.
- Physiotherapy may help for more severe sprains, or if symptoms are not settling. A physiotherapist can advise on exercises and may give heat, ultrasound, or other treatments. The aim of physiotherapy includes:
 - To get the ankle joint back to a full range of normal movement.
 - To improve the strength of the surrounding muscles. The stronger the muscles, the less likely it is that a sprain will happen again.
 - Improving proprioception. This means the ability of your brain to sense the position and movement of your joints. Good proprioception helps you to make immediate, unconscious minor adjustments to the way you walk when walking over uneven ground. This helps to prevent further sprains, and is achieved through special exercises.
- You should not play sport or do vigorous exercise involving the ankle for at least 3-4 weeks after a sprain.

Treatment of severe sprains

Extra treatment may be needed for some types of ankle sprain:

- Severe sprains (where the ligaments are badly torn (ruptured) or the joint is unstable).
- A high ankle sprain, where the ligament above the ankle joint is torn.

There is some evidence that these types of sprain may heal more quickly if treated with a short period of immobilisation. This means wearing a brace or a plaster cast on the lower leg and ankle for a few weeks.

In some cases, if ligaments are very badly torn or the joint is too unstable, surgery may be advised. Your doctor will assess if this is necessary (but it is not needed in most cases).

If the sprained ankle is still very painful six weeks after the original injury, you may be advised to have additional tests on the joint, such as a further X-ray or scan. Sometimes there are torn ligaments or small breaks (fractures) which do not show up at when the injury first happens. The ankle may initially have been very swollen and small additional points of damage might have been difficult to detect.

What about medication?

You may not need any medication if the sprain is mild and you can tolerate the pain. If needed, painkiller options include the following:

Paracetamol and codeine

Paracetamol is useful to ease pain. It is best to take paracetamol regularly, for a few days or so, rather than every now and then. An adult dose is two 500 mg tablets, four times a day. If the pain is more severe, a doctor may prescribe **stronger painkillers** such as **codeine**, which is more powerful, but can make some people drowsy and constipated.

Anti-inflammatory painkillers

These medicines are also called **non-steroidal anti-inflammatory drugs (NSAIDs)**. They relieve pain and may also limit inflammation and swelling. You can buy some types (eg, **ibuprofen**) at pharmacies, without a prescription. You need a prescription for some others - eg, **naproxen**. Side-effects sometimes occur. Stomach pain, and bleeding from the stomach, are the most serious. Some people with asthma, high blood pressure, chronic kidney disease, and heart failure may not be able to take anti-inflammatory painkillers. So, check with your doctor or pharmacist before taking them, to make sure they are suitable for you.

There has been debate about whether anti-inflammatory painkillers may delay healing. This is partly because some inflammation is a necessary part of the healing process, and partly because they may very slightly increase bleeding. Current advice from UK guidelines is to put off taking this type of painkiller until 48 hours after the actual injury, when bleeding should have completely stopped.

If you take anti-inflammatory medication, ibuprofen is recommended as the one least likely to cause side-effects.

Rub-on (topical) anti-inflammatory painkillers

Again, there are various types and brands of **topical anti-inflammatory painkillers**. You can buy one containing **ibuprofen** or **diclofenac** at pharmacies, without a prescription. You need a prescription for the others. There is debate as to how effective rub-on anti-inflammatory painkillers are compared to tablets. Some studies suggest that they may be as good as tablets for treating sprains. Other studies suggest they may not be as good. However, the amount of the medicine that gets into the bloodstream is much less than with tablets, and there is less risk of side-effects.

When should I see a doctor?

You should see a doctor if there is any concern about the injury, or if the injury is severe. In particular, see a doctor if:

- You suspect a bone may be broken or a ligament is ruptured.
- You have a lot of tenderness over a bone.
- The leg or joint looks out of shape (deformed) rather than just swollen. This may mean there is a break (fracture) or dislocation which needs urgent treatment.
- There is loss of circulation in the foot (a numb, cold foot with pale or bluish skin). If this occurs, treatment is urgent.
- The pain is severe.
- You cannot walk or weight bear because of the injury.

- Bruising is severe.
- The joint does not seem to work properly or feels unstable after the pain and swelling have gone down. This may be a sign of an additional injury such as a torn tendon.
- Symptoms and swelling do not gradually settle. Most sprains improve after a few days, although the pain often takes several weeks to go completely, especially when you use the injured joint.

What is an ankle fracture?

An ankle fracture is a break to one of the bones that make up the ankle joint. These are the tibia and fibula in the leg, the calcaneus in the heel and the talus in the front part of the foot.

There are many types of ankle fracture, depending on the pattern of bony injury.

Types of fractures

Fractures may in general be:

- **Open or closed:** an open fracture is one where the skin is broken over the fracture so that there is a route of possible infection from the outside into the broken bones. This is obviously a more serious type of fracture, with damage to the soft tissues around the ankle making treatment and healing more complicated, and it needs specialist assessment.
- **Displaced or not displaced:** a displaced fracture is one where, following the break, the bones have slipped out of line. A displaced fracture also needs specialist care, as the bones will need to be properly lined up and stabilised. This may involve an anaesthetic and some kind of metal pinning or plating to the bones.

Types of ankle fracture

Doctors classify ankle breaks (fractures) in various ways. Some classifications are based on whether the line of breakage (fracture) of the bone or bones runs through the ankle joint, just above it or just below it. Other classifications are based on particular patterns of breakage which are seen after particular types of injury. These include

- **Pott's fracture:** involving both the tibia and fibula leg bones (bimalleolar fractures). These fractures are unstable and require urgent treatment.
- **Pilon fracture:** a fracture of the very end of the tibia and top of the talus forefoot bone. The talus is 'driven' into the tibia as may happen in a fall from a height or a foot braced against the floor of a car in a collision.
- **Snowboarder's fracture:** this is a fracture of the outer side of the talus produced by forced turning down and inwards of the foot at the ankle.
- **Stress fracture:** this is a small crack in a bone. Stress fractures often develop from overuse, such as from high-impact sports like distance running - the repeated stress of the foot striking the ground can cause problems. Stress fractures differ from other ankle fractures in that they result from overuse rather than sudden trauma. The cracks are small (although they may be multiple) so that, although they are painful, the swelling may be only slight. In the ankle, the heel (calcaneus) and the lower leg (fibula) are most commonly affected.

What does an ankle fracture look and feel like?

An ankle break (fracture) and a severe sprain may feel (and look) very similar. Both cause sudden pain, swelling and loss of weight-bearing. Sprains vary in severity and may not always affect the ankle to this degree. Fractures (apart from stress fracture) are almost always severe enough to cause the following symptoms:

- Fractures cause sudden pain, and they can be very painful. People who have broken a bone stop what they are doing. They are unlikely to be able to continue running, jumping or walking.
- Swelling is a feature of broken bones, because they bleed. Bones have a rich blood supply so when broken they bleed into the surrounding tissues. This happens immediately, so the swelling from a broken ankle appears fast, with the ankle usually looking significantly swollen within the first thirty minutes.

- Bruising results as the swelling is caused by blood. It may not be immediately 'bruise-coloured' as it can take a while for the bruising to track through to the skin and be visible.
- Inability to weight bear: genuine weight-bearing (taking the body weight on to the injured foot) is usually impossible or very painful in ankle fracture. An exception to this would be stress fracture, when impact is likely to be painful but may still be tolerable.
- Bony tenderness is seen in ankle fracture. There are particular points of tenderness which doctors look for under and around the ankle and forefoot (see diagram). Most ankle fractures will cause tenderness in one of these areas. This is less often the case in bad sprains, so it can be a good way of determining which injuries need an X-ray.
- Deformity: if the ankle looks odd or misshapen, not just by bruising but because the foot looks twisted or out of place, a displaced fracture is likely. This is an extremely serious condition, as when bones slip out of place nerves and blood vessels may become trapped. It's important that the fracture be assessed urgently.

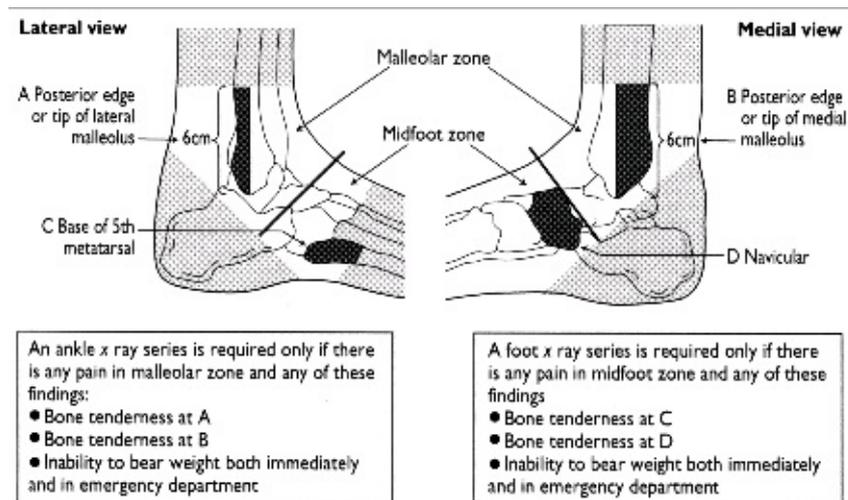
When should I have an ankle X-ray?

It can be very difficult to tell a severe sprain from a break (fracture) of the ankle.

Ankle fractures need X-ray for diagnosis, for management and in order for you to know what to expect in terms of recovery. Sprains do not need X-ray, and doctors prefer to avoid unnecessary X-rays in order to keep your lifetime exposure to radiation as low as possible.

Ottawa Rules

These are a set of rules devised by doctors to determine which ankle injuries should be X-rayed to look for fracture. They centre on whether there is bony tenderness at certain points around the ankle. If there is no bony tenderness in any of these points AND you are able to weight bear (both in casualty when seen, and immediately after the injury) then fracture is unlikely and you will probably not be X-rayed. If, however, any of those features ARE present then an X-ray will be offered in order to detect or rule out fracture.



Accuracy of Ottawa ankle rules to exclude fractures of the ankle and mid-foot: systematic review; BMJ, 2003 Feb 22;326(7386):417

How is an ankle fracture treated?

As with all breaks (fractures), the aim is to promote healing and restore function.

- If your fracture is **displaced** you will need surgical management (reduction of the fracture to re-align the bones). This is likely to be done under anaesthetic, and the bones may need some form of temporary or permanent fixation to hold them in line.
- If your fracture is **open** then you may need surgical treatment to clean your wound and repair the soft tissue damage, in addition to having the ankle fracture assessed.

If neither of these apply (ie you have a closed, non-displaced fracture) then treatment of the fracture involves:

- **Stabilisation** - initially with a 'backslab' cast which is open on one side to allow for continuing swelling.
- **Elevation** - keeping the ankle raised will reduce swelling, which in turn improves healing.
- A well-moulded cast for 4-6 weeks - after this, weight-bearing can be resumed.
- Some stable fractures are treated with a brace rather than a cast.
- Serial X-rays may be offered to make sure healing is taking place.

What does surgical treatment of ankle fracture involve?

Surgical treatment involving open reduction and internal fixation is considered for:

- Displaced fractures.
- Fractures which doctors think may be unstable (ie they are at risk of displacing).
- Some fractures which run through the joint and damage the ligaments which hold it together. These are called syndesmotic fractures and may need surgical repair.

What are the complications of ankle fracture?

Most ankle breaks (fractures) heal uneventfully. Possible early complications include:

- Infection (especially after open fracture).
- Damage to nerves and blood vessels (especially after displaced fracture).
- Compartment syndrome (severe swelling in the leg soon after the injury, putting pressure on nerves and blood vessels).
- Poor healing.
- Damage to skin and soft tissues by a tight or poorly finished cast.
- Burns to the skin as the plaster hardens.
- Failure of bones to knit together and heal well. This can lead to delayed union, union with poor alignment, or complete non-union even after six months.
- Temporary complications of wearing a cast include thinning of the bones and wasting of the muscles, both of which occur significantly even in a 4-6 week period of casting.
- Inflammation of the veins of the lower leg (**thrombophlebitis**).
- Clotting (thrombosis) of the deep veins of the leg (**deep vein thrombosis**) which can relate both to reduced mobility and to pressure on the leg veins from swelling and casting.
- Complications of surgical treatment of ankle fracture can include pain from, and infection around, surgical pins (which can in themselves be distressing and frightening).

Possible later complications include:

- Osteoarthritis of the ankle.
- Stiffness and loss of flexibility in the ankle.
- Long-term instability of the ankle joint, needing later correction.
- Algodystrophy (also called Sudeck's atrophy, or complex regional pain syndrome) is a nerve abnormality which can develop after fracture and which leads to continuous burning pain and gradual loss of strength. Treatment is prolonged and difficult.
- In children, damage to the growing parts of the bones of the ankle can affect overall growth

What about medication?

Painkiller options in ankle fracture are the same as for ankle sprain, above. However, rub-on (topical) treatments will not be possible if you are wearing a cast or have damage to the skin and soft tissues around the ankle.

How do I get back to full function after ankle fracture?

A period of immobilisation has lasting effects on the bones and muscles around your ankle. Therefore, both before and after the cast comes off it is important to work towards full recovery. This may involve physiotherapy, graded exercise and sometimes use of protective ankle supports or of crutches. It is important to take the advice of your doctor or physiotherapist before using an ankle support in the long term. Whilst a support may stabilise the ankle, the best stabilisation for your ankle is the development of its own strong and supportive muscles.

The aim of treatment

This is:

- To build up the muscles around the joint.
- To improve proprioception and balance.
- To restore the strength of the bone through weight-bearing exercise.
- To maintain or restore the normal range of movement of the ankle joint.

Preventing sprains and fractures

You can help to prevent ankle sprains by wearing boots that give ankle support rather than shoes when hiking across country or rambling over hills and uneven ground.

Exercises to build up the muscles around the ankle and to improve proprioception (described earlier under 'Other treatments') help to prevent ankle sprains. A physiotherapist can advise on these exercises.

What are the other causes of ankle pain?

- Achilles tendon injury or **Achilles tendinopathy**.
- Joint problems - eg, **gout**
- Tendon injuries, usually often due to poor running technique over a long period putting an imbalanced strain on the muscles and joints around the ankle.

The following conditions cause pain in the heel rather than the ankle, although this pain may extend into the ankle as things get worse:

- **Bruised heel**: this normally causes heel rather than ankle pain. It is usually caused by overuse such as repetitive bounding, long-distance running or landing heavily on the heel. The heel bone is protected by a pad of fatty tissue. Repeated pounding can cause the fat to flatten and move sideways so that cushioning is lost and bruising of the bone develops. It is treated by rest and prevented by protective footwear.
- **Plantar fasciitis**. This means inflammation of a strong band of tissue called the plantar fascia that stretches from your heel to your middle foot bones.

Summary

Ankle injuries are common, particularly in those involved in running sports or in any activity involving repeated impact on the ankle. Most injuries result from a sudden twist and result in pain, sometimes with swelling or instability.

If you injure your ankle and are unable to weight bear you should seek medical help, particularly if the ankle is also swollen.

If you injure your ankle and experience severe swelling or bleeding, open injury, displaced break (fracture), or any ankle injury that causes tingling, marked coldness and loss of feeling in your feet, you should seek help urgently.

You can protect your ankle by choosing suitable footwear for running sports, and ankle-supportive boots for activities that involve prolonged walking on rough ground (such as hiking) or carrying weight over rough ground (such as working on a building site).

Further reading & references

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