

Ministry of Defence

Synopsis of Causation

Acute And Chronic Soft Tissue Injury of the Lower Limb

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Disclaimer

This synopsis has been completed by medical practitioners. It is based on a literature search at the standard of a textbook of medicine and generalist review articles. It is not intended to be a meta-analysis of the literature on the condition specified.

Every effort has been taken to ensure that the information contained in the synopsis is accurate and consistent with current knowledge and practice and to do this the synopsis has been subject to an external validation process by consultants in a relevant specialty nominated by the Royal Society of Medicine.

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1. Definition

- 1.1. Acute soft tissue injury is a disruption of ligament, tendon or muscle as a result of a single episode of significant trauma in the recent past (usually interpreted as symptoms of less than 6 weeks duration).
- 1.2. Chronic soft tissue injury is a disruption of ligament, tendon or muscle as a result of single or multiple episodes of significant trauma that continue to produce symptoms after 6 weeks.
- 1.3. Overuse injury refers to symptoms arising in tendon, muscle or ligament that are attributed to multiple insignificant trauma or repeated normal use.
- 1.4. Significant trauma is trauma sufficient to cause bruising, swelling and some loss of function of the limb at the time of injury.
- 1.5. Insignificant trauma is trauma not sufficient to cause bruising, swelling or loss of function at the time of injury.
- 1.6. Anatomical instability of a joint is movement of a joint in an abnormal plane, which can be demonstrated on clinical examination or stress x-rays, e.g. positive anterior drawer sign at the ankle.
- 1.7. Functional instability of a joint is a subjective feeling by the patient that the joint is unreliable.

2. Clinical Features

- 2.1. Significant acute soft tissue injuries are characterised by pain, swelling, bruising and loss of function at the site of injury without evidence of a fracture, i.e. no bony tenderness or x-ray evidence of a fracture. There should be a history of a defined traumatic event.
- 2.2. Chronic soft tissue injuries are characterised by pain that is aggravated by using the injured limb and/or instability of the adjacent joint with a history of one or more episodes of significant trauma.
- 2.3. Overuse injuries are characterised by pain aggravated by using the limb and relieved by rest without an episode of significant trauma.

3. Aetiology

- 3.1. Acute and chronic soft tissue injuries are due to complete or partial tears of ligament, muscle or tendon.
- 3.2. Abuse of anabolic steroids¹ and use of prescribed oral steroids² render the individual more susceptible to acute and chronic soft tissue injuries. Local corticosteroid injections, as sometimes injudiciously administered by medical practitioners, can predispose to tendon rupture.³
- 3.3. Overuse injuries are aggravated by certain physical activities and training techniques, but these activities are not necessarily the cause. Minor anatomical variations such as valgus heel alignment are said to make people more prone to such conditions. This has been refuted by the evidence.⁴ A history of symptoms pre-dating the event being considered should be sought.
- 3.4. **Specific conditions**
 - 3.4.1. **Achilles tendon rupture.** Affected individuals often report that they have been hit on the back of the heel and that this is the cause of their injury. Indeed, this is what it feels like, but the rupture happens spontaneously as a result of age-related degeneration of the tendon.⁵ In the general population, it often occurs while playing squash or engaged in similar activities involving forceful acceleration. This does not alter the fact that an abnormal tendon is the underlying cause.
 - 3.4.2. **Acute and chronic ankle sprain.** These result from one or more episodes of significant trauma to the ankle. Injuries to the medial ligament complex (deltoid ligament) are uncommon in the absence of an ankle fracture and rarely cause long-term problems. Injuries to the lateral ligament complex are common. A complete tear that fails to heal satisfactorily can cause anatomical ankle instability. An incomplete tear can give rise to functional instability because of damage to proprioceptive nerve fibres from within the ligament. Patients with ankle instability and no clear history of significant trauma may have generalised ligamentous laxity as the underlying cause. This should be diagnosed by looking for hypermobility at the knees, elbows, joints of the fingers and wrist (ability to touch thumb to the forearm). In one paper 18% of male infantry recruits suffered a lateral ligament sprain of the ankle during basic training.⁶ Footwear was found to be irrelevant but sprains were more common in those with a previous lateral ligament sprain of the ankle.
 - 3.4.3. **Turf toe.** This is a tear in the great toe's plantar ligament complex of the metatarsophalangeal joint (Fig 1.) It is caused by forced dorsiflexion of the joint and is more common when sports and other athletic activities are performed in soft-soled shoes on hard surfaces.⁷ It is classically described in American Football but many other sports and military activities produce similar stress on this joint.

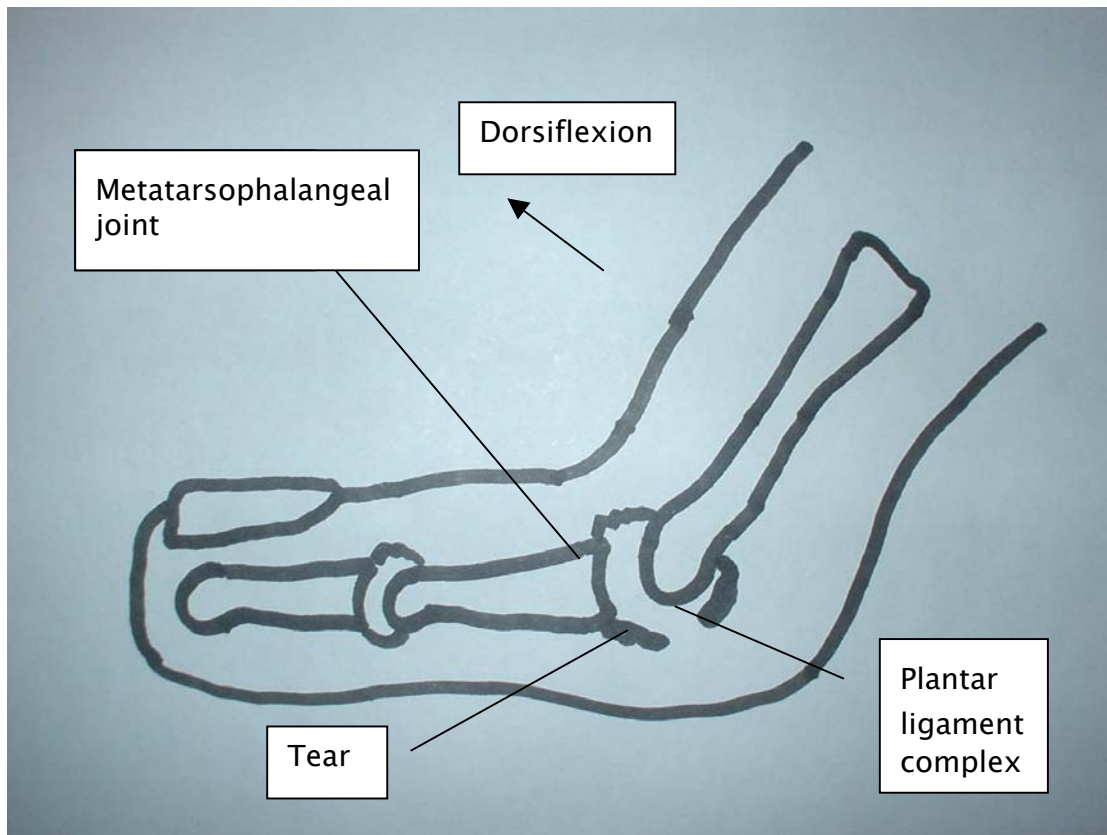


Fig 1. Turf Toe

- 3.4.4. **Other ligament injuries.** These are caused by one or more episodes of significant trauma. In young, fit people one might see an avulsed fragment of bone on the x-ray. Most do not lead to anatomical or functional instability of the adjacent joint, but this should be sought on examination.
- 3.4.5. **Knee injuries.** These are covered in other Synopses. (See Section 6).
- 3.4.6. **Muscle strains and tears.** In the context of military training or service, these injuries are caused by one or more significant traumatic events where the force across the muscle, including its own internally generated force and the external load being lifted or resisted, exceed the intrinsic strength of the muscle. In diabetics and the elderly, normal everyday forces can be enough to rupture the muscle. Early after complete muscle rupture there will be a palpable gap, with bulging of the muscle above and below. Later, weakness may be apparent but the early signs may be masked by muscle atrophy. A partial tear will cause pain, swelling and bruising at the time of injury, along with difficulty using the muscle.
- 3.4.7. **Tendon avulsions.** These are the result of one or more significant traumatic events where the tendon separates from its attachment to bone. In young, fit people, the tendon is often stronger than the bone, and an avulsed flake of bone

can be seen on the x-ray. Common sites are the insertion of the peroneus brevis into the base of the fifth metatarsal in the foot and the origin of the rectus femoris from the anterior inferior iliac spine of the pelvis.

- 3.4.8. **Acute compartment syndrome.** This is often the result of a broken bone but can be caused by a crushing of the soft tissues alone. This can happen when a leg is caught under a heavy object or when a person is unconscious and lying on the affected area without the ability to change position. Any fascial compartment in the lower limb may be affected-including the thigh, leg and foot. It occurs when the pressure within a rigid fascial compartment exceeds the ability of the body to pump blood into the muscle within that compartment. The condition is dealt with in more detail in the Synopsis *Compartment Syndrome*.

4. Prognosis

4.1 Recognised long-term sequelae

- 4.1.1 **Ununited tendon avulsions.** These can cause ongoing pain localised to the site of the avulsion and can also cause weakness in the affected muscle. These symptoms would be expected to resolve with successful surgical treatment.
- 4.1.2 **Complete muscle ruptures.** Left untreated, these lead to non-function of the affected muscle starting from the time of injury. If treated operatively, the muscle will not regain 100% strength and may also have restricted range.
- 4.1.3 **Lateral ankle ligament injuries.** A partial rupture (the typical sprained ankle) is treated initially with rest, ice, compression and elevation.
- 4.1.3.1 There is evidence that a supervised rehabilitation regime focussing on balance training can reduce the incidence of recurrent sprains (from 29% to 7%) and functional instability of the ankle joint^{8,9} when assessed at 12 months or less.
- 4.1.3.2 In the scientific literature, time of return to athletic and work activity is used as a measure of recovery and its effect on residual symptoms has not been studied. The evidence is wildly conflicting regarding whether unselected lateral ankle ligament injuries (a mixture of partial and complete tears) cause longer term symptoms. One source suggests that only 2 out of 82 patients had residual symptoms at 1 year,¹⁰ but another suggests that 14 out of 19 had residual symptoms at 2 years¹¹. This probably reflects a differing proportion of complete and partial tears in the people studied.
- 4.1.3.3 Where a complete tear is proven by arthrography or stress x-rays, functional treatment has been shown to result in less residual pain and instability (type not specified) than no treatment. In the same study, better results were demonstrated when an operation was done to repair the ligament than when functional treatment was used and functional treatment was better than 6 weeks in a plaster cast.¹² An operation to repair the ligament would therefore seem to be optimum treatment under these clearly defined circumstances.
- 4.1.3.4 Without surgical repair of the ligament, a complete rupture with demonstrable anatomical instability leads to osteoarthritis within 10 years in all, or nearly all cases.¹³ One should beware of extrapolating the prognosis for this severe and clearly defined subgroup to ankle sprains in general. Even at this late stage, an operation to repair the ligament can improve symptoms (14 of 22 with mild to moderate osteoarthritis improved). Once the stiffness of osteoarthritis has occurred, it may no longer be possible to demonstrate the anatomical instability. If ankle arthrodesis is used as a treatment for osteoarthritis then secondary osteoarthritis of the subtalar and talonavicular joints will develop in nearly all patients by 20 years post surgery.¹⁴

- 4.1.4 **Turf toe.** This is frequently stated by experts to cause osteoarthritis of the metatarsophalangeal joint of the great toe but there are no convincing studies to support this.
- 4.1.5 **Chronic ligamentous injuries of other joints.** By extrapolation from the findings for ankle and knee ligament ruptures, it would be reasonable to assume that any ligament tear causing demonstrable anatomical instability of the joint over a long period of time, would also cause osteoarthritis. Evidence is lacking because of lack of research. It is not reasonable to assume that injury to one joint can cause osteoarthritis in an adjacent joint unless the injury is severe enough to cause ankylosis, or the injured joint undergoes an arthrodesis and such treatment is a direct or indirect result of the original injury. This assumption is supported only by evidence on arthrodesis of the ankle (4.1.3) and hip (predisposing to osteoarthritis of the opposite knee.)¹⁵
- 4.1.6 **Overuse injuries of soft tissues.** These tend to recur on repeating the aggravating activity. There is no described link with osteoarthritis of adjacent joints or with other permanent harm.¹⁶
- 4.1.7 **Acute compartment syndrome.** If this is not recognised and treated by fasciotomy within 8 hours, it may lead to ischaemic contracture of the involved muscles and immediate severe permanent disablement.¹⁷

5. Summary

- 5.1 Strongly held beliefs in sports medicine sometimes have a fragile evidence base (as in turf toe).
- 5.2 Ligamentous injuries that are sufficiently severe to cause anatomical instability are known to predispose to osteoarthritis in the knee and ankle. They are also likely to do so in other weight-bearing joints.
- 5.3 Soft tissue overuse injuries do not cause long-term sequelae but may recur on repetition of the aggravating activity.
- 5.4 Compartment syndrome is well recognised to cause severe long-term, disablement if not treated promptly.

6. Related synopses

Knee - Internal Derangement

Knee Ligament Damage

Knee Osteoarthritis

Knee Pain (Anterior)

6. Glossary

ankylosis	Spontaneous fusion of a joint, resulting from a disease process.
arthrodesis	A surgical operation to fuse a joint.
arthrography	An x-ray examination where dye is injected into a joint
avulsion	Pulling off.
fascial compartment	A group of muscles, blood vessels and nerves enclosed by rigid fibrous tissue (fascia).
fasciotomy	An operation to lay open a muscle compartment.
functional treatment (of lateral ankle ligament injuries)	Treatment with a splint, special shoes, plaster cast for 3 weeks or less, strapping or elastic wrapping.
hypermobility	Movement of a joint beyond its expected normal range.
ischaemic contracture	Permanent shortening and scarring of a muscle as a result of interruption to its blood supply.
sports medicine	That subspecialty of medical practice which is concerned primarily with injuries of ligament, muscle and tendon.
stress x-rays	X-rays taken while a joint is positioned in such a way as to demonstrate an abnormal range of movement.

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