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Sports ankle injuries

Assessment and management

Background

Sports ankle injuries present commonly in the general practice setting. The majority of these injuries are inversion and plantar flexion injuries that result in damage to the lateral ligament complex.

Objective

The aim of this article is to review the assessment and management of sports ankle injuries in the general practice setting.

Discussion

Assessment of an ankle injury begins with a detailed history to determine the severity, mechanism and velocity of the injury, what happened immediately after and whether there is a past history of inadequately rehabilitated ankle injury. Examination involves assessment of weight bearing, inspection, palpation, movement, and application of special examination tests. Plain X-rays may be helpful to exclude a fracture. If the diagnosis is uncertain, consider second line investigations including bone scan, computerised tomography or magnetic resonance imaging, and referral to a sports physician. Manage all lateral ligament complex ankle sprains with ice, compression, elevation where possible and analgesia. Severe ligament sprains or rupture benefit from a brief period of immobilisation. After initial management, the athlete should complete a 6 week guided rehabilitation program. Athletes with moderate to severe lateral ankle ligament sprains should wear a semirigid or rigid ankle orthosis for at least 6 months following injury.

Keywords: ankle; athletic injuries; soft tissue injuries

CPD



Case study

Lucia is a female, 16 years of age, who plays netball with the state under 17s netball team. She presents with an ankle injury sustained at training the previous night. She is on crutches and is nonweight bearing. Examination raises the possibility of a fracture, but X-ray is negative. You diagnose a severe lateral ligament sprain and manage Lucia with ice, a compression bandage and a backslab initially. She then progresses through a 6 week rehabilitation program and you recommend she wear an ankle brace for at least 6 months.

The majority of ankle injuries are inversion and plantar flexion injuries that result in damage to the lateral ligament complex (*Figure 1*). The main ligaments of concern are the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the anterior tibiofibular ligament (also called the anterior inferior tibiofibular ligament or AITFL). The AITFL is the anterior component of the syndesmosis complex (*Figure 2*). A thorough history including past history and examination will determine the need for investigations and guide appropriate management.

History

Injury details

Severe ligament sprains or ruptures occur with high velocity injuries, such as landing on a player's foot while jumping or running. Simply rolling the ankle on an uneven surface while walking is unlikely to cause a ligament rupture or fracture in the setting of normal bone density and ligament integrity, ie. there is no history of prior ligament damage. Dorsiflexion and eversion injuries can cause damage to the syndesmosis (*Figure 2*). A syndesmosis injury takes significantly longer to recover than a lateral ligament injury and, if unstable, warrants immediate surgical referral.



Postinjury details

After a ruptured ligament or fracture, athletes are unlikely to be able to continue training or playing sport, and may be unable to weight bear (particularly with a fracture). Swelling within minutes or hours is the result of the bleeding that occurs with a ligament rupture or fracture/dislocation; swelling from synovitis takes longer to develop. Reports of a cracking noise or the feeling that the ankle bent double cannot differentiate between a fracture, ligament rupture or ligamentous sprain.¹

Past history

The past history provides the practitioner with an understanding of the state of the ankle before the current injury. Inadequate rehabilitation and a subsequently chronically unstable ankle would be expected to take significantly longer to completely rehabilitate. It is important to clarify the extent of any previous injury and any investigations or treatment. If a rehabilitation program was instituted, the clinician should seek details of the type and duration of the program. Appropriate rehabilitation programs focus on range of motion, proprioception, strength and sports specific exercises, and are usually a minimum of 6 weeks duration. Asking about previous or current use of a semirigid brace or tape may offer insight into the adequacy of past rehabilitation efforts as this is an important component of rehabilitation.

Examination

Examination of the injured ankle includes:

- Weight bearing – if the patient cannot weight bear on the affected leg for more than four steps unaided, ankle X-rays should be ordered (*Figure 3*)²
- Inspection – discoloration haematoma and significant swelling are suggestive of ligament rupture or fracture
- Palpation – pain on palpation of the posterior aspect of the medial and lateral malleolus (both sites are void of ligamentous attachments), the base of the fifth metatarsal and the proximal fibula are suggestive of fracture (*Figure 3*).² Lack of tenderness on palpation of the ATFL excludes ATFL rupture
- Range of movement – this may not assist diagnosis acutely and is likely to be limited by acute swelling and pain.

Special examination tests

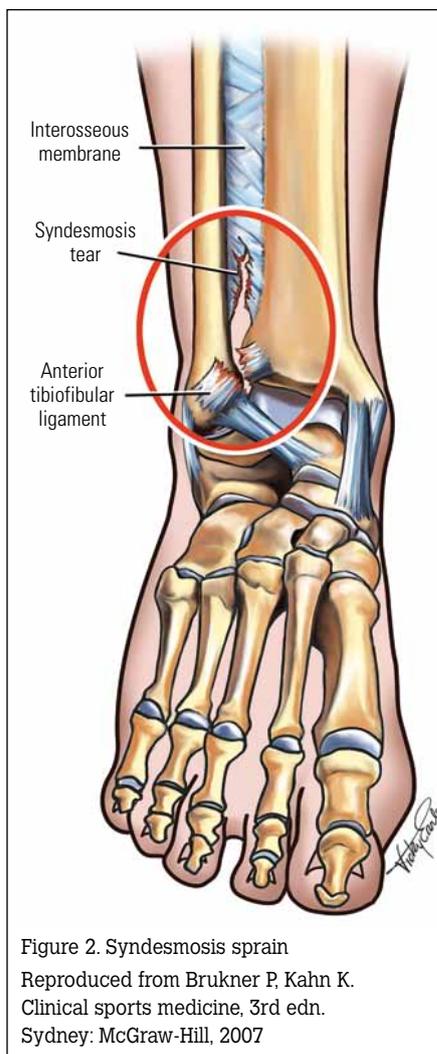
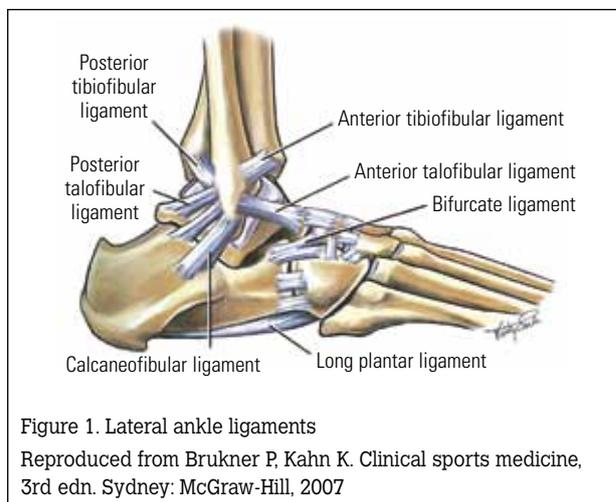
These may not assist diagnosis acutely as a result of swelling and pain. In this situation the examination should be repeated 3–5 days later when pain and swelling have subsided.

Anterior drawer test

This is performed with the knee at 90 degrees of flexion and the muscles relaxed. Increased laxity compared to the contralateral ankle reflects injury to the ATFL and possibly the CFL. The combination of discoloration haematoma, ATFL tenderness and positive anterior drawer provides sensitivity of 98% and a specificity of 84% of an acute lateral ligament rupture.¹

Lateral talar tilt test

This is performed by applying an inversion force to the ankle joint at the heel, then assessing the degree of talar tilt. A talar tilt of greater than 15 degrees reflects rupture of the ATFL and CFL (*Figure 4*).^{3,4}



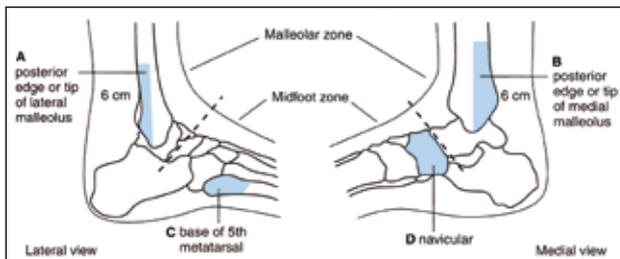


Figure 3. Ankle X-ray recommendations

Ankle X-rays are only required if there is pain in the malleolar zone and any of these findings: bone tenderness at A; bone tenderness at B; inability to bear weight both immediately and at the clinical assessment. Foot X-rays are only required if there is pain in the midfoot zone and any of these findings: bone tenderness at C; bone tenderness at D; or inability to bear weight both immediately and at the clinical assessment
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Tests for a syndesmosis injury

External rotation stress test, squeeze test and interosseous membrane tenderness length should be performed if the mechanism suggests a syndesmosis injury, or if there is tenderness on palpation of the AITFL (Table 1). Importantly, following an ankle inversion plantarflexion injury, 60% of patients will have pain over the medial malleolus in the absence of a syndesmosis injury or medial malleolus fracture.¹

Investigations

Plain X-rays are often unnecessary in the case of uncomplicated lateral ligament complex injuries. The Ottawa ankle rules (Figure 3) provide a well validated guide to assessing whether an X-ray is required to exclude a fracture.² Clinical assessment is usually adequate initially to assess the severity of ligament damage. There is no evidence based role for stress radiographs or ultrasound in acute ankle injuries.

Table 1. Clinical testing for syndesmosis injury	
External rotation stress test	The patient's ankle is passively dorsiflexed in maximal external rotation (either seated or lying prone with knee flexed to 90 degrees). Pain at the syndesmosis is regarded as a positive test
Squeeze test	With both hands clasp the medial and lateral aspects of the midcalf and squeeze. Pain distally at the site of the syndesmosis is regarded as a positive test
Interosseous membrane tenderness length	Patient sits or lies supine with their affected leg extended on examination table. Palpate between the fibula and tibia from the ankle joint proximally. Determine the length of tenderness from the distal tip of the fibula and document



Figure 4. Lateral talar tilt test

If the patient fails to improve significantly after a well guided rehabilitation period of at least 6 weeks then they should be reassessed and the differential diagnosis reviewed. At this stage, plain radiographs may be reconsidered to exclude an occult osteochondral lesion. Consider the commonly missed fractures around the ankle (Table 2). This is also an opportune time to consider referral to a sports physician.

While a plain X-ray excludes a fracture in the vast majority of cases, a bone scan or computerised tomography (CT) scan may be helpful if an occult fracture is suspected. These investigations are relatively inexpensive compared to magnetic resonance imaging (MRI) and are highly sensitive for bony pathology. Focally increased radioisotope uptake on the delayed phase of a bone scan confirms bone damage; CT provides further anatomical detail and assists determining whether surgery is required.

Magnetic resonance imaging can be useful as a second line investigation, usually in the specialist setting. It can clarify diagnoses of ligament sprain or rupture, reveal ongoing synovitis, and assess osteochondral damage that may require surgical referral.

Diagnosis and management

For management purposes, ankle injuries can be considered under the following headings:

- Mild to moderate lateral ligament complex sprain – treatable with early mobilisation and guided proprioceptive and strengthening rehabilitation program
- Severe lateral ligament complex sprain – immobilisation for a period of days in a cast (a simple backslab is sufficient) or cam walker (walking boot) followed by a guided proprioceptive and strengthening rehabilitation program
- Fracture/dislocation or unstable syndesmotic injury requiring orthopedic surgeon referral.

**Table 2. Commonly missed fractures**

- Proximal fibula
- Base of fifth metatarsal
- Anterior process of calcaneus
- Lateral talar process
- Posterior process of talus (also os trigonum fracture)
- Talar dome
- Tibial plafond

Adapted from Brukner P, Kahn K. Clinical sports medicine, 3rd edn. Sydney: McGraw-Hill, 2007

Acute phase management of lateral ligament complex strains

Once a fracture/dislocation or unstable syndesmotic injury is excluded, acute phase (1–5 days) management can be instituted. The aim is to decrease pain and swelling with ice, compression and elevation where possible. Simple analgesia (paracetamol) is useful to allow rehabilitation progression. Nonsteroidal anti-inflammatory drugs (NSAIDs) are probably best avoided early due to the increased risk of bleeding early and the impediment of tissue healing. Furthermore, acute inflammation is a necessary component of injury recovery and there is a lack of supportive data to suggest improved healing time with use of NSAIDs.

A recent study published in *The Lancet* questioned early

mobilisation for all ankle sprains and showed that severe ankle ligament sprains or ruptures had a better outcome following cast immobilisation for 10 days rather than early mobilisation with compression alone or an aircast.⁵ Severe was defined as being unable to weight bear for at least 3 days without radiological evidence of fracture. It is now generally accepted that following a severe ligament sprain or rupture, initial protected immobilisation is likely to be beneficial. A backslab or cam walker usually provides adequate protection. A more diagnostic examination is usually possible when pain and swelling have decreased and following a period of immobilisation the patient can progress to a graded rehabilitation program.

Rehabilitation

Guidelines for rehabilitation of ankle injuries are shown in *Table 3*. Ideally, the program should be supervised by a clinician (often a physiotherapist); however, in rural settings this may not be possible. The aim of a guided rehabilitation program is to improve proprioception and decrease the risk of ongoing pain and recurrent injury.^{6,7} Proprioceptive exercises are an essential component (*Figure 5*) and have been shown to reduce the rate of re-injury by up to 80%.⁸

No clinically validated tests have been created to formally assess proprioception, however, the star excursion balance test is a simple dynamic functional task that may be employed by general practitioners clinically to assess proprioception during rehabilitation (*Figure 6*).⁹ A detailed description of this test is beyond the scope of this article.

Table 3. Rehabilitation guidelines

Phase	Time postinjury	Goal of phase
Gentle pain free stretching, avoiding further tissue injury	1–2 weeks	<ul style="list-style-type: none"> • Normalise range of motion, perform three times daily
Progressive weight bearing exercises	1–2 weeks	<ul style="list-style-type: none"> • Walk with normal gait
Proprioception and resistance exercises: commence when weight bearing pain free	1–6 weeks	<ul style="list-style-type: none"> • Proprioception <ul style="list-style-type: none"> – at least 10 minutes daily – 5 days per week – progress difficulty, eg. increasingly unstable surfaces, then increase complexity of tasks while balancing on unstable surface • Strength – resisted eversion exercises <ul style="list-style-type: none"> – theraband – three sets of 15 daily – increase resistance if pain free
Return to running: commence when walking pain free, able to balance on unstable surface pain free	2–4 weeks	<ul style="list-style-type: none"> • Progression <ul style="list-style-type: none"> – slow jog – running in straight lines – slow change of direction – high speed zigzags
Return to training: functional exercises and sports specific drills	4–6 weeks	<ul style="list-style-type: none"> • Full ankle range of motion • Roughly 80% strength compared with contralateral lower limb • Running and changing direction at pace pain free • Capable of light controlled skills drills
Return to competition	5–8 weeks	<ul style="list-style-type: none"> • After two full pain free training sessions



Taping and ankle braces

Ankle taping has been shown to be effective for initial support of the injured ankle.¹⁰ However, it was found that the mechanical support of tape was reduced by more than two-thirds after approximately 400 steps.¹⁰ Lace-up ankle braces have been shown to be equally, if not more effective and more cost effective.¹⁰ Athletes with moderate to severe lateral ankle ligament sprains should wear a semirigid or rigid ankle orthosis for at least 6 months following injury.¹¹ The brace should be worn during painful activities and during exercise.

Summary of steps in assessment and management of ankle injuries

- Take a full history to determine the severity, mechanism and velocity of the injury, what happened immediately afterward and whether there is a past history of inadequately rehabilitated ankle injury.
- Examine the patient to determine whether any investigations are necessary, starting with an X-ray.
- Refer any fracture/dislocation or unstable syndesmotic injury to an orthopaedic surgeon.

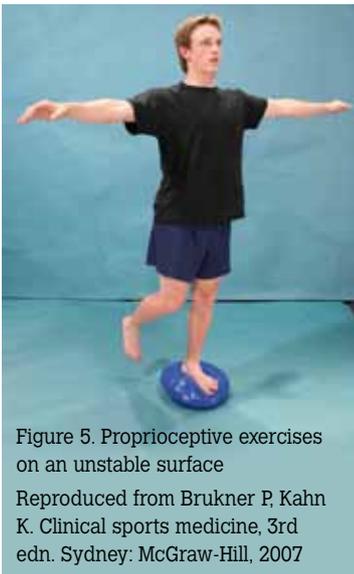


Figure 5. Proprioceptive exercises on an unstable surface

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Figure 6. Star excursion balance test

- Manage a lateral ligament complex sprain with ice, compression, elevation where possible and analgesia. Severe ligament sprains or rupture benefit from a brief period of immobilisation.
- Organise a thorough rehabilitation program of 6 weeks duration postinjury. Athletes with moderate to severe lateral ankle ligament sprains should wear a semirigid or rigid ankle orthosis for at least 6 months.
- If pain persists after a well guided rehabilitation program, revisit the diagnosis and consider further investigations and referral to a sports physician.

Resource

Brukner P, Kahn K. Clinical sports medicine, 3rd edn. Sydney: McGraw-Hill, 2007.

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Conflict of interest: none declared.

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