

# More about...Football medicine

## Muscle injuries in football

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In football, as in other sports, muscle injuries can be either strain injuries or contusions from a direct external force. Muscle strain injuries are particularly common in female<sup>1</sup> and male football players and account for: (i) approximately 10 - 30% of all football injuries;<sup>2,3</sup> and (ii) 15% of more severe injuries.<sup>4</sup> In elite football players muscle strain injuries account for an even larger proportion of injuries (31 - 43%).<sup>5</sup> Such injuries occur most commonly in the thigh (8 - 22% of football injuries, mostly hamstring injuries), groin (hip adductors), and calf muscles.<sup>3,5,6</sup>

A large number of studies have been conducted to identify possible risk factors for muscle strain injuries in football. The results of these studies show that the most important risk factors for such injuries are previous injuries (hamstring and groin),<sup>7</sup> reduced muscle strength and muscle strength imbalances (reduced hamstring to quadriceps strength ratio),<sup>7,9</sup> reduced pre-season range of motion (ROM),<sup>10,11</sup> reduced core muscle strength, and delayed activation of the transversus abdominis muscle.<sup>7</sup> The following were not identified as significant risk factors for hamstring strains: age, body size, limb dominance and playing position.<sup>10</sup>

Diagnosis of a muscle strain injury is based on a detailed history of the mechanism of injury and the presence of symptoms (acute pain, loss of function, swelling). A careful clinical examination to determine the exact anatomical location and grade of the injury is needed. Soft-tissue diagnostic ultrasound and magnetic resonance imaging (MRI) are very important special investigations that will assist the specialist in confirming the clinical diagnosis of a muscle injury.<sup>12-14</sup>

The treatment of acute muscle strain injuries has been reviewed<sup>15</sup> and is based

on the stage of the injury. The immediate management of a player who has just sustained an acute muscle strain injury is: (i) to remove the player from the field; (ii) to apply ice (5-minute intervals for 4 sessions, every 60 minutes) and compression to the area; and (iii) to elevate the limb. In the acute inflammatory phase (2 - 72 hours after injury) the management principles are to use analgesics (paracetamol with/without codeine) in the first 24 - 48 hours, and to avoid the use of non-steroidal anti-inflammatory drugs (NSAIDs) as there is evidence that these agents may have a negative effect on tissue healing. Clinical assessment should be repeated at 24 - 48 hours, and if signs of inflammation are still present a short course (5 - 7 days) of NSAIDs may be commenced. In the early repair phase of a muscle after injury, mobilisation and use of therapeutic ultrasound (in the first 7 - 10 days after injury) have been shown to improve healing of muscle tissue.<sup>16</sup> In recent years there has been considerable interest in the potential use of growth factors and stem cells to improve healing<sup>17-21</sup> in the early repair phase. Currently, the most popular technique is platelet-rich plasma (PRP) injections.<sup>18-20,22</sup> In general, these techniques are promising but require further scientific investigation to determine efficacy and safety. Currently, the World Anti-Doping Agency (WADA)'s rules related to doping state that intramuscular injections with PRP require a TUE (therapeutic use exemption - essentially an application for permission to use), but other forms of use (e.g. local infiltration) merely require a Declaration of Use (DoU). After the acute inflammatory and early repair phases tissue healing and remodelling take place. During this time active rehabilitation of the muscle injury is the main focus. Traditional rehabilitation, consisting of flexibility training and restoring of muscle strength, is important, but there is evidence that specific consideration should be given to the lumbar spine, sacro-iliac and pelvic alignment and postural control mechanisms.<sup>23</sup>

Guidelines with regard to the return to play after a muscle injury are important for the attending sports physician, but there is no clear consensus on these guidelines.<sup>24</sup> It is well established that there is a high risk of recurrent injury during the first 12 weeks after injury.<sup>25</sup> The following are clinical guidelines for return to play after a muscle injury:

- There must be no pain, weakness, stiffness, tenderness or pain with muscle contraction.

- A full range of motion must be restored and the football player must perform normally during full functional sports-specific testing. It has been suggested that isokinetic muscle strength testing should show normal concentric and eccentric muscle strength (within 10% of the non-injured side) and normal muscle strength ratios must be present (concentric agonist/eccentric antagonist).
- Normal muscle activity patterns must be restored before the player can return to full play.

It has been shown that muscle strain injuries in football can be prevented by football-specific balance training in a dose-response fashion.<sup>26</sup> Therefore, in addition to strengthening of the muscles,<sup>27</sup> in particular eccentric training,<sup>28</sup> neuromuscular and proprioceptive training are important components of a muscle injury prevention programme in football.<sup>27</sup>

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## Foot and ankle injuries in football players

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Twenty-five per cent of athletic injuries involve the foot and ankle.<sup>1-4</sup> Underdiagnosis and undertreatment are common, causing poor functionality and high risk of re-injury.<sup>1,4,5</sup> Correct, specific diagnosis and management are therefore necessary.

Appropriate management of acute injuries (mainly ankle injuries) requires specific diagnosis and correct, urgent treatment. Successful management of chronic injuries (mainly foot injuries) depends on management of the presenting symptoms and possible causes of injury.<sup>1,6</sup>

Clinical pointers on selected common and 'not to be missed' conditions are discussed below.

### Ankle sprains

The most common football injury is the lateral ankle sprain.<sup>7-9</sup> Associated pathology, including osteochondral and joint cartilage damage, impingement, or tendon injury, should not be missed, because appropriate management prevents recurrent injury. Residual poor functionality nearly doubles the chance of re-injury.<sup>1,9</sup>

A typical ankle sprain is an inversion injury in plantar flexion. The anterior talofibular ligament, which runs anterior to the lateral joint line between the calcaneus and the talus, is injured in 80% of cases. Injury history should include timing of the injury and recurrence. Physical examination should note swelling, haematoma/ecchymosis, localisation, deformity and neurovascular status. Medial involvement usually indicates a severe injury, justifying earlier and more rigorous special investigations and indicating a possible prolonged recovery time.<sup>1</sup> High ankle injuries may point to injury of the inferior tibiofibular ligament/syndesmosis, which puts the integrity of the ankle joint at risk and demands a thorough investigation.<sup>7</sup> It may be suspected in the case of a painful 'squeeze test', performed by compressing the distal tibiofibular interval.<sup>1</sup>

The Ottawa Ankle and Foot Rules are used to indicate the need for radiography after ankle and foot injuries (Table I). Full,

functional rehabilitation of a grade 2 ankle sprain can take up to 20 weeks.<sup>1</sup> Treatment for the first 24 - 48 hours consists of rest, application of ice (20 minutes every 2 hours), compression and elevation.<sup>8</sup> Reassessment after 3 - 5 days is important for more accurate diagnosis.<sup>7</sup> Management is focused on early mobilisation. Short-term immobilisation is used for initial pain management and weight bearing. The use of anti-inflammatory medication (non-steroidal anti-inflammatory drugs (NSAIDs)) is controversial and is mainly indicated for analgesia.<sup>11</sup> Full range of motion, muscle strength, proprioception and neuromuscular function are mandatory to prevent re-injury. Taping or bracing is used until the foregoing are achieved and should be continued for 6 - 12 months.<sup>9</sup> Progress can be measured by comparing the injured ankle with the uninjured one. Muscle strength can be assessed against manual resistance or with functional tests, such as comparing the number of calf raises that can be done with each leg. Proprioception is easily measured by comparing the ability to balance on the injured limb with the contralateral limb, first on a stable surface and then on an unstable surface. Neuromuscular function can be assessed with progressive functional tests, such as jumping, hopping, running and direction-changing drills.<sup>6-9</sup>

### Disorders of the hindfoot

**Acute Achilles peritendonitis** causes local tenderness, mild swelling and significant pain, characterised by a quick onset and often a definitive causative factor. Treatment includes limitation of possible causative factors, ice and NSAIDs.<sup>6</sup>

**Chronic Achilles tendinopathy** is a degenerative condition of longer duration, best treated with limitation of causative factors, analgesics, ice, and eccentric



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**Table I. The Ottawa Ankle and Foot Rules, indicating the need for radiographs after acute ankle or foot injury.**<sup>1,10</sup>

Indications for radiographs of the ankle after acute injury	<ul style="list-style-type: none"> <li>• Pain in the malleolar zone, and</li> <li>• One of the following:               <ul style="list-style-type: none"> <li>• bone tenderness at the posterior edge or tip of the lateral malleolus</li> <li>• bone tenderness on the posterior edge or tip of the medial malleolus</li> <li>• inability to bear weight for 4 steps, both immediately after injury and at the clinical assessment</li> </ul> </li> </ul>
Indications for radiographs of the foot after acute injury	<ul style="list-style-type: none"> <li>• Pain in the midfoot zone, and</li> <li>• One of the following:               <ul style="list-style-type: none"> <li>• bone tenderness at the base of the 5th metatarsal</li> <li>• bone tenderness of the medial midfoot (navicular)</li> <li>• inability to bear weight for 4 steps, both immediately after injury and at the clinical assessment</li> </ul> </li> </ul>

exercise protocols.<sup>12</sup> Evidence is mounting for the use of nitric oxide donor therapy (GTN patches), extracorporeal shock-wave therapy (ESWT) and sclerosing agents.<sup>6</sup> NSAIDs are best avoided in this condition.<sup>11</sup>

**Anterior/posterior ankle impingement** is common in football players with residual ankle laxity. Symptoms include sharp, localised anterior or posterior ankle pain on end-range plantar flexion or dorsiflexion. Treatment includes local physiotherapy, NSAIDs, orthotics, external stabilisation of the ankle or surgical removal of spurs.<sup>1,6</sup>

**Peroneal longus tendonitis** causes pain of the lateral ankle where the tendon passes beneath the cuboid towards the insertion on the plantar base of the first metatarsal. It is treated with ice, NSAIDs, rest and biomechanical correction.<sup>1</sup>

**Peroneal brevis ruptures** occur in association with inversion ankle sprains, usually 3 - 5 cm proximal to the insertion on the base of the 5th metatarsal. Chronic, degenerative tears and rupture require surgical debridement and repair.<sup>1</sup>

**Tarsal tunnel syndrome** causes sensory symptoms on the plantar aspect of the foot and tenderness behind the medial malleolus owing to entrapment of the posterior tibial nerve in the tarsal tunnel. It is associated with excessive pronation or space-occupying conditions in the tunnel, such as ganglions or varicose veins.<sup>1,6</sup>

**Sinus tarsi syndrome.** The sinus tarsi is an osseous canal running from an opening that is antero-inferior to the lateral malleolus in a postero-medial direction.

Synovitis in the sinus tarsi causes poorly localised pain in the area. It is associated with previous inversion sprains and poor biomechanics. Treatment includes subtalar joint mobilisation, anti-inflammatory treatments and biomechanical correction.<sup>6</sup>

### Disorders of the mid- and forefoot

**Lisfranc injuries** are ligament injuries to the tarsometatarsal joints, ranging from partial sprains to complete tears with displacement. A Lisfranc injury and fracture dislocation should be considered and managed in any slow-responding midfoot sprain because of disastrous secondary changes if untreated.<sup>1,6</sup>

**Navicular stress fractures** require a high index of suspicion and conservative immobilisation, as delayed or non-union is common.<sup>6</sup>

Fifth metatarsal injuries include **avulsion fractures of the peroneal brevis attachment, proximal diaphyseal (Jones) fractures and stress fractures.**<sup>1</sup> The treatment for each fracture is different and specialist consultation is advised.

Other common injuries of the ankle and foot include **Morton's neuroma, tibialis posterior dysfunction, peroneal dislocation and extensor tendonitis.** Meticulous diagnosis of foot and ankle injuries ensures optimal management. General terms such as 'foot sprain' should therefore be avoided.

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