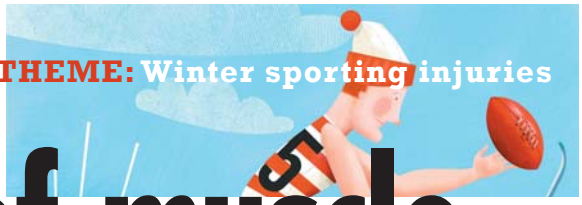
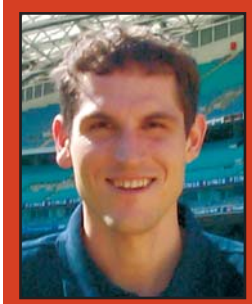


Management of muscle and tendon injuries in footballers

John Orchard



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BACKGROUND Muscle and tendon injuries are among the commonest football injuries and can be very frustrating to treat because of the high risk of recurrence.
OBJECTIVE This article aims to highlight the optimal management of, and risk factor for re-injury of, the common soft tissue injuries in football players.
DISCUSSION The high risk of recurrence of soft tissue injuries is because most football players return to play before complete healing of the injury. For hamstring and quadriceps strains and thigh haematomas, early return is often a sensible strategy. Calf strains in older players and tendinopathies (Achilles, patellar tendon and chronic groin injuries) generally require a more conservative approach as the risk of prolonged missed playing time is greater. The rupture of tendons that have nearby agonists can often be managed conservatively, but rupture of isolated prime mover tendons, such as the Achilles and patellar tendons, should be managed surgically.

Muscle and tendon injuries – often called 'soft tissue' injuries – are a source of tremendous frustration for football players. Many team doctors feel more comfortable treating a fracture or major joint ligament injury, where the disability is obvious and the player accepting that he will miss time through injury, than a soft tissue injury. Soft tissue injuries are often insidious in onset and apparently minor at the initial presentation, but have a very high rate of injury recurrence. This extent is detailed in Table 1, showing for example that of all players who miss a match with a hamstring strain, after return to play 34% will miss a further match due to a hamstring strain on the same side at a later stage that season.[1] This figure is for the fully professional Australian Football League (AFL) competition, where clubs have full time rehabilitation staff whose job includes formulating injury management plans and objective fitness testing before return to play.

The most relevant cause of the high recurrence rate is the professional environment itself, which necessitates playing as many matches as possible. Return to play after a soft tissue injury almost always involves a degree of risk taking; risks related to soft tissue injuries are considered acceptable at the professional level as long term disability is unlikely.

Australian Football League has the highest rate of noncontact soft tissue injuries.[2] Rugby League and Rugby Union generally have higher rates of contact mechanism injuries. This difference is particularly accentuated in the rugby forwards, whereas the backs are more free running players and have an injury profile similar to AFL players.[2] This article focusses first on lower limb muscle injuries, and then, the most important tendinopathies.

Muscle injuries

Hamstring strains

Hamstring injuries usually occur when a player overstrides when running at full speed.[3] Bending

Table 1. Incidence, prevalence and recurrence rates of soft tissue injuries in AFL[1]

Injury category	Incidence (n/team season)	Prevalence (missed games/ team season)	Recurrence rate
Groin strains	3.3	11.9	21%
Hamstring strains	6.2	21.2	34%
Quadriceps strains	2.5	7.6	23%
Thigh haematomas	0.9	1.4	5%
Patellar tendon injuries	0.7	2.9	20%
Calf strains	1.9	5.4	19%
Achilles tendon injuries	0.4	1.4	23%

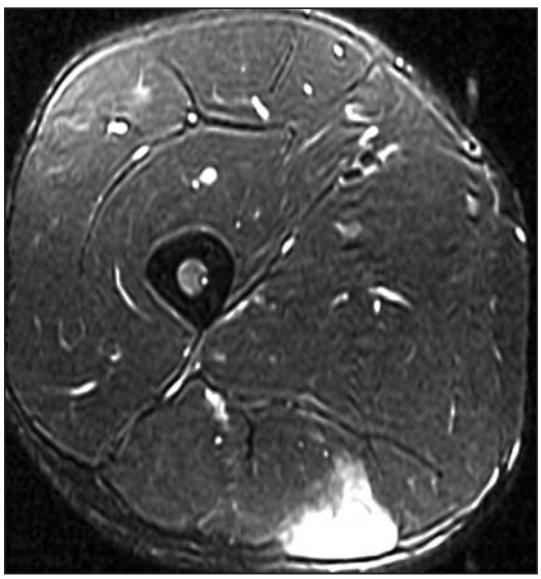


Figure 1. MRI cross section of thigh muscles showing right semitendinosus strain

over to pick up a ball when running at pace is a particular risk. During these types of movement, the hamstring muscles are relatively more stretched than during a stride of normal length at maximum speed, although they do not reach maximum muscle length. It is not known whether the actual muscle injury in sprinting occurs during the late swing phase (when muscle length and stretch is greatest) or early stance phase (where stress due to ground reaction forces is greatest).[4–6] The most established risk factors for hamstring strain are age and injury history and regrettably these are not reversible.[7,8] Another likely risk factor is low strength (usually measured by hamstring to quadriceps [H:Q] ratio of less than 0.60).[9–11] Only one study has suggested that hamstring strains can actually be prevented by reversing strength deficits.[12]

The most important variant of hamstring injury to exclude on the initial examination is a ruptured hamstring origin tendon.[13] These injuries will almost always cause the player to immediately cease running and present with severe hamstring weakness, proximal tenderness, swelling and often bruising. If such an injury is suspected, ultrasound or magnetic resonance imaging (MRI) is indicated as surgical repair of a proximal tendon rupture is required to return to full activity. The MRI appearance of a typical hamstring muscle strain is shown in Figure 1. Magnetic resonance imaging is generally only indicated for prognosis in professional players, where it has been shown that amount of time to return to play is proportional to cross sectional area of signal change on the T2 images.[14] In the rugby codes, return to play is also dependant on player position. Forwards can often carry hamstring injuries without missing any matches, whereas the prognosis for outside backs is similar to AFL and soccer players, where most players will usually miss at least 2–3 weeks of playing.

Return to jogging and nonweight bearing exercise can be accelerated after a hamstring strain, as these activities are very unlikely to stress the hamstring muscle group. Return to full speed running and full training should only occur when normal strength (>90% of the unaffected side) and range of motion have returned.[12] Performance at training should dictate whether a player returns for matches. A player is at risk of re-injury for at least 6–8 weeks after return to play,[15] so should only undertake sprinting and other high risk drills with extreme caution in this period. The clinician must convey to the athlete and the coach, that return to play following a muscle strain does not usually coincide with full recovery and healing from the injury. The concept of a player 'carrying' a muscle strain is an accurate expression.[15]

In some sports, NSAIDs and cortisone injections are used by some clinicians to promote early return to play after muscle strains.[16–18] This use of anti-inflammatory agents is currently a decision based on clinical experience rather than carefully controlled clinical studies. The risk of using anti-inflammatory agents is that healing and scar formation will be delayed, possibly predisposing to recurrence. In some cases, pain from excessive scar formation may delay recovery so there is an argu-

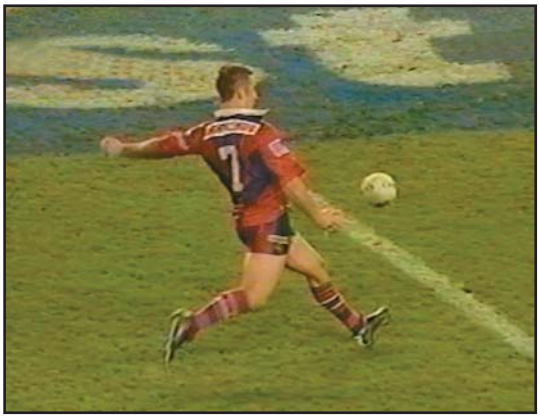


Figure 2. Video still of likely timing of right rectus femoris strain during kicking

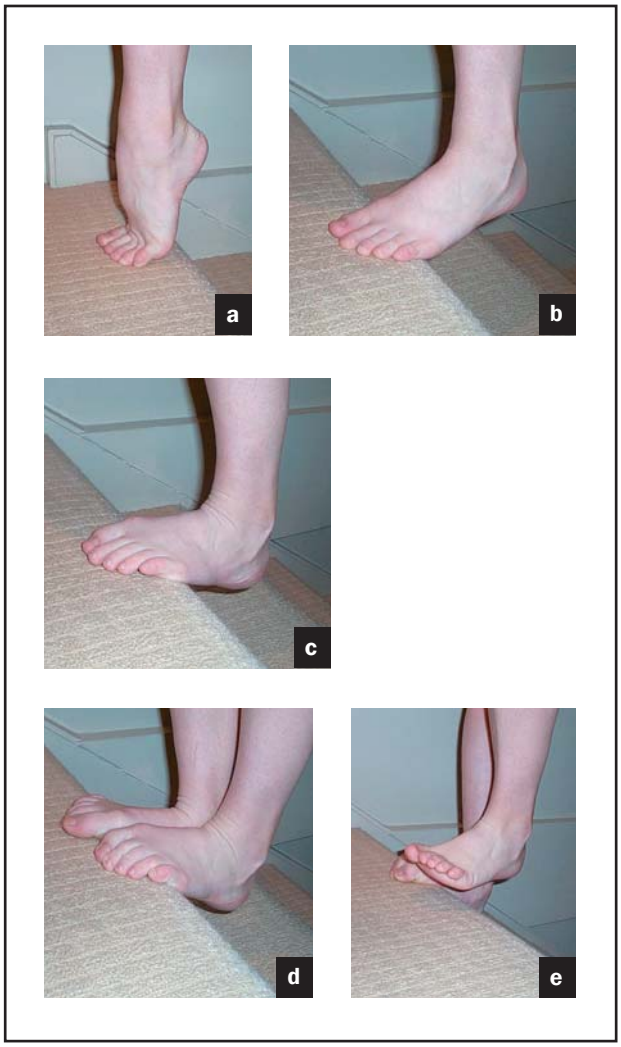
ment for use of anti-inflammatory agents if the pain of the injury appears to be out of proportion to the structural lesion.[15]

Calf strains

Although soleus strains are not uncommon, the majority of calf strains affect the gastrocnemius muscle. These occur during the commencement of the second step of take off movements, when the lead leg has left the ground.[6] It should be explained to the player that acceleration, not velocity, puts the greatest load on the calf. Because of this, gastrocnemius strains are much more likely to recur in everyday activities, such as taking off to cross the road, or when walking with a dog in the park or up a slope. A heel raise during walking and training unloads the calf, and players with a history of calf strains should have their boots wedged to increase the heel height. Even more so than hamstring strains, calf strains are far more common in older players.[7] A severe calf strain is a rare event in a 20 year old but one of the commonest injuries in a player over 30 years of age. The almost ubiquitous mild L5/S1 disc degeneration in veteran football players is probably related to the propensity for older players to strain their calves.[7]

Quadriceps strains

Quadriceps strains, mostly affecting the rectus femoris, are a common injury in AFL[1] and soccer.[19] Even though the common denominator in these sports is kicking, it is unlikely that the quadriceps strains during ball contact.[3] A kick 'on the run', even when aiming for short distance, is the activity of highest risk for a quadriceps strain, more so than a kick for full distance from a standing start. In a running kick the step before the kick involves a short stride and upper body deceleration, which increase the stretch on the rectus femoris (Figure 2).[3]



Figures 3a-3e. Eccentric (lengthening only) calf and Achilles strengthening exercises

Thigh haematomas

The 'corked thigh' is the commonest muscle haematoma in football players.[2] Despite an extensive amount of muscle damage which can be demonstrated on imaging modalities, these injuries usually recover very rapidly, so imaging is not necessary unless recovery is taking longer than expected. Range of motion is a good prognostic indicator, with an inability to flex the knee past 90 degrees suggesting a more severe injury. Massive bleeding can rarely lead to an acute thigh compartment syndrome which requires surgical assessment.[20] A late complication is myositis ossificans. Anti-inflammatory medications should not be used acutely as they

affect platelet function and hence can increase bleeding, however, they can be used to prevent myositis ossificans. Acute bleeding can be assessed by an ultrasound and any cystic area drained.

Tendinopathies

Achilles tendinopathy

Like calf strains, Achilles tendinopathy is more common in older players. Although this condition is degenerative (rather than inflammatory), players can be reassured that adults can lay down adequate new collagen to repair degenerative areas of tendon. The key management principal is graduated loading, including eccentric (lengthening only) strengthening exercises (Figure 3a–3e).[21] Very few athletes require total rest from running or immobilisation. Heel raises and football boot wedging to increase heel height are helpful. Cortisone injections are contraindicated due to lack of success and increased risk of rupture.[22] Aprotinin (Trasylol), which probably works as a protease (collagenase) inhibitor, can be used in injection form as a better alternative.[23]

Patellar tendinopathy

Patellar tendinopathy is also known as 'jumper's knee', and is more common in AFL players and rugby union second rowers. The treatment principals are very similar to Achilles tendinopathy, including eccentric strengthening, relative rest with graduated loading and Aprotinin injections.[24,25] Surgery for both of these tendinopathies has limited success.

Groin injuries

The differential diagnosis of groin pain is extremely complicated.[26] Adductor muscle strains are common and fortunately recover quickly, although they can occasionally lead to adductor tendinopathy. Chronic groin pain is often due to osteitis pubis,[27] which is probably a bony stress overload lesion at the end stage of insertional tendinopathy. The standard treatment of chronic groin overuse injuries is reduction of load (rather than total rest) to a level where the pain is not worsening. Fortunately many football players can continue to play once a week and limit their training without aggravating a chronic groin injury. In the off season, jogging is generally encouraged, followed in order by faster running, maximal sprinting, kicking from a standing start, change of direction movements and then kicking on the run. Surgery is sometimes indicated, including hernia repair and adductor tenotomy.[28] In addition to unresolved chronic pain, the indication for adductor tenotomy includes painful reduction of range of passive hip abduction, as surgery can correct this. A hernia repair is indicated if there is pain and clinical or imaging (usually ultrasound) evidence of a hernia or posterior inguinal wall deficit.[29]

Rupture of other tendons

The commonest tendons to rupture in football players are the finger flexor tendons. The optimal management is acute surgical repair, as this leads to the best functional outcome. This management is problematic in high level football players who are likely to wish to return shortly after surgery that jeopardises the surgical repair. Many professional players elect to continue to play important games and put up with the inevitable fixed flexion deformity. Tendons that rupture, which have nearby agonists, such as long head of biceps brachii and distal semitendinosus, are often managed conservatively as the functional deficit is generally acceptable.

Full thickness rotator cuff tendon tears, proximal hamstring, Achilles tendon and patellar tendon rupture are not common but need to be managed surgically in football players.

SUMMARY OF IMPORTANT POINTS

- Muscle and tendon injuries in footballers frequently recur.
- Acceleration, not velocity, places the greatest strain on the calf.
- Cortisone injections are contraindicated in Achilles tendinopathy.
- Bending to gather a ball while running at full speed places extra strain on the hamstrings.
- 'Kicking on the run' is a high risk activity for quadriceps strain.

Conflict of interest: none declared.

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