CASE REPORT

Proximal hamstring avulsion in a professional soccer player

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Elite athlete;
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Summary Acute hamstring strains are a common athletic injury, which may be treated non-operatively with a satisfactory outcome. A complete proximal hamstring avulsion is a rare and potentially career ending injury to an elite athlete. For these high demand patients, surgical reattachment should be immediately undertaken to shorten return to sport and to improve functional outcome. This report describes the occurrence of a complete avulsion of the proximal hamstrings in a professional footballer during an international match. We highlight the clinical presentation, the appropriate diagnostic investigations, the surgical technique and the rehabilitation protocol for this injury. The successful surgical reattachment of the common hamstring tendon was confirmed by magnetic resonance imaging done 5 months after repair and allowed the player a full return to competition at 6 months after surgery. Hamstrings isokinetic peak torque was 80% at 6 months and 106% at 11 months after repair comparing with the uninjured side.

Introduction

Hamstrings are the most common muscles injured in professional athletes [1]. The majority of acute hamstring injuries are partial thickness tears. Full recovery of the patients can be expected with conservative treatment followed by an appropriate physical therapy program. In contrast, a complete proximal hamstring avulsion is a rare but serious injury. For these injuries, poor outcomes following non-operative management have been reported [2–4]. Due to the scarcity of these lesions, there is a lack of studies comparing the results between conservative and surgical treatment. Nevertheless, recent literature suggests that early surgical reattachment gives an athlete a greater chance of returning to their pre-injury level of sport and achieve a better functional outcome [5]. For an elite athlete, surgical repair of a complete hamstring tear may be indicated. We describe its occurrence in a professional international soccer player.

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and highlight the need for early surgical reattachment of this uncommon and potentially career ending injury.

Case presentation

A 24-year-old professional soccer player injured his left leg during an international match. The injury occurred while attempting to cross the football towards goal. Just prior to striking the football, with his left knee extended and the hip flexed, he felt a sudden painful sensation in his thigh. He immediately collapsed clutching the posterior aspect of his left thigh. On examination there was significant swelling and localised tenderness of the left posterior thigh. Comparison to the right revealed asymmetry of the left posterior thigh with a visible distal bulge and a palpable defect just distal to the ischial tuberosity. Weakness with active and active-resisted knee flexion was found on muscle testing. He had no previous history of hamstring injury.

Magnetic resonance imaging (MRI) of the pelvis and thigh showed complete avulsion of the common hamstring tendon from its ischial insertion (Fig. 1A and B).

In accordance with the player, the decision was made to perform an early surgical repair. The choice of this treatment option was based on the poor outcome and low rate of return to sports associated with non-operative management and the higher risk of complication associated with chronic surgical repair [2].

Surgery was performed in the prone position with the knee flexed to 60° to take the tension off the hamstrings. A longitudinal incision was made from the inferior gluteal crease to 8 cm distally (Supplementary data, Movie 1). The posterior cutaneous nerve of the thigh is identified and protected. The posterior fascia was divided and the gluteus maximus was retracted superiorly. The sciatic nerve, located deep and lateral to the proximal hamstring origin is identified and protected. The hamstring tendon was readily identified and mobilised (Fig. 1C) (Supplementary data, Movie 1). The hamstring insertion on the ischial tuberosity was identified and a rongeur was used to denude the bone of soft tissue to enhance healing. Two 6 mm resorbable Mitek suture anchors loaded with #4 Orthocord were placed in the ischium (Supplementary data, Movie 1). One limb of each suture was stitched through the tendon in a locking stitch; the other limb was used to secure the fixation (Fig. 1D). With the anchor acting as a pulley, tension was placed on the simple stitch pulling the tendon to the ischium. The sutures were tied sequentially with the knee at 60° of flexion providing a tension free repair (Supplementary data, Movie 1).

Figure 1 Imaging. A. T2 Coronal shows a complete avulsion of the proximal hamstring (arrow) with retraction of approximately 4 cm surrounded by a large haematoma between the adductor compartment and the hamstrings. B. T1 axial shows a complete avulsion of proximal hamstring tendon from the ischium (arrow). C. Mobilisation of the common hamstring origin at the time of surgery. D. Representation of the surgical technique used to reattach the hamstrings to the ischial tuberosity. E. T1 coronal at 5 months post-surgery shows the reattachment of the common hamstring tendon to the ischial tuberosity (arrow). F. Axial at 5 months post-surgery demonstrating the tendon/bone healing.
To reduce the stress on the tendon repair the limb was immobilized with the knee flexed at 45° for the first 4 days following surgery. A hinged knee brace was applied to allow immediate free range of passive movement from 30° to 110°. This was gradually increased to a full range of motion. The patient was kept to 50% weight bearing for 4 weeks, which was advanced to full weight bearing at day 30. No stretching work was permitted at this stage. The second phase of rehabilitation started at 4 weeks. At this stage active work without resistance was started. At 3 months isokinetic work was commenced in the lying position. The final stage of rehabilitation began at 4 months post-surgery. Jogging without acceleration was initiated with continued strengthening. MRI imaging at 5 months was performed to check the healing of the repair. Complete healing of the common hamstring origin onto the ischial tuberosity (Fig. 1E and F) was observed and allowed the patients to return to full training. The patient returned to competitive football at 6 months after surgery. The isokinetic data (Cybex international, Ronkonkowa, NY) at 6 and 11 months after the surgical repair presented in Table 1 underline at 11 months comparable features for the operated versus the non-operated limb (Fig. 2).

### Discussion

Proximal hamstring avulsions occur due to forceful eccentric contraction of the hamstrings secondary to sudden hip flexion in combination with knee extension [6]. In this case the injury occurred during an attempt to cross the football. As the player’s swinging left leg contacts the ground his knee is fully extended and his hip is flexed. This places the hamstrings at their maximal stretch and the avulsion occurs as they eccentrically contract. Following avulsion, a palpable proximal defect in the posterior thigh associated with gross swelling and ecchymosis should alert a sports physician to its occurrence. However the defect can often be masked by the haematoma [7]. If there is a suspicion of a proximal hamstring avulsion immediate imaging is recommended to confirm the diagnosis. MRI is the best investigation as ultrasound, due to the depth of the injury and the presence of extensive haematoma, can miss up to 42% of these injuries if used alone [8].

Conservative treatment is recommended in the case of partial hamstring tears, but its ability to restore function and to allow a full return to sports in the case of complete hamstring avulsion is questionable. A number of studies have shown significant functional loss following conservative treatment of complete proximal hamstring avulsions. Cross et al. [9] reported no improvement in a series of 9 patients who had extensive physical therapy. For Sallay et al. [2], patients treated non-operatively showed a low rate of return to sport, difficulty to run or to participate in sports requiring agility. This finding was confirmed by Kurosawa et al. [3] who contrasted the poor outcome of the conservative management of a hamstring avulsion against that of a similar patient who demonstrated no difficulty for any sporting activities following early surgical repair. These good results have been reported after acute or delayed surgical repair [7,9,10] with better results after early reinsertion [11]. In addition, in chronic repair, extensive dangerous sciatic nerve neurolysis is required [9] resulting in an increased frequency of sciatic nerve injury [12]. In a series of 62 consecutive repairs, Wood et al. [13] reported 80% of the patients return to their pre-injury level of sports at 6 months post-surgery. The author advocated for an early repair as delayed surgical treatment was associated with a more challenging procedure, an increased risk of sciatic nerve injury and reduced post-operative hamstring strength and endurance. Acute surgical repairs, lead to a mean postoperative hamstring strength and endurance of 84% and 89% respectively compared to that of the contralateral leg [14].

This work suggests that early surgical repair of complete hamstring tears is the optimal treatment especially for the elite athlete. Most authors recommend that the surgical repair be performed within 5 weeks of the initial injury [7,11–14]. Up to this time, there is usually no tethering and the tendon can be repaired to the bone without tension, allowing rehabilitation without restriction. Moreover,

**Table 1** Isokinetic data at 6 and 11 months.

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| **Isokinetic data at 6 months**
  (in % of uninvolved limb) |             |                |                 |
| Peak torque   |             |                |                 |
| Hamstring     | 79          | 63             |                 |
| Quadriceps    | 100         | 102            |                 |
| Total work    | 85          | 72             |                 |
| Hamstring     | 111         | 94             |                 |
| Quadriceps    | 96          | 96             |                 |

**Figure 2** Isokinetic curve at 11 months after surgical repair.
in our experience delayed surgical repair often requires difficult sciatic neurolysis and fractional lengthening of the hamstrings. This observation was confirmed by a recent systematic review of the literature [5].

The acute surgical treatment is well defined from previous reports. Following identification and exposure of the hamstring tendons transosseous fixation to the ischial tuberosity is achieved through the use of bone anchors [12,14].

There are few reports on the outcome of acute surgical repair after complete hamstring avulsion in elite athletes. Early return to sport with full functional outcome is crucial for them. A complete hamstring tear can be a career-threatening injury. Konan and Haddad [15] have reported good outcomes and an early return to sports in a series of 10 elite athletes. Our patient made a full return to first league competition 6 months after surgery with a complete strength/endurance recovery at 11 months. Non-operative management is often associated with poor functional outcomes, low rate of return to sports and a bad strength/endurance recovery [2–5]. An early and precise diagnosis of the tear would therefore appear to be crucial.

Conclusion

This case report shows that in an elite athlete the prognosis following a complete proximal avulsion of the hamstring tendons is good provided the injury is diagnosed and treated early.

Full return to competitive sport at the same level with a full strength/endurance recovery was achieved after acute hamstring reininsertion.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.otsr.2012.05.007.

References