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Complete rupture of the hamstring origin in a road accident: 5-year follow-up

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Abstract A rare case of post-traumatic rupture of the hamstring muscles at their origin in a young adult is reported. Lesional mechanisms, epidemiology and diagnostic tools are described. A conservative treatment was adopted because of the presence of other more severe pathologies, but functional results at the 5-year follow-up are unsatisfactory. We suggest surgical treatment of this uncommon lesion.

Key words Hamstring muscles • Traumatic rupture

Introduction

Avulsion of the hamstring muscles with fracture of the ischial tuberosity is relatively frequent in adolescents. However, complete disruption of these muscles at their origin on the ischial tuberosity without fracture of this bone is a rare event [1–4]. We report an unusual case of complete hamstring rupture at the ischial tuberosity, without fracture, in a young man, as a consequence of a traffic injury.

Case report

A 26-year-old man was knocked down by a car at a pedestrian crossing. He was hit by the front bumper in the anteromedial region of the left knee. The fall caused a forced extension of his left knee associated with sudden

flexion and abduction of the ipsilateral hip and forward projection of the trunk. The patient immediately felt a violent pain at the back of the left thigh and in the left knee and he found it impossible to assume an erect position.

Physical examination revealed a large and extremely tender ecchymotic swelling at the root of the left thigh at the posteromedial site. Severe anterolateral laxity of the left knee was also observed.

Radiographs of the pelvis did not demonstrate the presence of fractures; in particular, there were no signs of avulsion fracture of the left ischial tuberosity.

An ultrasound study of the thigh using frequency linear probe (7.5 MHz) showed a conspicuous subcutaneous haematoma in the posteromedial portion of the root of the thigh. Due to the anatomic disorganization caused by the haemorrhagic components, it was not possible to identify with certainty the muscles involved and it was therefore decided to perform a magnetic resonance imaging (MRI) study.

This procedure not only revealed the subcutaneous haematoma in the posteromedial portion of the thigh, but

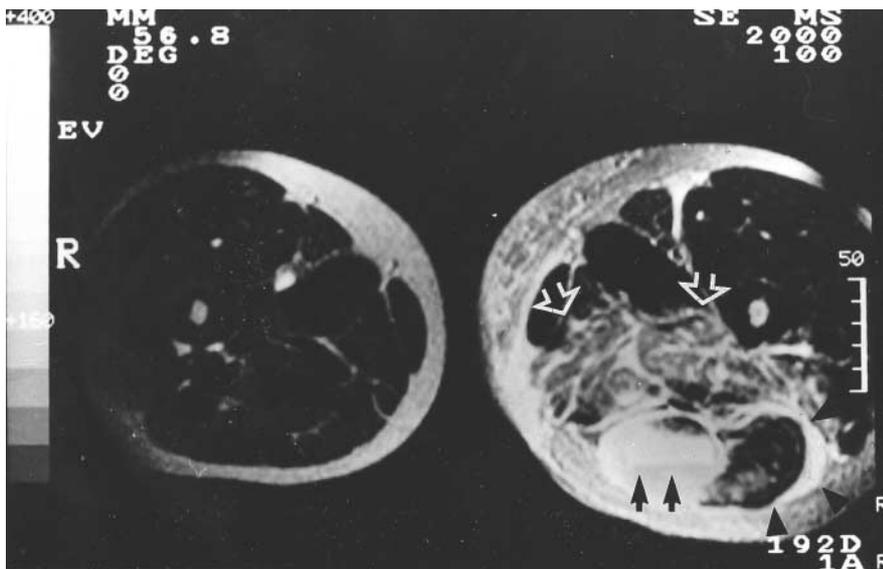
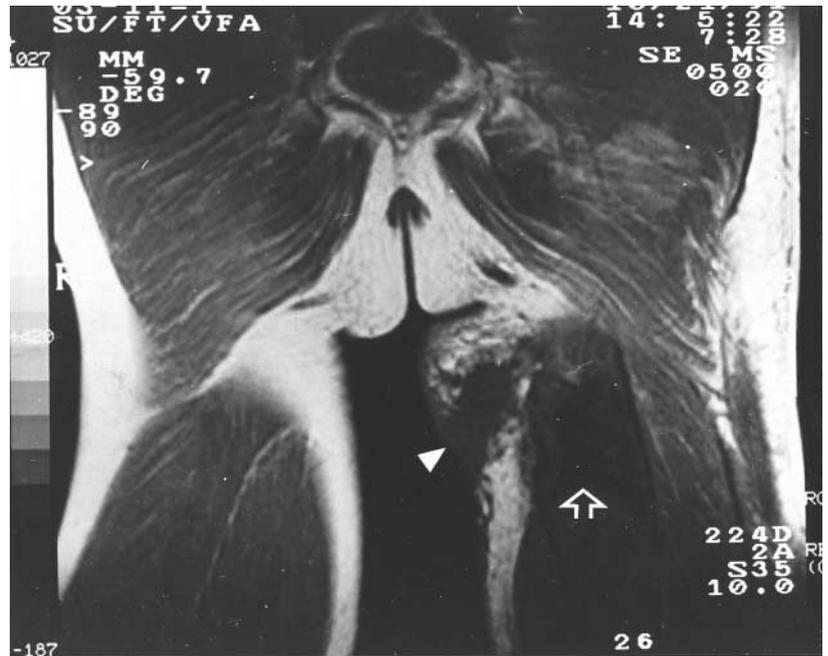


Fig. 1 Axial T2-weighted MR image (TR, 2000 ms; TE, 100 ms). The semimembranosus muscle is completely interrupted with the presence of a clearly evident fluid level (*arrows*). The semitendinosus muscle appears instead surrounded by fluid (*arrowheads*) due to partial interruption at the most cranial level. The biceps and great adductor muscles are hyperintense due to oedema (*empty arrows*)

Fig. 2 T1-weighted coronal MR image (TR, 500 ms; TE, 20 ms) of the back of the thigh reveals a muscular rupture with retraction of the distal part (*arrow*) and a subcutaneous haematoma (*arrow-head*)



also permitted the identification of a complete rupture of the semimembranosus and semitendinosus muscles near their ischial origin with partial retraction (Figs. 1, 2).

In view of the concomitant serious ligament injury of the ipsilateral knee, it was decided to treat only this lesion by surgery and conservatively manage the hamstring rupture. Surgical treatment of the latter would in fact have required a prolonged period of immobilization (at least 6 weeks) with the knee bent at 90°, and this, after an operation of ligament reconstruction, would have involved too high a risk of sub-

sequent knee stiffness. The patient thus underwent surgery of the left knee with reinsertion of the anterior cruciate ligament avulsed from the intercondylar eminence, suture of the lateral meniscus, reinsertion of the fibular collateral ligament and the iliotibial tract, and repair of the posteromedial and posterolateral corners of the articular capsule of the knee. A partial tear of the posterior cruciate ligament was also present but was not surgically repaired. A hinged brace was applied, and for the first 6 weeks after the intervention, extension of the knee beyond 30° was not allowed.

Five years after treatment, physical examination revealed a range of motion of 0°-90° with a firm stop depending on intra-articular knee stiffness. Knee laxity tests revealed a varus laxity with varus stress test +++, Lachman +, anterior drawer sign-, and Jerk test -. At the level of the hamstrings the tight profile was altered with an evident depression of the skin. The biceps femoris was

apparently uninvolved. Follow-up MRI showed atrophy and retraction of semimembranosus and semitendinosus muscles and fat infiltration of the biceps femoris due to non-use (Figs. 3, 4). Isokinetic testing of the affected side, as compared with the contralateral limb, revealed a concentric hamstring muscle deficit of 65% and a quadriceps muscle deficit of 27%.

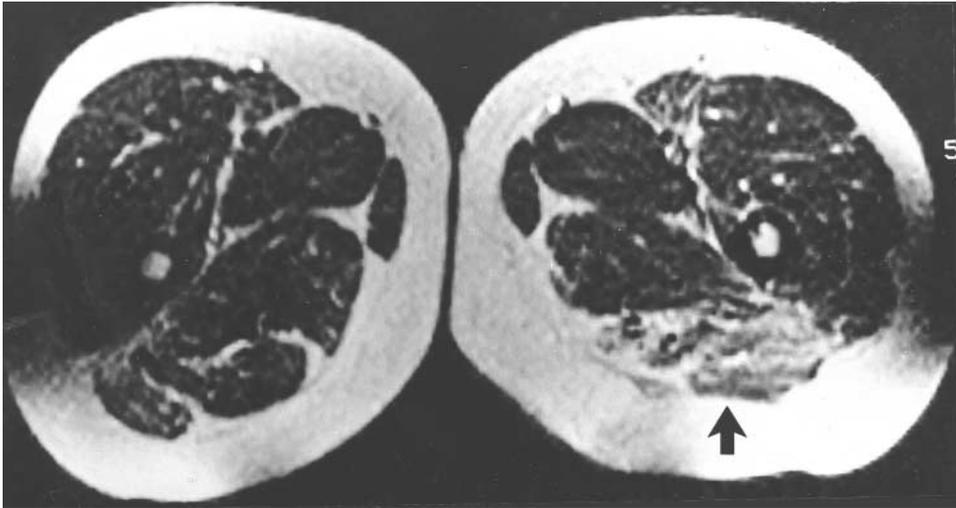


Fig. 3 Follow-up axial T1-weighted MR image (TR, 500 ms; TE, 20 ms) shows atrophy and retraction of semimembranosus and semitendinosus muscles and fat infiltration (*arrow*) of the biceps femoris muscle

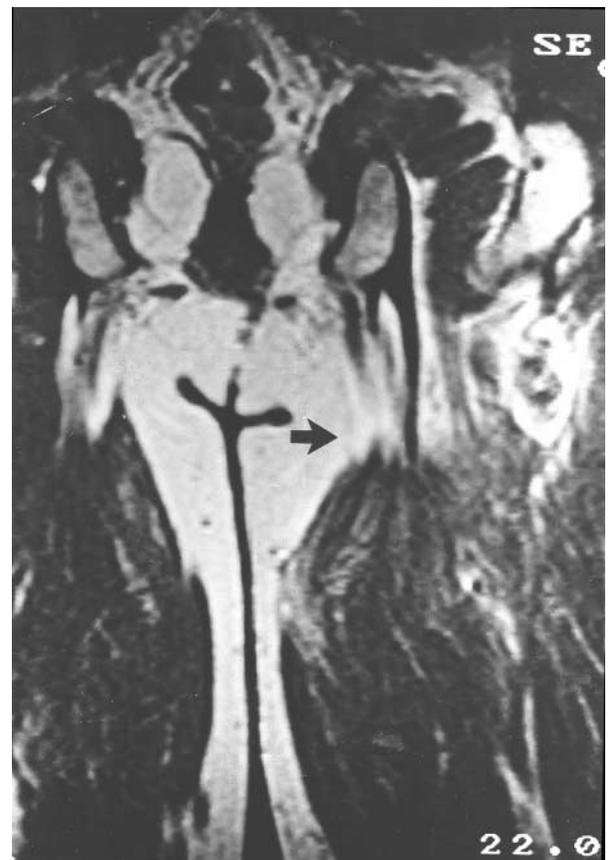


Fig. 4 Follow-up coronal T1-weighted MR image (TR, 500 ms; TE, 20 ms) shows atrophy and retraction of semimembranosus and semitendinosus muscles (*arrow*)

Discussion

Cases of rupture of the hamstring muscles have been described in the literature. They are frequently avulsion fractures of the ischial tuberosity occurring in adolescents following a violent muscular contraction. The fracture involves the base of the ischial tuberosity, an area with a minor resistance to traction compared with the tendons and ligaments. The situation is different in adults in whom hamstring rupture is rare. In the large series of 1014 musculotendinous unit injuries reported by Anzel et al. [5], out of 871 muscular ruptures only two were of the hamstrings. It is unclear whether they were partial or complete lesions. Subsequent reports of complete ruptures of the hamstring muscles due to indirect trauma in the adult include a few sports injuries [1–4] and one rupture caused by a road accident [2].

In the rare cases of hamstring rupture in adults, the emphasis of discussion has been placed on predisposing factors including insufficient flexibility of hamstring muscles, strength imbalance between quadriceps and hamstring muscles, poor strength, degenerative changes and aging [6, 7]. We do not believe that such factors played a significant role in our patient's hamstring rupture.

The mechanism of trauma appears significant in causing the hamstring tear. The sudden flexion and abduction of the hip associated with extension of the knee was, in our opinion, critical. Notable similarities with this type of traumatic mechanism are observed in the rare cases reported in the literature. Blasier [1] described a water skier in whom a complete hamstring rupture was caused by a sudden

engagement of his ski tips under a wave and a consequent sudden deceleration and face-first dive into the water with the knees forcibly extended while the hips were flexed. A similar traumatic mechanism was reported by Ishiwaka et al. [2] in a judoka athlete. A common characteristic of our case and the others cited is thus a sudden, rapid stretching of the posterior musculature of the thigh followed by a violent reflex contraction of the hamstring muscles causing avulsion at the bony insertion of the tendon.

At physical examination we suspected a hamstring rupture based on: (a) agonizing pain at the back of the proximal left thigh, (b) marked ecchymosis in the same region, and (c) no radiographic evidence of ischial avulsion. The fourth diagnostic factor, i.e. difficulty in flexion of the knee and hip, was not observed in our patient because of the concomitant severe ligament injury of the ipsilateral knee.

The ultrasound study of the thigh suggested the diagnosis, but the anatomic disorganization caused by the haemorrhagic components did not allow the muscles involved in the trauma to be identified with certainty. These were instead clearly visualized by MRI which demonstrated the precise site, extension and characteristics of the lesions. (Figs. 1, 2).

Treatment of the hamstring injury was influenced by the presence of an associated severe knee ligament lesion. Conservative treatment led to muscular retraction and significant function loss with an overall unsatisfactory result. Surgical repair with reinsertion of the muscle origin into the ischial tuberosity is the treatment of choice for minimizing functional loss.

References

1. Blasier RML (1990) Complete rupture of the hamstring origin from a water skiing injury. *Am J Sport Med* 18:435–437
2. Ishikawa K, Kai K, Mizuta H (1988) Avulsion of hamstring muscle from the ischial tuberosity. *Clin Orthop* 232:153–155
3. Sallay PI, Friedman RL, Coogan PG, Garrett WE (1996) Hamstring muscle injuries among water skiers. Functional outcome and prevention. *Am J Sports Med* 24(2):130–136
4. Orava S, Kujala UM (1995) Rupture of the ischial origin of the hamstring muscles. *Am J Sports Med* 23(6):702–705
5. Anzel SH, Covey KW, Weiner AD, Lipscomb PR (1959) Disruption of muscles and tendons. An analysis of 1014 cases. *Surgery* 45:406–414
6. Agre JC (1985) Hamstring injuries. Proposed aetiological factors, prevention and treatment. *Sports Med* 2:21–33
7. Burkett LN (1975) Investigation into hamstring strains: the case of hybrid muscle. *J Sports Med* 3:228–231