

radiographic change in the early stages. The presence of severe osteoporosis in such cases is of considerable value in the diagnosis of this condition.

Differential diagnosis of early stage fractures should include femoral head necrosis, reflex sympathetic dystrophy, and transient osteoporosis of the proximal femur. MRI is useful for the diagnosis of this lesion. T1W and T2W images of insufficiency fractures of the femoral head yield low intensity areas in the early stages. However, if tissue edema is present, there is a high intensity area on the T2W image (Bangil et al. 1996). A straight or serpiginous line of low signal intensity is thought to represent the fracture line or trabecular impaction (Rafii et al. 1997). Visuri (1997) reported stress fractures of the femoral head among young military recruits. MRI showed a diffuse decrease in the signals in bone marrow, spreading from the femoral head to the femoral neck on T1W, which is a wider zone than that seen in osteoporotic elderly patients with femoral head insufficiency fracture.

Insufficiency fracture of the femoral head should be considered in the diagnosis of hip pain in patients

with osteoporosis. Rapidly destructive arthropathy, in which the femoral head collapses within a short period, is seen in patients with osteoporosis. Insufficiency fracture may have preceded this condition. Early diagnosis by MRI is essential, as in case 2, when no weight bearing is allowed in the early stages of the lesion. This may have prevented the advancement of the fracture, followed by a good clinical outcome without surgical treatment.

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Late repair of rupture of the hamstring tendons from the ischial tuberosity—a case report

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A 39-year-old woman played badminton and, when trying to reach the ball in a splinting-like position, she developed severe pain in her right buttock. She attended the emergency ward. The physical examination revealed a large ecchymosis on the proximal posterior part of the thigh. A diagnosis of hamstring sprain was made. She then underwent physical therapy a few times but it did not relieve the symptoms.

On admission to our department, 2 months after the injury, she complained of muscle fatigue daily. The patient had, since the trauma, been unable to partake in any sports, because of pain in her proximal thigh and give-way symptoms. The physical examination showed a tender defect just distal to the ischial tuberosity and weakness of flexion of the knee. The symptoms were interpreted as a second degree strain and the patient was referred to intensive physical therapy for a 3-month period with no effect. MRI was then

performed, revealing a complete avulsion of the hamstring muscles from the ischial tuberosity (Figure). The muscles were retracted 5–6 cm and showed some signs of degeneration.

Operation was performed 8 months after the injury. A straight-line incision was made over the defect. The gluteus maximus was lifted proximally, showing the totally avulsed hamstring muscles. The muscles were mobilized as much as possible. To strengthen the reconstruction, a polypropylene ligament augmentation device (LAD; 3M, St Paul, MN) was inserted through a drill-hole in the ischium and threaded through the semitendinosus and biceps femoris muscle 3 times and sutured in place. Heavy, nonabsorbable sutures were used to reinforce the attachment to the ischium. The semimembranosus was left adherent to the surrounding tissue. Finally, a fascia lata graft was used to strengthen the origins of the semitendinosus and biceps femoris.



MRI (sagittal plane) showing the avulsed hamstring tendons displaced 5–6 cm from the ischial tuberosity.

Postoperatively, the knee was immobilized at 60 degrees of flexion, and 0–45 degrees hip flexion was allowed for 3 weeks. Physical therapy was started after 6 weeks. 1 year after surgery, she had normal hip and knee motion. Strength of the hamstring muscles was restored and the patient had started swimming and running. The only discomfort was some pain, where the fascia lata graft was taken.

Discussion

Hamstring sprain is a relatively rare but well known injury. Of 1,014 musculotendinous injuries, Anzel et al. (1959) found that only 2 involved the hamstring muscles. Complete hamstring ruptures are extremely rare and only a few case reports exist (Ishikawa et al. 1988, Blasier and Morawa 1990, Kurosawa et al. 1996). Orava and Kujala (1995) reported a series of 8 patients, but 5 of these ruptures involved only the biceps femoris.

The injury mechanism is indirect, resulting from a momentary forceful contraction of the hamstrings (Orava and Kujala 1995). It has been reported to occur while practicing more energetic sports like judo and water skiing, with simultaneous knee extension and hip flexion (Ishikawa et al. 1988, Blasier and

Morawa 1990).

This diagnosis should be suspected in patients with a relevant trauma and acute onset of severe pain in the buttock with difficulty in standing and walking. Physical findings include a palpable tender defect distal to the ischial tuberosity and impaired knee flexion. Massive bleeding results in marked ecchymosis of the posterior thigh. For diagnostic purposes, a pelvic radiograph should be performed to rule out an ischial apophysiolysis, which would normally result from this trauma in adolescents (Ishikawa et al. 1987).

In the acute phase, severe pain can make it difficult to interpret the clinical findings. Therefore re-evaluation should be done after 3–4 days. Demonstration of a local muscle/tendon defect and loss of strength are in many cases sufficient to make the diagnosis. However, continuous severely decreased ability to contract the muscle can indicate either a large intramuscular hematoma or total rupture of the tendon (Kujala et al. 1997). For confirmation of the diagnosis, MRI is recommended as the most sensitive technique. It shows not only the extent of the anatomic defect but also associated pathological changes in other areas of the tendon and surrounding structures (Pope 1992, Kibler 1997).

Orava and Kujala (1995) used carbon fiber as a bridge between the biceps tendon and the ischial tuberosity. Carbon fiber stimulates local fibrous tissue ingrowth. We performed the operation using LAD, which is designed to support and protect ligament reconstructions in the healing phase. For permanent placement, the LAD was threaded into the muscle. This is our first experience with LAD in tendon surgery and, to our knowledge, this technique has not been reported before.

Our patient, treated 8 months after the injury, is satisfied with the result, having clearly improved her function after surgery. The problems with treatment at this late stage are degeneration and retraction of the muscles, making it difficult to make a secure reattachment to the ischium. Optimally, these patients should be operated on shortly after the injury, since anatomic repair is important for a better functional recovery (Kibler 1997). Left untreated, these patients will be severely disabled.

The MRI is reproduced with kind permission of MR-videncentret, Hvidovre Hospital.

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Bilateral atraumatic avulsion fracture of the calcaneal tubercle in osteomalacia during fluoride therapy—a case report

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A 56-year-old woman with insulin-dependent diabetes mellitus, compensated renal failure and osteoporosis treated with fluorides (150 mg natriumfluorophosphate/day) for the last 6 years complained of bilateral painful swelling of the ankles for the past 4 months. She could walk only with elbow crutches.

Radiographs showed that both ankles were normal, apart from low grade arthrosis. A 3-phase radioisotope bone scan demonstrated increased uptake in both os calcis, in the left upper tibia and in the right third, fourth and fifth ribs. A Looser zone was present in the left upper tibia which had not been visible 4 weeks previous. MRI of both ankles revealed arthrosis in both ankle joints and also extensive edema of the marrow mainly in both dorsomedial aspects of the calcanei. On the left side, dorsal and cranial interruptions of the cortex in the insertion area of the Achilles' tendon were evident.

Laboratory tests showed a positive rheumatoid factor and a positive titer for antinuclear factor, however, clinically there was no additional sign of inflammatory joint disease or collagenosis. 25-hydroxyvitamin D was low—i.e., 15 nmol/L (normal range 43–94 nmol/L), and 1,25-dihydroxyvitamin D was normal. Calcium, measured in serum and urine, parathyroid hormone and alkaline phosphatase were normal, creatinine clearance, 73 mL/min, and phosphate excretion 0.4 g/24 h (normal range 0.46–1.4 g/24 h) were low borderline. ESR was 29 mm/h, c-reactive protein and leukocyte count were normal. There were no sensory disturbances. Iliac crest bone marrow biopsy showed moderate osteomalacia, with widened osteoid areas and signs of fluorosis.

During physiotherapy both calcanei became increasingly painful. New radiographs, 4 weeks later,

showed bilateral avulsion fractures of the Achilles' tendon (Figure 1). An ultrasound scan had been normal 4 days before. Because of contracture, both Achilles' tendons could be reinserted by screw fixation only after tendon lengthening (Figure 2). Both ankles were immobilized in plaster casts for 2 months after surgery. At the follow-up 1 year postoperatively, standing on tip toes was possible with little aid and the fractures had healed. Therapy for osteomalacia continues with alfacalcidol and calcium carbonate.

Discussion

Avulsion fracture of the Achilles' tendon is rare and often associated with metabolic disturbance (Bierweg 1970, Cooper and Heckman 1989, Biehl et al. 1993, Cole et al. 1995, Itokazu et al. 1996). In our case, the avulsions were not traumatic.

Operative treatment is preferred, since closed treatment does not lead to satisfactory functional results (Brunner 1971). In our case, bilateral Achilles' tendon lengthening was necessary because of contracture and osteoporosis, in order to achieve stable reduction and reduce tractive forces (Itokazu et al. 1996).

Spontaneous fractures in generalized osteoporosis are ascribed to deteriorated microarchitecture of the trabecular structure of cancellous bone (Verlooy et al. 1991). Fluorides stimulate the osteoblasts and formation of new bone which leads to an increase in the bone mineral density (Murray and Ste-Marie 1996, Talbot et al. 1996) and to a diminished fracture rate (Turner et al. 1996a). Thus therapy with fluorides is widely practiced in osteoporosis (Abbott et al. 1996) and in medium-term studies shows positive results, as regards bone mineral density, and a lower fracture