

# Bilateral quadriceps tendon rupture in a seasoned marathon runner with patellar spurs

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## Abstract

We present the case of a healthy seasoned marathon runner who sustained bilateral quadriceps tendon rupture following a low-energy fall. Radiographs demonstrated bilateral patellar spurs. Our case report serves to highlight the importance of maintaining a high index of clinical suspicion in patients of all ages. This is the first report of bilateral quadriceps rupture in the presence of bilateral patellar spurs.

## Keywords

Quadriceps tendon rupture; patellar spurs.

## Case report

A 63-year-old Caucasian gentleman tripped on a step and fell down, landing on both his knees. He felt the sudden onset of severe pain and could not bear weight at all, as his legs were 'giving way'. He presented to an emergency department with gross swelling and bruising around both knees. Plain radiographs were deemed normal and he was sent home with crutches. He spent 6 weeks in bed, as he was unable to bear weight despite the resolving knee swelling and bruising and the significant reduction in pain. He re-attended the emergency department and was reviewed by the orthopaedic team. Clinical examination demonstrated inability to bear weight, inability to raise a straight or initiate knee extension on both sides with tenderness and a 5 cm palpable gap over the superior poles of the patellae. The rest of his lower limb muscles were functioning normally. The clinical diagnosis of bilateral quadriceps tendon rupture was made, supported by radiological evidence, leading to operative treatment the day after.

Despite his age, this gentleman had competed more than 40 full marathons in the past 20 years. He was very fit and healthy, with no other health problems, including gout, and was not taking any medication, including steroids or antibiotics. He also denied any pain over the anterior aspect of his knee or distal thigh prior to the injury. His blood tests demonstrated a normal haemoglobin level, normal white cell count and normal renal function and electrolytic profile, including normal calcium and phosphate. His glucose, urate and parathyroid hormone levels were also normal.

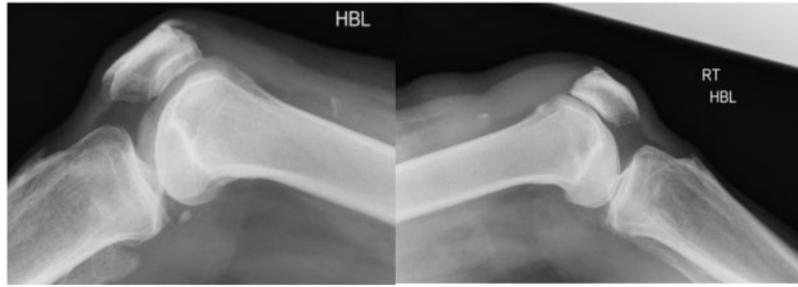


Fig. 1. Primary images at first presentation.

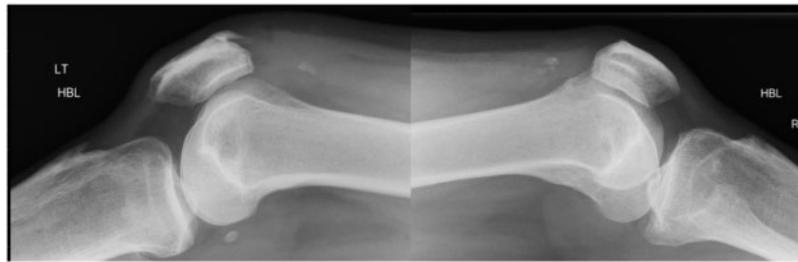


Fig. 2. Radiographs from subsequent presentation.

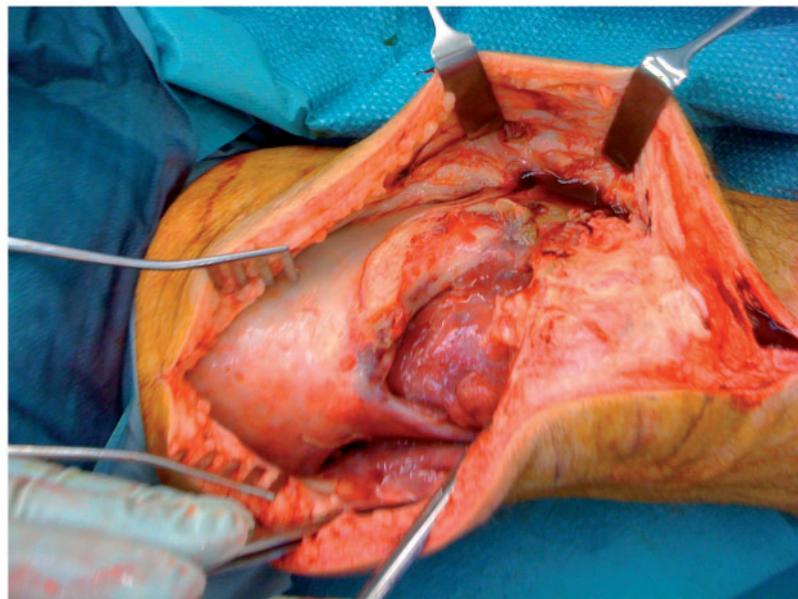


Fig. 3. Intra-operative image of the right quadriceps tendon rupture 6 weeks after the injury, with the quadriceps muscle retracted, fibrosed and stuck down and an obvious gap of about 7 cm.

A consultant musculoskeletal radiologist closely examined the plain radiographs, from the initial and subsequent presentation, commenting that there were prominent superior patellar spurs. Furthermore, both patellae were low riding, a finding commonly observed after quadriceps tendon rupture (Figs. 1 and 2).

Both quadriceps tendons were repaired via midline longitudinal incisions, breaking down of the extensive adhesions and remobilization of the quadriceps mechanism (Fig. 3). No tourniquet was used and three separate Krakow type sutures with multiple locking loops were passed through three separate drilled tunnels in the patella and secured over the distal pole. The repair was reinforced with tri-con suture material and the retinaculum was re-approximated both medially and laterally. Both legs were immobilized in cylinder casts with the knees in extension.

## Clinical evidence

Steiner and Plamer<sup>[1]</sup> described the first bilateral quadriceps tendon rupture in 1949 and since then there have been about 100 cases published in the English literature. The rarity of this condition is one of the main reasons for its late and difficult recognition<sup>[2]</sup> and the false diagnosis of other pathologies, such as neuropathy, cerebrovascular accident and even psychiatric pathologies<sup>[1]</sup>. The three cardinal features of this pathology, as reported by MacEachern in 1984, are bilateral diffuse swellings around the knees, palpable suprapatellar gaps and inability to lift the extended legs, in the presence of normal functioning lower limb muscle groups<sup>[2]</sup>. In terms of epidemiology, this injury tends to occur more frequently in men above the age of 50 years<sup>[2,3]</sup> and in the case of unilateral rupture this tends to be in the non-dominant limb<sup>[4]</sup>. It is extremely rare in fit and active individuals.

The quadriceps tendon is very strong and able to withstand heavy loads<sup>[3]</sup>. McMaster<sup>[5]</sup> demonstrated that for a complete rupture to occur, more than half of the fibres have to be severed. The majority of ruptures occur when quadriceps is eccentrically loaded with the knee in flexion following low- or high-energy falls and direct or indirect injury of the knee<sup>[1,3]</sup>. Studies have demonstrated that the commonest site of failure is the osteotendinous junction<sup>[3]</sup>.

In terms of biomechanics, the ratio of the force distribution over the patellar and quadriceps ligament is in direct relationship with the degree of knee flexion. The loading forces of the quadriceps tendon rise as knee flexion increases. Huberti et al.<sup>[6]</sup> thoroughly studied this relationship and demonstrated that the force acting on the quadriceps tendon is 30% less than the force on the patellar tendon at 30° of flexion, equal at 50° and 30% higher at 90°.

Ageing is known to cause degenerative changes to tendons such as calcification, decrease in collagen content and fatty and/or cystic degeneration<sup>[3]</sup>. Despite this, quadriceps tendon rupture is rather rare even amongst the elderly<sup>[3]</sup>, with roughly one-third being spontaneous<sup>[1,7]</sup>.

A number of medical pathologies have been associated with this condition, such as chronic kidney disease, diabetes mellitus, hyperparathyroidism, crystal arthropathy, obesity, various connective tissue disorders and chronic tendinopathy<sup>[1]</sup>. Hyperparathyroidism leads to weakening of the tendon both by calcification and fragility of the bone at the osteotendinous junction<sup>[8]</sup>. Chronic kidney disease and uraemia, especially when necessitating dialysis, may cause atrophy of muscle fibres and therefore weaken the quadriceps muscles<sup>[3,8]</sup>. An interesting theory was reported by Shiota et al.<sup>[9]</sup>, whereby end-stage kidney disease causes secondary hyperparathyroidism and subsequent tendon rupture through the mechanism already described. Dialysis-related amyloidosis has also been associated with weakening of the quadriceps tendons. Gout can cause synovitis, obesity may cause fatty degeneration of the tendon fibres, connective tissue diseases lead to chronic inflammation and poorly controlled diabetes mellitus to vascular degeneration of tendons<sup>[3]</sup>. A recent report by Hardy et al.<sup>[10]</sup> suggested that in traumatic failures of the knee extensor mechanism, patellar spurs were associated with quadriceps tendon ruptures to a significant degree when compared with the association of spurs with patellar fractures and patellar tendon ruptures.

In terms of medication, the systemic or intra-articular use of steroids<sup>[3]</sup> and the systemic use of fluoroquinolones have been implicated in the pathogenesis of similar conditions.

Shah performed a review of all relevant literature in 2002 and suggested that if bilateral quadriceps tendon rupture is diagnosed in patients younger than 50 years of age, the surgeon will need to consider an underlying pathology, as younger patients are statistically more likely to have a medical pathology than older patients<sup>[7]</sup>.

Quadriceps tendon rupture is a clinical diagnosis that can be supported with radiographic investigations. Initially a plain radiograph may be sufficient but if necessary it can be followed by ultrasound and MRI scans<sup>[7]</sup>, which are non-invasive and have the ability to distinguish between partial and complete ruptures. Early operation of complete ruptures is considered the gold standard treatment.

Several techniques for repair have been described in the literature, with the commonest being end-to-end repair with the sutures passing through tunnels drilled in the patella<sup>[3]</sup>. Yilmaz et al.<sup>[11]</sup> used the Scuderi technique in one case, with immediate mobilization after the surgery, with excellent long-term results.

In all the reported cases that have been undergone surgery, good outcomes have been demonstrated, even those with delayed presentations<sup>[2,3,7]</sup>. However, delayed repair is a more challenging operation due to the inevitable contracture of the quadriceps muscle a few days after the injury<sup>[3]</sup> and has been associated with an inferior outcome, compared with early repair<sup>[4,12]</sup>.

In all cases, cylinder leg casts were applied with the knee in extension and Esenyel et al.<sup>[3]</sup> suggested straight-leg lifting exercises to commence 1 week after the surgery, with the cast removed at 6 weeks after surgery at the earliest<sup>[7]</sup>. A trial did not demonstrate any difference in the functional outcome between early and delayed onset of exercise<sup>[12]</sup>. In terms of long-term results, Shah<sup>[7]</sup> reported full range of motion and power in 57% of his series and extensor lag and/or need for assistance when walking was reported in the other 43% of his cases.

To our knowledge this is the first report in the English literature to present bilateral quadriceps tendon ruptures in a healthy patient with patellar spurs. Although the prevalence of patellar spurs in the general population has not been described, a positive association between this pathology and patellar spurs has already been reported and our case report might stimulate further research into the pathology that weakens the quadriceps tendon in the presence of patella spurs.

### Teaching points

- Bilateral quadriceps tendon rupture is a rare pathology
- Delayed diagnosis affects final outcome
- There is a potential relationship between quadriceps rupture and patellar spurs

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