



## Spontaneous and simultaneous bilateral rupture of the quadriceps tendon A case report

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**Simultaneous bilateral rupture of the quadriceps tendon has rarely been reported ; it generally occurs in association with chronic metabolic disorders, such as chronic renal failure, obesity, diabetes mellitus and secondary hyperparathyroidism. The case presented here was in an 85-year-old man with no known risk factors, who sustained simultaneous and spontaneous rupture of both quadriceps tendons. The patient suffered from spinal stenosis and degenerative changes in the knee menisci. These findings suggest that instability of the knee due to meniscal damage, and quadriceps weakness as a result of spinal stenosis, may have played a significant role in the pathogenesis of this injury.**

### INTRODUCTION

Unilateral patellar tendon rupture commonly occurs after trauma. However, bilateral, simultaneous and spontaneous rupture of the quadriceps tendon is a rather uncommon injury (3, 5, 11, 14). The condition occurs mainly in males and is extremely rare in females. In 1949, the first case of bilateral, simultaneous rupture of the quadriceps tendon in literature was reported by Steiner and Palmer (19). Since then, a number of case reports have associated this injury with diabetes, chronic renal failure, hyperparathyroidism, systemic lupus erythematosus, gout, pseudogout, rheumatoid arthritis, vasculitis, anabolic steroid abuse, Wilson's disease and thrombocytopenia (3, 4, 8, 10, 14, 15, 18, 21).

### CASE REPORT

We report the case of an active 85-year-old male, who fell while he was walking. He was unable to stand and was admitted to the hospital, where he was correctly diagnosed as having bilateral quadriceps tendon rupture. Physical examination revealed absence of a joint effusion, a visible and palpable sulcus above both patellae and inability to actively extend the knees.

Radiographs especially the lateral view with soft tissue technique, were useful in revealing the indirect signs of tendon rupture, e.a. a defect across the quadriceps shadow, and forward tilting of the patella. Heterotopic bone formation was observed in the suprapatellar region of both knees. Magnetic Resonance Imaging (MRI) revealed complete rupture of the left and partial rupture the right quadriceps tendon. There was also a grade II degenerative tear of

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the right medial meniscus, while a grade I degenerative tear was apparent in the left knee medial meniscus.

The plasma biology was normal. An electromyographic study (EMG) was normal too. Microscopic examination of tendon biopsy specimens, obtained from the ruptured ends of the tendons, showed fatty and myxoid degenerative changes without evidence of malignancy.

Operative repair was performed four days after injury. The exposure revealed no haematoma ; the rupture was complete bilaterally, diverging from the MRI findings. The rupture was close to the upper pole of the patella and to the site of calcification. Repair was carried out using interrupted, non-absorbable sutures through three holes, drilled through the proximal pole of the patella, after debridement of the rupture. Retinacular tears were repaired using interrupted absorbable sutures.

A cylindrical cast was applied for six weeks. Isometric exercises were initiated one week after the operation, and weight bearing with crutches three weeks later. After six weeks, functional braces with controlled flexion were provided for six weeks. Four months after quadriceps repair, the patient was able to stand up from a sitting position and he would walk without any support. The range of motion (ROM) was 0° to 120° on both sides. MRI was performed four months postoperatively, and revealed healed tendons.

## DISCUSSION

Rupture of the quadriceps tendon after trauma is not unusual ; however spontaneous, bilateral rupture of the quadriceps tendon is an uncommon injury, which has been described in the literature as a complication of various metabolic diseases (3, 8, 15, 18, 21).

A history of an attempt to rise after stumbling, immediately followed by sharp pain just above the knees, weakness and inability to bear weight, especially in an elderly person, suggests this diagnosis (5, 6, 16, 20). Diagnostic features at examination are as follows : a) inability to stand and bear weight b) inability to extend the knee completely c) tenderness and diffuse knee swelling (a large

haemarthrosis often follows the tear) d) palpable suprapatellar defect which corresponds to the normal insertion of the quadriceps tendon which has retracted superiorly. However, the diagnosis may be difficult when there is no history of a major trauma ; moreover a haematoma may mask the defect in the tendon at physical examination (9, 10, 11).

Bilateral rupture is even more difficult to detect since both knees may appear symmetrical. Lateral radiographs, employing soft tissue techniques, reveal a defect in the quadriceps tendon, anterior tilting of the proximal pole, and a poorly defined suprapatellar swelling (7, 12). Although ultrasound may reveal the break in the tendon, the rupture may be obscured by haemorrhage (10) ; MRI imaging is the most accurate technique to visualize the tendons, because separation and proximal retraction are clearly defined (2). Delay in diagnosis is not uncommon. There may be confusion with other causes of inability to use the legs (5).

Primary operative repair is the treatment of choice because it shortens the period of rehabilitation (3, 5, 16). In the early stages the tendon remains well structured, making re-approximation easy (11, 16). In our case early primary repair was performed using interrupted, non-absorbable sutures. Complete immobilisation was sustained for six weeks, and subsequent physiotherapy produced an excellent result (5, 8, 9, 11, 16).

Complete disruption of the quadriceps muscle-tendon unit at the tendon level often occurs as the ultimate result of repetitive micro-trauma, or secondary to weakening by underlying conditions such as diabetes mellitus, pseudogout, administration of corticosteroids, chronic renal failure, hyperparathyroidism and obesity. Pre-existing degenerative changes in the tendon as precursors to rupture are mentioned in the literature (10, 11, 15, 18). Most patients are elderly ; pathological changes in the tendon have been documented as associated with advancing age. Fatty degeneration and sclerosis changes are found to a marked degree in elderly people. Other pathological findings include calcification within the collagen connective tissue, myxoid degeneration, cystic softening and decrease in collagen content with marked loss of nuclei (12). The most common cause of simultaneous bilateral

rupture seems to be a sudden violent contraction of the quadriceps tendon, with the knees slightly flexed and the feet fixed (11). Another causative factor may be prolonged periods of kneeling (9). Prolonged tension could indeed, render the tendon ischaemic, and it might predispose to rupture proximal to the superior pole of the patella (9). Microcirculation within the tendon was studied by means of injection techniques and immunohistochemical methods. The distribution of blood vessels within the quadriceps tendon is not homogeneous. The anterior superficial part of the tendon has a complete vascular network that extends from the musculotendinous junction to the patella. Within the deepest portion of the quadriceps tendon there is an oval shaped avascular area, which measures 50 mm in length and 15 mm in width approximately. An explanation for the absence of blood vessels may be the compressive stress exerted by the patellar groove, which serves as a fulcrum for the quadriceps tendon when the knee is flexed. The existence of this avascular zone within the deepest layer of the tendon, which faces the joint, may explain the frequency of degeneration and rupture in this area (13).

A literature search revealed repetitive microtrauma as a precursor to rupture (3, 8, 18). Davidsson (in 17) provided a theory of multiple recurrent microtears within the tendon substance as a cause of rupture. In our case there was no history of repetitive microtrauma, although the pathology report mentioned the possibility of prior microinjury. Instability of the knee as a result of ligamentous, meniscal or capsular damage, due to wasting of the muscles that cross the knee, especially the quadriceps, may lead to repetitive microtrauma. Degenerative changes of the menisci will produce similar symptoms, even without a history of predisposing trauma, because they do not only act as passive stabilisers of the knee but also as proprioceptive informants for muscle tone function and movement co-ordination (1). Meniscus or ligament damage may not be followed by instability if the quadriceps mechanism is of sufficient bulk and strength to stabilise the knee (6). However, some degree of quadriceps weakness may be due to spinal canal stenosis (6). For this reason an MRI

scan was performed in our patient, which revealed spondylolisthesis L1-L2 and L4-L5, spinal stenosis, caudal constriction and disk degeneration. Spinal stenosis, in association with the degenerative changes in the menisci, may have constituted a predisposing factor, that led to micro-trauma and finally to tendon rupture.

In conclusion, as far as we know, this is the first case report in the literature, which supports the possible correlation of quadriceps tendon rupture with spinal stenosis leading to quadriceps weakness, and with meniscal degeneration leading to instability of the knee.

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