

## Case Report

# A Rare Case of Post-Traumatic Partial Rupture of the Quadriceps Tendon

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**Abstract:** Traumatic ruptures of the quadriceps tendon are rare and usually occur after the age of 40, as a result of indirect trauma in athletes (contrary flexion of the knee) or minor trauma in sedentary individuals. Pre-existing tendinopathy is common. The rupture is most often complete and occurs at the body of the tendon in 60% of cases, or quadricipital avulsion at the upper edge of the patella (40% of cases). The diagnosis is primarily clinical, with complementary examinations (ultrasound and magnetic resonance imaging) playing a key role. Surgical treatment, combined with functional rehabilitation, produces better outcomes. The timing of intervention is a very important prognostic factor. We report a case of post-traumatic rupture of the quadriceps tendon in a 47-year-old patient.

**Key words:** Traumatic ruptures, trauma, Pre-existing tendinopathy, intervention.

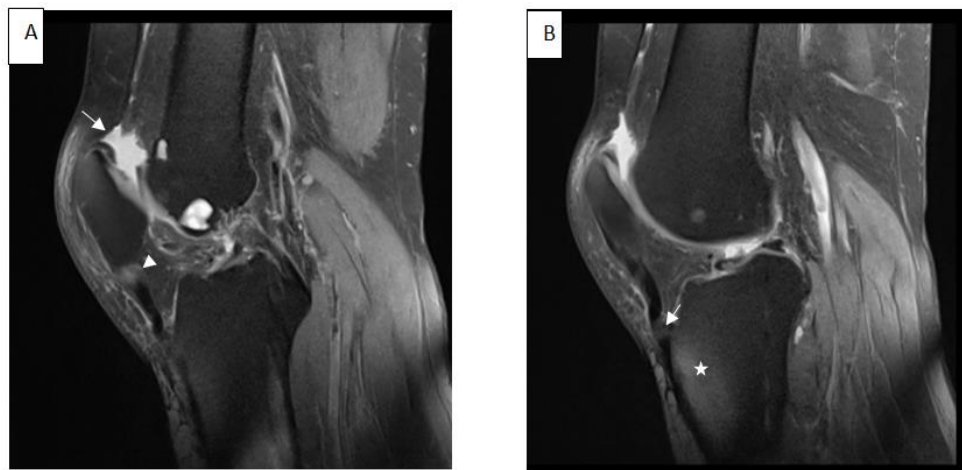
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## INTRODUCTION

Injuries to the knee extensor apparatus refer to a discontinuity that interrupts the transmission chain of leg extension on the thigh. These injuries include patellar fractures and musculotendinous apparatus injuries (patellar tendon and quadriceps tendon). Quadriceps tendon rupture is a rare condition, with approximately 2 to 3 cases per year [1, 2], less frequent than patellar fractures [1, 2]. They preferentially occur in athletes over 40 years old after indirect trauma, or in sedentary individuals following minor trauma, often in the context of systemic disease (diabetes, gout, renal insufficiency, use of fluoroquinolones or corticosteroids) [3]. Diagnosis of this pathology is often overlooked due to frequent ignorance of these injuries and the particular structure of the tendon, which is lamellar. Clinical examination is essential, and imaging plays an important role in diagnosis. Here, we report a case of post-traumatic quadriceps tendon rupture in a 47-year-old patient to support the role of MRI in diagnosing this injury.

## CASE REPORT

A 47-year-old patient with no significant medical history who was involved in a road traffic accident that caused sharp pain and a tearing sensation, followed by partial functional impairment of the right lower limb. The patient consulted one week after the trauma. Clinical examination revealed a loss of active extension of the leg on the thigh. Radiological assessment of the right knee showed low patella suggestive of a rupture of the quadricipital tendon. MRI of the knee revealed a rupture at the patellar insertion of the posterior portion of the quadricipital tendon with persistence of the anterior layer corresponding to the tendon termination of the rectus femoris (Figure 1) as well as a patella baja with a Caton-Deschamps index measured at 0.57 and an Insall-Salvati index measured at 0.55. There were also bruises on the patellar tendon at its patellar insertion and in relation to the anterior tibial tuberosity, which was the site of bone edema (Figure 2). It should be noted that there were femoral mucoid cysts present.



**Figure 1: Knee MRI; sagittal T2 sequence showing A): A uni-lamellar appearance of the quadriceps tendon, only the layer of the rectus femoris persists (white arrow) with rupture of the middle and posterior layers, which are replaced by liquid signal. There is also a T2 hyper signal anomaly at the patellar insertion of the patellar tendon related to a tendon contusion (white arrowhead). B): Swollen appearance of the patellar tendon with a heterogeneous T2 hyper signal anomaly (white arrow) in relation to the anterior tibial tuberosity, which shows bone oedema (star)**



**Figure 2: Sagittal T1 showing the persistence of the anterior layer of the quadriceps tendon (white arrow) and the rupture of the other layers, and a patella baja**

## DISCUSSION

The quadriceps tendon constitutes the terminations of the quadriceps tendons just a few centimeters above the patella. It usually presents a trilaminar appearance with an anterior layer corresponding to the termination of the rectus femoris, a middle layer that corresponds to the fusion of the terminations of the vastus lateralis and vastus medialis, and finally a posterior part corresponding to the termination of the vastus intermedius. Rupture of the quadriceps tendon can affect all of these terminations or, as in our case, a few fascicles of this tendon. The vascularization of the anterior tendon fibers extends from the musculotendinous junction to the patellar insertion. In the deep layer, there is an avascular area.

This zone could therefore explain the occurrence of degenerative lesions, more frequent on the hypovascularized middle and posterior fascicles, especially since the constraints on the posterior face of the tendon are increased during hyperflexion of the knee which presses these posterior elements against the trochlea [4].

Rupture of the quadriceps tendon is a rare condition among traumatic knee extensor system injuries. It comes after patellar fractures and patellar ligament rupture. It most often affects older sports subjects over 40 years old [5], with a male predominance and a male-to-female ratio of 6:1 [6, 7]. Several factors predispose to this tendon injury, in particular: general fatigue with absence of muscular

recovery and after sustained efforts; cold or dehydration in overweight and obese patients [8]; pre-existing pathologies such as systemic diseases in which tendons are weakened (rheumatoid arthritis, diabetes, lupus erythematosus, hyperparathyroidism). These patients are at high risk of presenting bilateral ruptures, which are fifteen to twenty times rarer than unilateral ruptures. Several cases of bilateral rupture in athletes consuming anabolic steroids have been reported in the literature [9]. The rupture can also have an iatrogenic cause such as direct steroid injection or iatrogenic weakening of the tendon following surgical removal for plasty (Mac Intoch) [5]. The mechanism is most often indirect by sudden contraction of the extensor apparatus to avoid falling [11]; during a sudden landing after a jump, due to the abrupt braking stresses imposed on the quadriceps either on this occasion; or during a sudden hyperflexion of the knee during a fall. Direct trauma is recognized but rare. Clinically, the interrogation allows orientation towards the diagnosis. It manifests as sharp and intense pain followed by functional impotence, which can be complete or replaced by a simple discomfort when walking. Palpation finds a suprapatellar depression that can be felt, while hemarthrosis may be absent. 40% of cases of quadriceps tendon rupture are initially undiagnosed according to Bianchi [12]. Imaging should be requested as soon as there is doubt in order to confirm or rule out this pathology.

Calcifications at the upper pole of the patella can be an indirect sign of quadriceps tendon tendinopathy and therefore a predisposition to rupture [13]. The patella, since it is no longer subjected to traction from the quadriceps, can be located lower compared to the non-injured side (patella baja or infera).

The conventional radiographic assessment is systematically performed in case of doubt and to look for a low-lying patella, visible in the sagittal plane, and to rule out the diagnosis of patella fracture. Ultrasound is a non-invasive, rapid and effective diagnostic tool for confirming a partial or complete rupture of the quadriceps tendon, but interpretation is examiner-dependent and should therefore be performed by a specialist. It can visualize a hypoechoic zone traversing the entire thickness of the tendon, and an intratendinous thickening. The examination is done in slight flexion, which usually facilitates diagnosis by promoting a discreet widening of the inter-fragmentary space. MRI is a determining and highly sensitive examination, especially in old forms [14]. It is the most effective, and shows a disappearance of tendon fibers and the presence of edema-hemorrhagic changes [14]. It allows locating the exact location of the tear, determining if all layers of the quadriceps tendon are affected or if it is a partial rupture, and finally seeing if the retinaculum is torn [7].

The evolution in the absence of treatment leads to healing with retraction, leaving a depression and a contractile swelling at the lower part of the thigh. Treatment is mainly surgical. Early treatment gives better results in acute total ruptures.

## CONCLUSION

Quadriceps tendon ruptures occur mainly in athletes over 40 years of age. Early diagnosis is crucial for optimizing orthopedic management. Ultrasound remains the basic examination when the diagnosis is suspected. An MRI is essential if ultrasound is insufficient, especially in older cases. Early surgical management is necessary to guarantee complete functional recovery.

**Conflicts of Interest:** The authors declare no conflicts of interest.

**Author Contributions:** All authors contributed to this study from conception, reading, and approved the final version.

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