

## Neglected rupture of the quadriceps tendon after removal of a bracing of the patella: Case report

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World Journal of Advanced Research and Reviews, 2024, 22(02), 1825–1829

Publication history: Received on 18 April 2024 revised on 24 May 2024; accepted on 27 May 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.22.2.1636>

### Abstract

**Introduction:** Ruptures of the quadriceps tendon are rare, disabling injuries compromising the knee extension mechanism. Tendon plasty procedures are proposed with the aim of obtaining a solid repair allowing rehabilitation to begin quickly. In cases of old ruptures, tendon retraction and tissue degeneration sometimes prevent satisfactory direct tendon repair from being obtained.

**Observation:** We report the case of a young patient, 19 years old, who underwent removal of osteosynthesis equipment for a fracture of the patella. The evolution is marked by an iatrogenic rupture of the quadriceps tendon which has gone unnoticed.

**Technique:** Positioned in the supine position, using the old approach, a retraction of the quadriceps tendon was revealed with a displacement of the quadriceps tendon at the upper edge of the patella and a tendon defect of 5 centimeters. We performed VY lengthening of the quadriceps tendon using the Codivilla method with reconstruction of the tendon defect.

**Discussion:** Ruptures of the quadriceps tendon are rare, often occurring over the age of 40. Traumatic ruptures are the result of significant stress on the extensor system of the knee. The type of lesion may correspond to a rupture at the level of the tendon body or to a quadriceps collapse often occurring on a previously weakened degenerative tendon and includes a tendon tearing at the upper pole of the patella with a periosteal sleeve sometimes taking away the pre-patellar fibrous part. The treatment of a neglected rupture of the quadriceps tendon is always surgical. A tendon plasty should not be systematically performed.

**Conclusion:** Ruptures of the quadriceps tendon are a rare entity both in current practice and in the literature, ignorance of which leads to inveterate lesions. Several types of plasty are described in the literature, including VY lengthening plasty of the quadriceps tendon using the Codivilla method.

**Keywords:** Neglected Ruptures; Quadriceps Tendon; Patella; Knee; Bracing; Codivilla Method

### 1. Introduction

Ruptures of the quadriceps tendon are rare, disabling injuries that compromise the knee extensor mechanism, leading to an inability to lift the leg straight by interrupting the transmission chain of the knee extensor system [1]. Tendon plasty procedures are then proposed with the aim of obtaining a solid repair allowing rehabilitation to begin quickly

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[2][3], consequently, the vast majority of quadriceps tendon ruptures require surgical repair, and the traditional approach consisting of transpatellar bone tunnels remains relevant, but appears to be biomechanically and functionally replaced by techniques using single- or double-row anchor repair. The diagnosis is essentially clinical. Additional examinations, particularly magnetic resonance imaging, are useful to determine the size of the tear and assess the condition of the tendon. [1][3]. In the case of old ruptures or ruptures linked to advanced chronic tendinopathy, tendon retraction and tissue degeneration sometimes prevent satisfactory direct tendon repair from being obtained. We report the case of a neglected rupture of the quadriceps tendon occurring after removal of bracing of the patella repaired by a “VY” lengthening.

### 1.1. Observation

Mr. K. Y., aged 19, without profession, without medical history, who reported a history of closed trauma to the right knee following a public road accident. He consulted for absolute functional impotence with pain and rupture of the extensor apparatus. The x-ray revealed a fracture of the patella; the treatment consisted of surgical treatment using internal osteosynthesis such as bracing. He underwent removal of the osteosynthesis material two months later and resumed normal activities (figure 1).



**Figure 1** X-ray of the knee (A: after bracing of the patella, B: after removal of the osteosynthesis material and lowering of the patella)

The evolution was marked by functional limitation of the knee with pain and significant hematoma. The knee was tender, edematous, with loss of anatomical landmarks of the knee and depression of the subquadriceps region with inability to extend the knee (figure 2).



**Figure 2** Tendon defect indicating quadriceps retraction

There were no vascular-nervous disorders. The radiograph of the right knee (front and profile) showed a lowering of the patella without other associated lesions (figure 1B). Magnetic resonance imaging (MRI) of the knee showed a clear rupture of the quadriceps tendon at its patellar insertion with retraction of the quadriceps and significant hemarthrosis (figure 3).



**Figure 3** T1 and T2 MRI: an area of T2 hypersignal, with a fluid tone, is located between the tendon fragment and the base of the patella (blue arrow). The tendon fragment is in hyposignal, more or less frayed

## 1.2. Technique

Surgical exploration using a longitudinal median approach to the knee under spinal anesthesia made it possible to demonstrate, after resection of the fibrous scar tissue, a detachment of the quadriceps tendon at the upper edge of the patella. The release of the patellar wings and the posterior surface of the tendon was carried out as well as regularization of the tendon with identification of a 5 centimeter tendon defect (figure 4).



**Figure 4** Regularization of the quadriceps tendon with identification of a tendon defect

A “VY” lengthening of the rectus femoris as well as a bone trench was made at the upper edge of the patella as well as 4 vertical transpatellar tunnels starting from it, allowing “inverted U” points to be supported on the patella and thus bring the tendinous stump into contact with the spongy bone (figure 5).



**Figure 5** VY elongation, tunneling, of the patella and docking to the upper pole of the patella

Framing protection has been created. The tension of the different tendon sutures was controlled when the knee was flexed at 30°. The continuity of the ailerons was restored by separate points. For analgesia, immobilization of the knee with an orthosis for one week was indicated, the pain had disappeared and the mobility of the knee was satisfactory with recovery of the extensor system. Given the long-standing nature of the lesion and especially the normal postoperative functional state of the knee, and the stability of the tendon graft, we preferred to start a functional knee rehabilitation protocol from the second week.

## 2. Discussion

Ruptures of the quadriceps tendon are rare, in most cases occurring after the age of 40. Traumatic ruptures are the result of significant stress on the knee extensor system [3][4][5][6][1]. Medication such as long-term corticosteroids, statins and certain systemic diseases (secondary hyperparathyroidism, hypocalcemia, rheumatoid arthritis, osteogenesis imperfecta or insulin-dependent diabetes) are implicated in ruptures with trauma of the low energy or without trauma [5][6][1]. The role of corticosteroids would be to cause degenerative changes with alteration of the ultra-structure of collagen at the site of the rupture [7][8]. Our patient, however, had no medical history, the rupture

would have occurred after a trivial trauma which corresponds to the removal of the bracing pinning. The type of lesion may correspond to a rupture at the tendon body or to a quadriceps decapitation as in our patient. This decapitation often occurs on a previously weakened degenerative tendon and involves a tearing of the tendon at the upper pole of the patella with a periosteal sleeve sometimes taking away the pre-patellar fibrous tissue [9][10]. The clinical diagnosis of recent rupture of the quadriceps tendon is easy given the existence of a large knee, a painful suprapatellar groove with loss of active knee extension. That of inveterate forms is more difficult because these clinical signs are more crude. However, due to the rarity of this lesion, its initial ignorance is not uncommon, according to Neubauer et al. [11], 30.5% of quadriceps tendon ruptures are diagnosed at the stage of inveterate lesions. The treatment of a neglected rupture of the quadriceps tendon is always surgical. A tendon plasty should not be systematically performed [12][13]. In cases of patellar bone avulsion or in cases of transtendinous rupture with good tissue quality, bony reinsertion of the torn fragment or direct tendon suture provides satisfactory repair. In the event of transmuscular ruptures, the contribution of tendonplasties is limited by poor muscle fixation. The objectives of using tendonplasties are to strengthen the tendon suture or bone reinsertion to the patella and to reconstruct a loss of tendon substance, which allows protected early passive mobilization of the operated knee. Tendonplasties have their place during ruptures of the quadriceps tendon due to advanced degenerative tendinopathy, during ruptures diagnosed late causing tendon retractions or in case of patient requirements (high-level athlete) [14][15]. Other plasties have been described for the repair of the quadriceps such as the plasty using a returned flap of the quadriceps or patellar tendon or the VY lengthening plasty of the quadriceps tendon according to the Codivilla method [16] such is the case of our patient. These plasties tend to weaken the remaining tendon and can only fill a limited loss of substance. An autograft to the fascia lata tendon has also been proposed for quadriceps tendon repair [17]. The advantages of DIDT tendon autoplasty compared to other autografts are the robustness of these tendons, the low morbidity of the donor site, the constant anatomy of the tendons and the satisfactory length allowing multiple transtendinous passages. The advantages of tendon autografts compared to tendon allografts are the absence of potential risk of viral transmission, immediate use in the emergency setting, and low logistical burden. Some studies report the reconstruction of the knee extensor apparatus using patellar tendon allografts, or the complete extensor apparatus (quadriceps tendon + patella + patellar tendon + anterior tibial tuberosity) [18]. Postoperative immobilization is recommended by most authors [19] [20] [21]. This can be done with a knee brace, a cast splint or a removable orthosis for 3 to 6 weeks. In order to prevent the usual trophic disorders, some authors recommend early functional rehabilitation with the objective of recovering 90° of flexion on day 45 [17] [22] [23]. This rehabilitation protocol must take into account the stability and solidity of the surgical repair. In our patient, the functional result was satisfactory, which can be explained by early rehabilitation.

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### 3. Conclusion

Quadriceps tendon ruptures are a rare entity both in current practice and in the literature. Their ignorance leads to inveterate lesions whose treatment is more difficult and the functional result delicate. Several types of plasty are described in the literature. The VY lengthening plasty of the quadriceps tendon according to the Codivilla method with reconstruction of the tendon defect particularly in the neglected rupture associated with good reinforcement of the suture of the quadriceps tendon to the patella made it possible to obtain a functional result satisfying.

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### Compliance with ethical standards

#### *Disclosure of conflict of interest*

The authors declare no conflict of interest.

#### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

#### *Contribution of the authors*

All authors participated in the development of this work. All authors also declare that they have read and approved the final version of the manuscript.

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