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Acute Quadriceps Tendon Tear Following Trivial Trauma in a Physically Active 40 Year Old Male: A Case Report

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Abstract: ***Background: Quadriceps tendon rupture is an uncommon but clinically significant cause of extensor mechanism disruption of the knee. While often associated with systemic comorbidities, it can also occur in otherwise healthy individuals following eccentric loading or awkward jerky movements. Case Presentation: A 40-year-old male gym trainer presented with acute-onset pain, swelling, and functional impairment of the left knee while descending from stairs. Clinical examination revealed restricted range of motion and inability to actively extend the knee with effusion. Radiographs demonstrates knee effusion without any evidence of fracture, MRI confirmed complete quadriceps tendon tear at its patellar insertion. Intervention: On surgical exposure, the Quadriceps tendon was found to be degenerated. Surgical repair was performed involving thorough debridement of devitalised tendon tissue followed by secure reattachment using suture anchors at the superior pole of the patella. A structured post-operative rehabilitation protocol was implemented. Hypothesis: We propose that in well-built individuals, repetitive micro-trauma and occult degenerative changes weaken the quadriceps tendon. When subjected to abrupt eccentric loading, the resulting tensile forces exceed the reduced structural integrity of the tendon, precipitating rupture even in the absence of significant external trauma. Outcome: Till six weeks post operatively, the knee was maintained in full extension as per the immobilisation protocol, with no evidence of extensor lag. Gradual mobilisation was initiated thereafter, achieving 30° of knee flexion at 7 weeks and 70° by 8 weeks. Adjunct therapy using Matrix Rhythm Therapy (MaRhyThe) was incorporated to enhance soft tissue recovery. By 10 weeks, the patient achieved 110° of knee flexion, and by 12 weeks, more than 120° of flexion with full active knee extension was restored. The patient demonstrated good functional recovery with no residual extensor lag. Conclusion: Quadriceps tendon rupture in muscular individuals may represent an internal biomechanical failure rather than purely traumatic injury. Early clinical suspicion, prompt MRI-based diagnosis, and timely surgical repair with suture anchors are key determinants of restoring full knee extensor function and preventing long-term disability.***

Keywords: Quadriceps tendon rupture; knee extensor mechanism; suture anchor repair; knee trauma; rehabilitation; Lysholm score

1. Introduction

Quadriceps tendon rupture is a relatively rare injury, with an estimated incidence of 1.37 per 100,000 person-years, predominantly affecting men over the age of 40 [1]. It constitutes a disruption of the knee extensor mechanism- a complex functional unit comprising the quadriceps muscle group, the quadriceps tendon, the patella, the patellar tendon, and their tibial attachment. Disruption at any level within this chain results in significant loss of active knee extension and functional impairment [2].

The injury typically occurs due to sudden eccentric quadriceps contraction against a flexed knee- commonly during sporting activities, stumbling, or awkward landings. While systemic predisposing conditions such as chronic renal failure, diabetes mellitus, rheumatoid arthritis, gout, and prolonged corticosteroid use are well-documented risk factors, acute tears can also occur in otherwise healthy, physically active individuals [3,4]. However, rupture following trivial trauma in otherwise healthy, muscular individuals presents a diagnostic and mechanistic challenge. Such cases suggest underlying tendon pathology despite apparent physical fitness.

Despite its clinical significance, quadriceps tendon rupture is frequently misdiagnosed or diagnosed with delay, particularly when presentation is atypical or in patients without obvious comorbidities [5]. Clinical examination may reveal a palpable suprapatellar gap and inability to perform straight leg raise. MRI remains the gold standard for confirming the diagnosis and delineating the extent of the tear [6].

Surgical repair is the treatment of choice for complete tears. Suture anchor fixation at the superior patellar pole has gained widespread acceptance as it offers strong biomechanical fixation, avoids trans-osseous tunnel complications, and facilitates early rehabilitation [7]. This case report describes the presentation, imaging findings, operative management, and functional outcome in a healthy, middle-aged gym trainer who sustained a complete quadriceps tendon tear following a low-energy mechanism.

2. Case Presentation

A 40-year-old male gym trainer presented to the Orthopaedic outpatient department with a five-day history of pain, swelling, and inability to extend the left knee. The injury occurred during descending stairs when the patient experienced a sudden jerk at the knee, followed by immediate pain and collapse. He denied any prior knee surgery, trauma, or systemic illness, and was not on any long-term medications.

On examination, he was ambulatory with an antalgic gait. The left knee demonstrated visible and palpable swelling predominantly in the suprapatellar region. A palpable gap was appreciated just above the superior pole of the patella. Active knee extension was completely lost; the patient was unable to perform a straight leg raise. Passive range of motion was restricted due to pain. No neurovascular deficit was noted distally.

Figure 1 (a): Left knee showing suprapatellar swelling and ecchymosis compared with the unaffected right knee

Figure 1 (b): Lateral view showing bruising over the left knee with position of the patella

Radiographs of the left knee (anteroposterior and lateral views) demonstrated effusion with no evidence of bony fracture, avulsion, or intra-articular pathology (Figure 2).

Figure 2: Knee AP/Lateral radiograph demonstrating knee effusion on the left side, without evidence of fracture

MRI of the left knee was subsequently performed which included proton density fat-suppressed (PD-FS) sagittal, axial, and coronal sequences. Imaging confirmed a complete tear of the quadriceps tendon at its insertion at the superior pole of the patella with retraction of the tendon stump. Surrounding soft tissue oedema and haemarthrosis were also noted. The patellar tendon, posterior cruciate ligament (PCL), anterior cruciate ligament (ACL) and medial/lateral collateral ligaments appeared intact (Figures 3a, 3b, 3c).

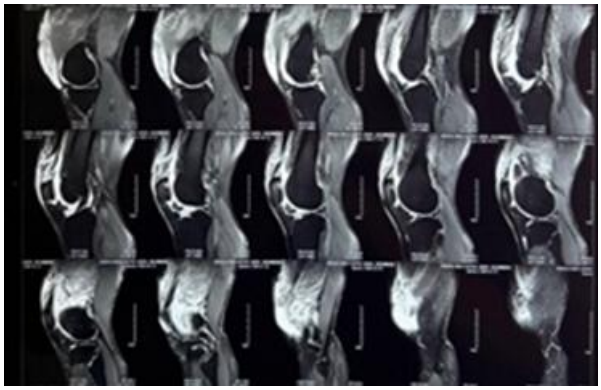

Figure 3 (a): Sagittal PD-FS MRI demonstrating complete quadriceps tendon tear with retraction

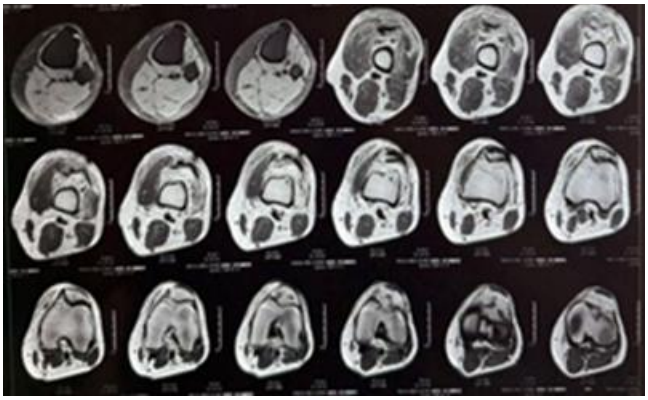

Figure 3 (b): Axial PD-FS MRI showing the level of tendon disruption and surrounding oedema

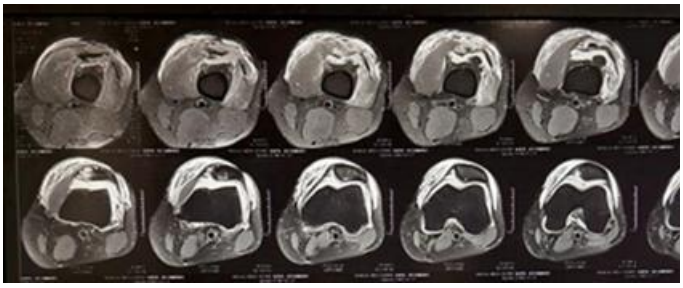

Figure 3 (c): Axial PD-FS MRI showing the level of tendon disruption and surrounding oedema

Surgical Management

The patient was operated under appropriate anaesthesia in the supine position with a tourniquet applied. A midline longitudinal incision *(figure 4b)* was made over the distal thigh and patella centred over the palpable gap *(figure 4a)* in the supra patellar region. After evacuation of hematoma, the ruptured quadriceps tendon was identified *(figure 4c)*. The quadriceps tendon was found to be severely degenerated and the tear was with ragged edges and muscle fibrils. This was surprising considering that the patient was healthy, with good quadriceps mass and gym trainer. Devitalised muscle tissue was excised, remnant of the quadriceps tendon from the superior pole of patella was removed and the tendon edges were freshened to healthy margins. *(figure 4e)*

The tendon was mobilised and secured using non-absorbable Ethibond sutures in a locking Krackow configuration to ensure optimal load distribution across the repair. *(figure 4f)* The superior pole of the patella was prepared, and pilot holes were created using a K-wire to facilitate precise placement of suture anchors. *(figure 4g)* Three anchors were inserted into the patella.

The sutures were passed through the tendon and tied with the knee in full extension, restoring the anatomical footprint and continuity of the extensor mechanism. *(figure 4e)*. This anchor-based fixation provides strong tendon-to-bone healing and improved resistance to gap formation under physiological loading. The medial and lateral retinacula were repaired to augment stability.

Figure 4 (a): Clinical demonstration of supra patellar sulcus sign, indicative of quadriceps tendon tear

Figure 4 (b): Preoperative marking outlining the patella and longitudinal incision landmark

Figure 4 (c): Intra operative exposure showing complete quadriceps tendon tear and devitalised tendon edges

Figure 4 (d): Debridement of devitalised tendon edges and preparation of the rupture site

Figure 4 (e): Freshened margins of quadriceps tendon edges devoid of any devitalised tissue

Figure 4 (f): ethibond suture applied in Krakow technique ensuring secure hold of entire tendon bulk.

IV. Post-operative Rehabilitation

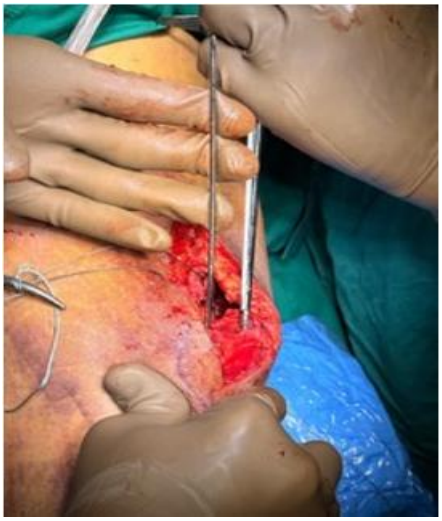

Figure 4 (g): Placement of suture anchor screw in the superior pole of the patella, with sutures passed through the quadriceps tendon for anatomical reattachment

Figure 4 (h): Intraoperative view demonstrating passage of suture limbs through the tendon for secure reattachment

Figure 4 (i): ethibond sutures from tendon passed through anchors

Post-operatively, the limb was immobilised in full extension for the initial 6 weeks to protect the repair and allow adequate tendon-to-bone healing. Gradual knee mobilisation was initiated thereafter, with passive and assisted flexion started at 7 weeks, achieving 30° of flexion. By 8 weeks, knee flexion improved to 70° with supervised physiotherapy. Adjunctive rehabilitation using the Matrix Rhythm Therapy (MaRhyThe) device was incorporated to enhance soft tissue recovery and muscle function.

Further progression of range of motion was noted, with the patient achieving 110° of knee flexion by 10 weeks. By 12 weeks, flexion improved to beyond 120°, *(figure 5a)* with restoration of full knee extension and no evidence of extensor lag *(figure 5b)*. The patient demonstrated satisfactory functional recovery with progressive return to daily activities.

The structured rehabilitation protocol, combined with stable anchor fixation, facilitated early controlled mobilisation and contributed to a favourable functional outcome

Table 1: Post-operative Functional Outcomes

Follow-up Period	ROM (Flexion)	Extensor Lag	Lysholm Score
6 Weeks	None (Immobilisation)	None	-
7 weeks	30	None - Full Extension	45
8 weeks	70	None - Full Extension	60
10 weeks	110	None - Full Extension	75
12 weeks	>120	None - Full Extension	88

Figure 5 (a): more than 120 degrees of flexion of knee joint at 12 weeks

Figure 5 (b): full extension of knee joint with no extensor lag at 12 weeks

Hypothesis

Quadriceps tendon rupture in a muscular individual following trivial trauma may be explained by a mismatch between increased muscle-generated force and reduced tendon tensile strength. [10,12]

Despite well-developed musculature, the tendon may undergo subclinical degeneration due to repetitive micro-trauma, chronic overload, and relative hypovascularity. These changes compromise collagen integrity and reduce tensile capacity. [13,14]

During trivial trauma, particularly involving sudden eccentric contraction, the force generated by a hypertrophied quadriceps muscle may exceed the strength of the weakened tendon, leading to rupture.[15]

Thus, the injury represents an internal biomechanical failure rather than purely external trauma. [12,15]

3. Discussion

Quadriceps tendon rupture is an under-diagnosed condition that can occur in otherwise healthy, physically active individuals, as demonstrated by this case. Our patient, a gym trainer in his fourth decade, sustained a complete tear following a relatively low-energy eccentric mechanism- a clinical scenario that may initially divert suspicion towards less severe pathologies such as muscle strain or haemarthrosis.

The characteristic triad of supra-patellar swelling, a palpable gap above the patella, and inability to perform active straight leg raise should immediately raise clinical suspicion.

MRI remains the investigation of choice for confirming the diagnosis, characterising the extent of tear, and ruling out concurrent intra-articular pathology. In this case, PD fat-suppressed sequences clearly delineated the complete tear at the osteotendinous junction with associated peritendinous oedema and haemarthrosis, whilst confirming the integrity of the posterior cruciate ligament and collateral ligaments.

Surgical repair remains the standard of care for complete quadriceps tendon ruptures, as conservative management invariably results in poor functional recovery and persistent extensor weakness [2,7]. The timing of surgery is a critical factor: repairs performed within three weeks of injury are associated with superior outcomes compared to delayed primary or reconstructive procedures [8]. In this case, surgery was performed within five days of injury, enabling primary anatomical repair with minimal tendon retraction.

Suture anchor fixation, as employed in this case, offers several theoretical and practical advantages over traditional trans-osseous tunnel repair. It eliminates the risks of patellar fracture or stress risers inherent to drill-hole creation, provides secure multipoint fixation at the patellar surface, and facilitates an earlier initiation of rehabilitation [9]. The Krackow locking suture configuration distributes load evenly along the repaired tendon, reducing the risk of early failure.

The Lysholm score of 88 at three months, combined with full extension and more than 120° of flexion, indicates a good functional outcome consistent with the published literature. Several series report Lysholm scores exceeding 85 and return-to-work rates of over 90% following early suture anchor repair, particularly in patients without systemic comorbidities [7,9].

A plausible biomechanical hypothesis in this scenario is that repetitive high-load training may lead to occult micro-degenerative changes at the osteotendinous junction, rendering the tendon susceptible to failure under sudden eccentric loading. This interplay between subclinical degeneration and acute eccentric overload may explain the occurrence of complete rupture following seemingly trivial trauma in muscular individuals. [10,11,12]

4. Conclusion

This case highlights that acute quadriceps tendon rupture can occur in healthy, physically active individuals in the absence

of identifiable systemic risk factors, underscoring the need for a high index of clinical suspicion to avoid delayed diagnosis. A combined approach of thorough clinical examination and appropriate imaging, including lateral knee radiographs and MRI, provides a reliable diagnostic pathway. Early surgical repair using suture anchor fixation, followed by a structured rehabilitation protocol, can achieve favourable functional outcomes. The occurrence of such injuries following trivial trauma in muscular individuals suggests a contributory role of occult tendon degeneration and eccentric loading, emphasising the importance of early recognition and timely intervention for optimal recovery.

Patient Consent

Written informed consent was obtained from the patient for publication of this case report and all associated clinical images, intraoperative photographs, and radiological investigations.

Conflict of Interest

The authors declare no conflict of interest.

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