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(CASE REPORT)

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Spontaneous bilateral quadriceps tendon rupture: A case report with review of the literature

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Abstract

Introduction: Spontaneous bilateral quadriceps tendon rupture is an exceptionally rare injury and is most often associated with systemic conditions, particularly end-stage renal disease (ESRD). Tendon fragility in ESRD patients increases the risk of rupture even after minimal trauma.

Case report: We report the case of a 28-year-old man undergoing chronic hemodialysis who presented with acute bilateral quadriceps tendon rupture following a minor domestic accident. Clinical evaluation revealed suprapatellar swelling and complete loss of active knee extension. Diagnostic imaging included plain radiographs and magnetic resonance imaging (MRI). The patient underwent bilateral surgical repair using transosseous sutures after preoperative hemodialysis, followed by standardized postoperative immobilization and rehabilitation. At three months, the patient achieved satisfactory functional recovery, with restored ambulation and independence in daily activities.

Discussion: This case illustrates the multifactorial mechanisms of tendon weakening in ESRD, including metabolic, vascular, and structural alterations. Early diagnosis and prompt surgical intervention are essential to achieve favorable outcomes, as delayed management is associated with significant functional impairment. Clinicians should maintain a high index of suspicion for quadriceps tendon rupture in ESRD patients presenting with sudden loss of knee extension, even after minor trauma.

Keywords: Quadriceps tendon; Rupture; Bilateral; End-stage renal disease

1. Introduction

The knee extensor mechanism is a functional and anatomical entity composed of the quadriceps femoris muscle, the quadriceps tendon, the patella—integrated into the prepatellar fibrous plane—and the patellar tendon, which inserts on the anterior tibial tuberosity [1]. Quadriceps tendon rupture, although rare and most frequently affecting middle-aged men, is increasingly reported in younger patients with comorbidities such as diabetes, gout, rheumatoid arthritis, or end-stage chronic renal failure [2–3]. In these patients, even minor trauma may cause rupture due to tendon weakening [4]. Bilateral ruptures have also been described, particularly in patients with end-stage renal failure.

Quadriceps rupture severely impairs walking ability, causing pain and inability to actively extend the knee [5–6].

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Because of the tendon's limited healing capacity—especially in cases of retraction or pre-existing lesions—early surgical repair is generally recommended [7–8]. However, several operative techniques are available, with no single method clearly superior [9]. This article reports a case of bilateral quadriceps tendon rupture in a young patient with ESRD.

2. Case report

A 28-year-old male patient was admitted to the emergency department with acute pain and complete functional impairment of both lower limbs following a minor domestic accident (rapid loading of the limb upon standing) one day earlier. His medical history was notable for end-stage renal disease secondary to pyelonephritis, managed with hemodialysis since 2019 (three sessions per week), associated with hyperparathyroidism.

Clinical examination revealed bilateral supra-patellar swelling with depression and complete loss of active knee extension, without skin breach or distal neurovascular deficit.

Figure 1 Patient's clinical appearance

Standard radiographs of both knees demonstrated patellar descent without associated fracture. MRI confirmed bilateral quadriceps tendon rupture with a gap of 15 mm on the right and 20 mm on the left between the tendon insertion and the superior patellar border. A hemodialysis session was scheduled the day before surgery. The patient subsequently underwent bilateral surgical repair under regional anesthesia with pneumatic tourniquet control.

Figure 2 Standard radiographs of both knees revealed a patellar lowering without any associated fracture

Figure 3 MRI shows bilateral quadriceps tendon rupture

Through an anterior approach to both knees, extensive irrigation and hematoma evacuation were performed. Bilateral tendon avulsions were identified, and repair was achieved using double transosseous sutures with 2-Vicryl. Intraoperative testing confirmed stability, and closure was performed in layers over a suction drain.

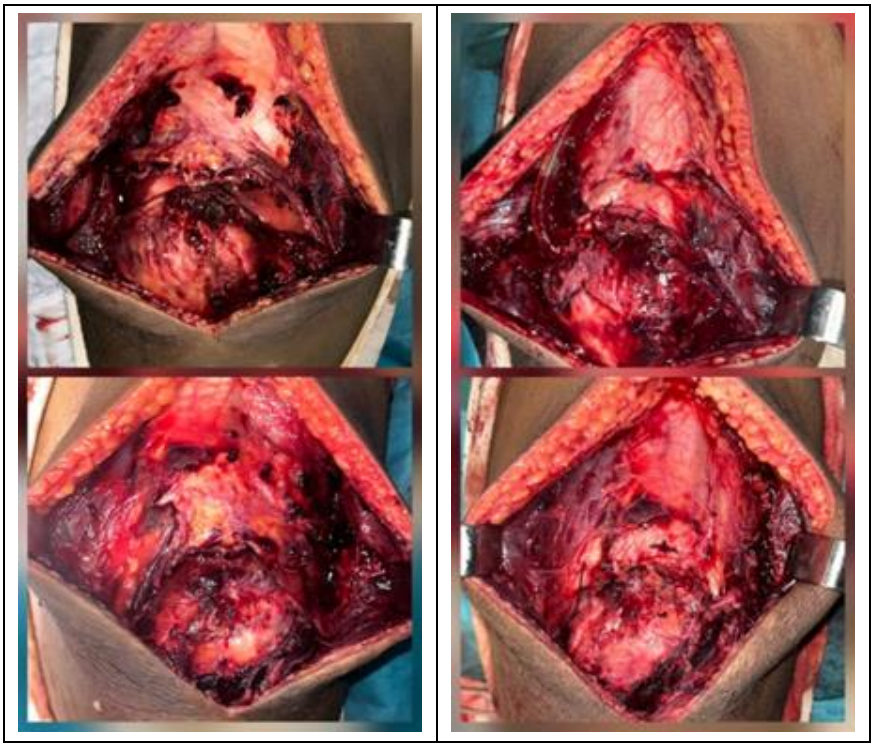

Figure 4 Post-suturing appearance (Right) Intraoperative findings of the rupture (left)

Postoperatively, the patient was immobilized with bilateral rigid knee braces in full extension for 6 weeks, followed by progressive passive rehabilitation (up to 60° then 90°). At 3 months, active rehabilitation was initiated, and muscle strengthening was added in the fourth month. The outcome was favorable, with recovery of ambulation and daily activities.

3. Discussion

The normal quadriceps tendon is one of the strongest tendons in the body, capable of withstanding loads of 15–30 kg/mm [10]. Spontaneous bilateral quadriceps tendon (QT) rupture is rare. A UK-based study reported an incidence of 1.37 per 100,000 persons per year [11], with a mean age of 50.5 years in men and 51.7 years in women, and higher frequency in men [12]. Another study indicated that simultaneous atraumatic bilateral ruptures account for 30–35% of all QT rupture cases, highlighting their rarity [13].

Multiple conditions predispose to tendon rupture by altering tendon ultrastructure or vascular supply [14]. These include chronic kidney disease, hyperparathyroidism [15], diabetes, systemic lupus erythematosus [13], as well as chronic use of corticosteroids, fluoroquinolones, statins, anabolic steroids, and immunosuppressants [16–17]. Studies show that younger patients with bilateral QT ruptures are statistically more likely to have underlying systemic disease compared to older patients [13]. The pathophysiology of bilateral QT ruptures in chronic renal failure remains poorly understood and appears multifactorial. Reported mechanisms include collagen abnormalities, local ischemia, dystrophic calcification, chronic metabolic acidosis, direct effects of parathyroid hormone, and subperiosteal bone resorption—all contributing to weakening of the tendon–bone junction and predisposing to rupture [18–19]. The mainstay of treatment is surgical reattachment to the patella [20]. For mid-substance ruptures, direct tendon repair is recommended, whereas osteotendinous junction ruptures are managed with transosseous tunnels or suture anchors, the latter being less invasive.

Although clinical outcomes are comparable between techniques, the lack of robust comparative studies prevents formal recommendations [21]. In chronic retracted ruptures, augmentation techniques such as those described by Scuderi or Codivilla may be employed; however, their effectiveness is often limited by poor tendon quality, reducing their clinical applicability [22].

4. Conclusion

Spontaneous bilateral quadriceps tendon rupture is a rare condition, often misdiagnosed initially due to confounding factors such as obesity, comorbidities, or incomplete physical examination. A thorough medical evaluation—including detailed history, comprehensive clinical examination, and appropriate imaging—is essential. Early diagnosis allows prompt surgical management, which is associated with a more favorable prognosis compared with delayed intervention.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of ethical approval

Ethical approval was not required for this study as it is a single case report and does not involve experimental research on human or animal subjects.

Statement of informed consent

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

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