Case Report

Caspian Journal of Surgery
p-ISSN **-****e-ISSN ****-****
(2025) vol 1: (1)

Bilateral and Simultaneous Quadriceps Tendon Rupture in a Chronic Kidney Disease Patient: A Rare and Severe Presentation

Majid Khalilizad*[1], Amir Mahmoud Afshar[2], Mobin Marzban Abbas Abadi[1]

1. Department of Orthopedic and Trauma Surgery, Shahid Beheshti Hospital, Babol university of medical sciences, Babol, Iran.

2. Clinical Research Development Unit of Shahid Beheshti Hospital, Babol University of medical sciences, Babol, Iran.

Background: Bilateral quadriceps tendon rupture is a rare and severe injury that is often associated with chronic conditions such as chronic renal failure, hyperparathyroidism, and long-term hemodialysis. This case report presents a rare instance of bilateral quadriceps tendon rupture in a patient with chronic renal failure, highlighting the underlying pathophysiological mechanisms and diagnostic challenges.

Case Presentation: A 37-year-old man with a seven-year history of chronic kidney disease, treated with hemodialysis, presented with bilateral knee pain, swelling, and an inability to walk after falling on a flat surface. Clinical examination revealed an inability to actively extend both knees, with palpable suprapatellar gaps. Imaging studies, including X-ray and MRI, confirmed bilateral quadriceps tendon rupture. Laboratory tests revealed elevated parathyroid hormone (PTH) levels, supporting the diagnosis of secondary hyperparathy-roidism due to chronic renal failure.

Treatment and Outcome: The patient underwent surgical repair using the Krackow method with anchor sutures. Postoperative rehabilitation included physiotherapy, and four months after surgery, the patient regained full knee extension and 100° of flexion. He was able to return to normal activities without complications.

Discussion: Bilateral quadriceps tendon rupture is rarely seen in individuals with chronic kidney disease, with secondary hyperparathyroidism being a key contributor. The weakened tendons, combined with the trauma, can result in tendon rupture even with minimal injury. Early diagnosis through imaging, particularly MRI, is crucial in such cases. This case underscores the importance of recognizing the risks of tendon rupture in high-risk populations and implementing preventive measures.

***Conclusion*:** Hyperparathyroidism secondary to chronic renal failure likely contributes to the weakening and rupture of tendons. Timely diagnosis and surgical intervention can lead to successful outcomes in these high-risk patients.

Keywords: Bilateral quadriceps tendon rupture, chronic renal failure, secondary hyper-parathyroidism, tendon repair

***Received*:**
January 2, 2025
***Accepted*:**
February 28, 2025
***Published*:**
March 28, 2025

Corresponding author:
Majid Khalilizad
Department of Orthopedic and Trauma Surgery, Shahid Beheshti Hospital, Babol university of medical sciences, Babol, Iran.
E-mail:
majidkhalilizad@yahoo.com

Introduction

Quadriceps tendon rupture is a rare condition, with an incidence of approximately 1.37 per 100,000 individuals, predominantly affecting men over the age of 40 (1). This injury can result from direct trauma, particularly in sports-related activities (2), or may occur spontaneously in the presence of chronic conditions such as gout, systemic lupus erythematosus, hyperparathyroidism, and chronic kidney disease (CKD) (3-6). Additionally, the use of medications such as fluoroquinolones, corticosteroids, and anabolic steroids has been implicated as a risk factor for tendon rupture (7).

Diagnosis is primarily clinical, with the classic triad consisting of acute pain, an inability to actively extend the knee, and a palpable suprapatellar gap (8). When clinical suspicion arises, imaging modalities such as ultrasonography or magnetic resonance imaging (MRI) are utilized to confirm the diagnosis (9).

In patients with CKD undergoing dialysis, quadriceps tendon rupture has been linked to secondary hyperparathyroidism, which disrupts bone and tendon homeostasis (5, 10). However, despite this association, tendon rupture in patients with CKD remains uncommon and is primarily documented through case reports.

Herein, we present a case of bilateral, simultaneous quadriceps tendon rupture in a middle-aged patient with chronic kidney disease following low-energy trauma.

Case Report

In March 2021, a 37-year-old man presented to our hospital with an inability to walk following a fall. He reported a two-week history of bilateral knee pain and swelling after falling. Initially, he assumed that his symptoms would resolve spontaneously, leading to a two-week delay in seeking medical attention. However, during this period, his inability to bear weight persisted.

The patient had a seven-year history of end-stage renal disease (ESRD) secondary to hypertension and was undergoing hemodialysis. He had previously undergone a kidney transplant six years ago, which failed after eight months, necessitating a return to dialysis three times per week.

On physical examination, the patient exhibited significant bilateral knee swelling and was unable to actively extend his legs. A palpable suprapatellar gap was present bilaterally. Additionally, he was unable to perform the straight leg raise (SLR) test on both sides. Upon palpation, a noticeable depression was observed in the superior aspect of both knees at the quadriceps tendon insertion site (**Figure 1**).

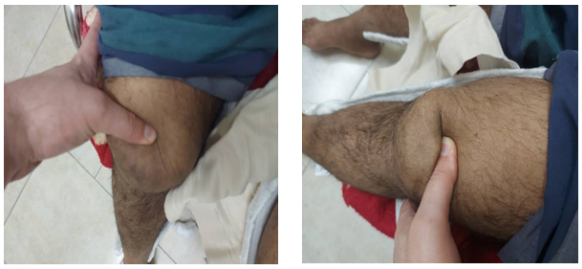

Fig. 1. Bilateral depression of the suprapatellar area.

Based on the patient's symptoms and physical examination findings, a suspicion of bilateral quadriceps tendon rupture was raised. Consequently, X-ray (**Figure 2**) and MRI (**Figure 3**) were ordered for further evaluation.

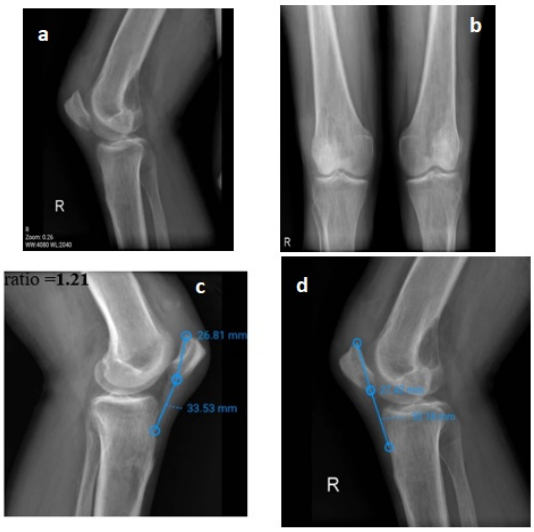

Fig. 2. Preoperative X-ray of both knees of the patient in lateral (a) and anterior (b) views and calculation of the insall-salvati ratio (c and d)

The X-ray showed no evidence of fracture, cartilage damage, or patellar dislocation but revealed significant joint effusion. MRI findings confirmed bilateral quadriceps tendon ruptures, with clear detachment of the tendons from their insertion sites.

Given the patient's history of chronic renal failure and ongoing dialysis, additional laboratory tests were ordered. His metabolic and hematological profiles were within normal limits, but elevated parathyroid hormone (PTH) levels were noted.

A clinical diagnosis of bilateral quadriceps tendon rupture was confirmed based on the combination of physical examination findings and radiological

imaging. The patient was scheduled for surgical repair the following day.

The repair was performed using the Krackow method, with three parallel tunnels and two size-five anchor sutures (**Figure 4 and 5**). the patient underwent outpatient physiotherapy to regain strength and improve the range of motion. Four months postoperatively, the patient was able to walk without difficulty, achieving full bilateral knee extension (0°) and 100° of bilateral flexion. he reported no limitations in daily activities and had fully recovered.

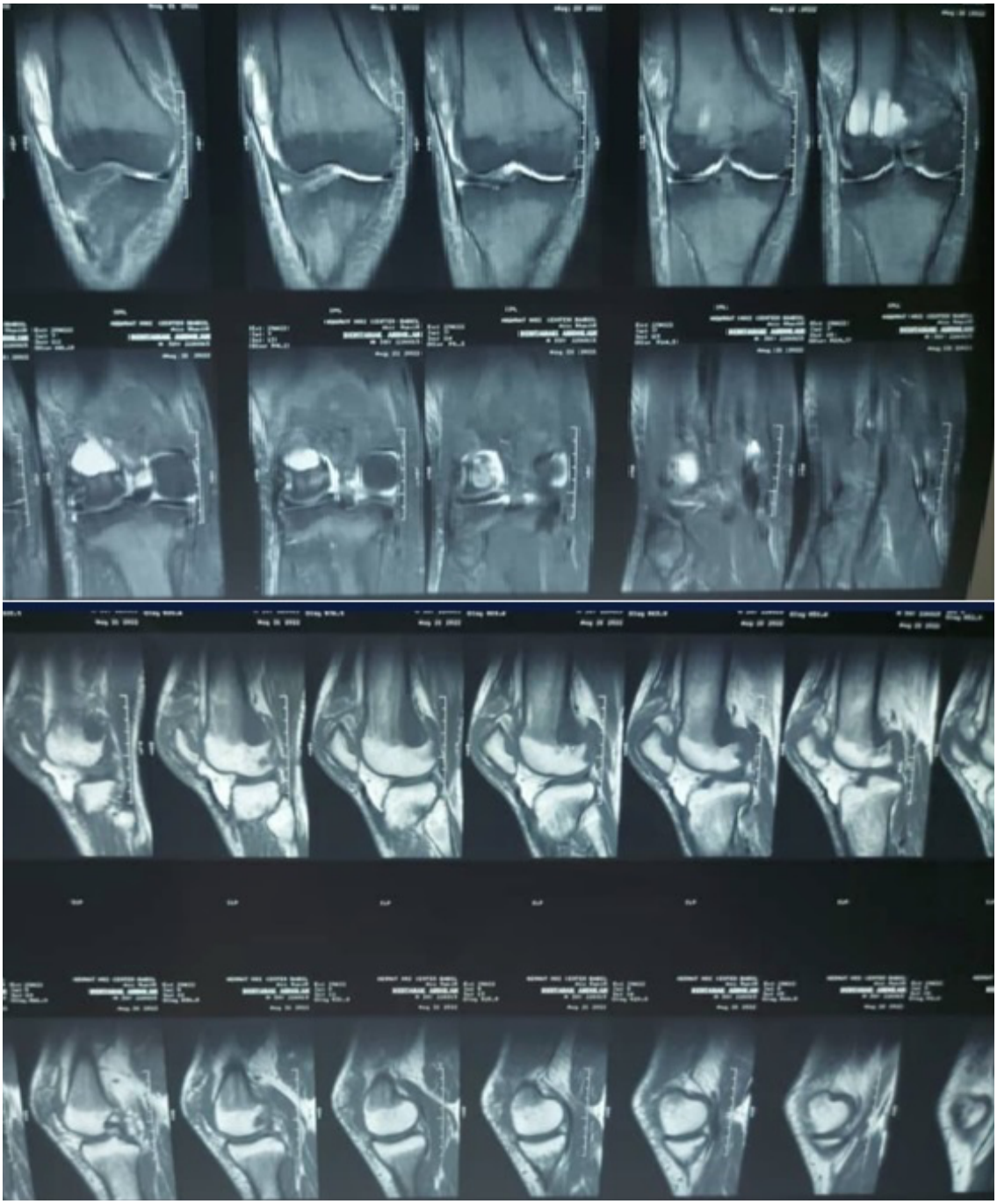

Fig. 3. Preoperative MRI of the patient.

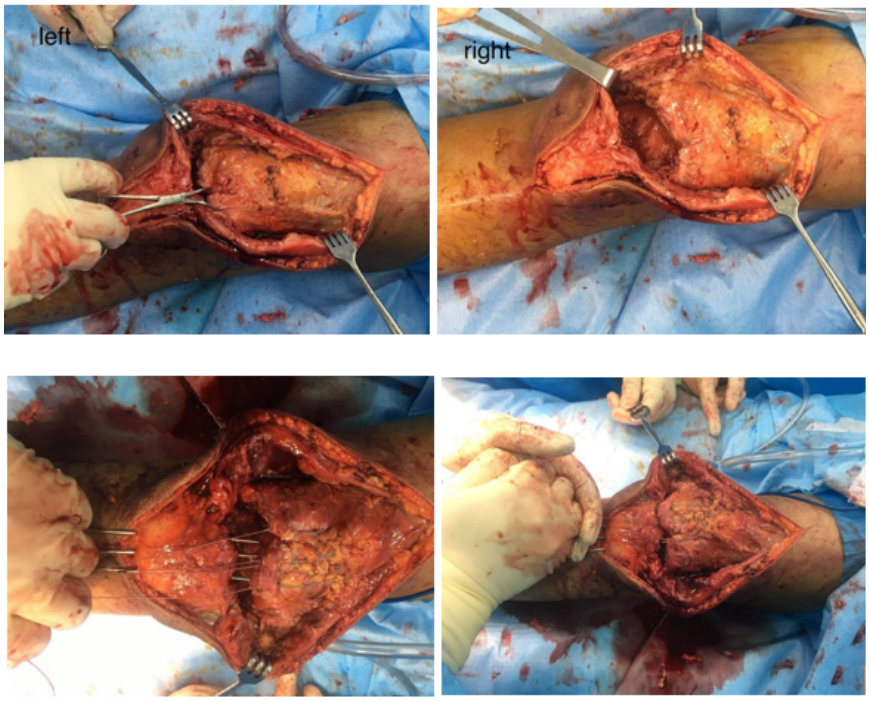

Fig. 4. Surgery process of both knees.

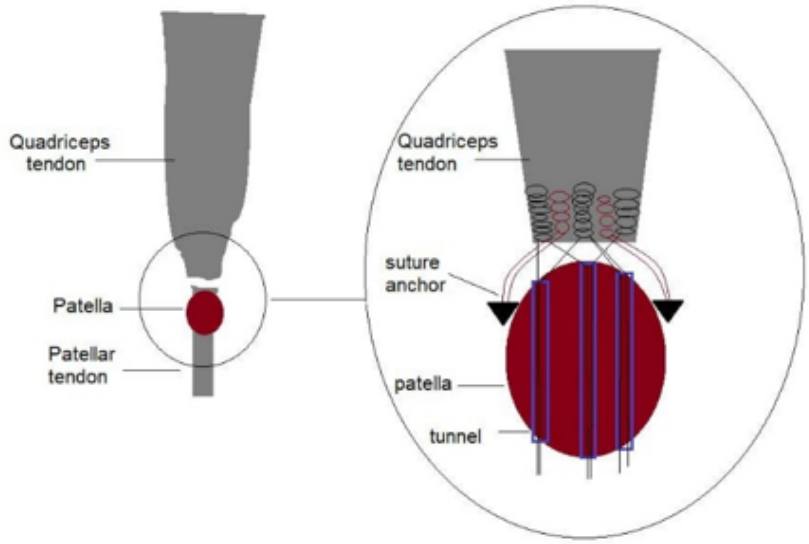

Fig. 5. Schematic diagram of surgery process.

Discussion

Bilateral quadriceps tendon rupture is a rare injury in otherwise healthy individuals. Simultaneous bilateral quadriceps tendon rupture is more commonly observed in men over 50 years old, particularly those who are obese, diabetic, or have age-related tendon abnormalities (11). However, cases have also been reported in younger individuals with chronic conditions such as gout, hyperparathyroidism, and chronic renal failure (11). Other contributing factors include the use of anabolic steroids, local steroid injections, and a history of persistent tendinitis (12-14). These predisposing factors promote tendon degeneration by impairing collagen production or strength, resulting in tendon sclerosis, fibrosis, fatty degeneration, necrosis,

or calcification (11, 15).

The first documented case of simultaneous bilateral quadriceps tendon rupture in a patient with chronic renal failure and secondary hyperparathyroidism was reported by Preston and Adikoff in 1962 (16). Since then, numerous studies, particularly in recent years, have highlighted this issue (17-21). Early research emphasized the association between the duration of hemodialysis and the occurrence of spontaneous tendon ruptures, attributing the mechanism to tendon weakness caused by malnutrition and the accumulation of uremic toxins—classic complications of long-term hemodialysis (22, 23). A study by De Franco et al. also reported secondary hyperparathyroidism in these patients and attributed tendon rupture to this condition (10).

Secondary hyperparathyroidism is a common complication of chronic renal failure. Its development is driven by several factors, including calcitriol deficiency, phosphorus retention, decreased calcium receptor activation in the parathyroid, and skeletal resistance to the calcemic effects of parathyroid hormone. The reduction in calcitriol also diminishes intestinal calcium absorption, contributing to hypocalcemia and stimulating increased parathyroid hormone production (24). Elevated PTH levels activate osteoclasts at the tendon attachment site, weakening the bone at the tendon insertion, which makes it more susceptible to rupture even with minimal trauma (6). In our patient, a fall from a flat surface led to the mild trauma that resulted in bilateral quadriceps tendon rupture.

Diagnosing bilateral quadriceps tendon rupture can be challenging due to its rarity, the absence of obvious trauma, and the difficulty of performing a thorough physical examination, especially with knee swelling and bilateral involvement, which prevents a comparative examination (17). Consequently, diagnosis may be delayed, underscoring the importance of imaging studies. In this case, we ordered an MRI of both knees for a definitive diagnosis. Other case reports have similarly relied on MRI for diagnosis (17, 19). Zribi et al. also employed knee ultrasonography in conjunction with MRI (18), while Lim et al. diagnosed bilateral quadriceps tendon rupture through X-ray, physical examination, and elevated PTH levels (19). Nevertheless, we recommend MRI as the gold standard for confirming the diagnosis in this patient population. In settings where MRI is unavailable or has a long waiting period, ultrasound can be used as a diagnostic tool, although its sensitivity is lower compared to MRI.

Conclusion

This case highlights that secondary hyperparathyroidism, as a complication of chronic renal failure, likely contributes to tendon weakening and may even lead to spontaneous tendon rupture. Preventive measures should be considered for high-risk patients with chronic renal failure to mitigate the risk of such injuries.

References

1. Clayton RA, Court-Brown CM. The epidemiology of musculoskeletal tendinous and ligamentous injuries. Injury. 2008;39(12):1338-44.
2. Shah M, Jooma N. Simultaneous bilateral quadriceps tendon rupture while playing basketball. Br J Sports Med. 2002;36(2):152-3; discussion 3.
3. Ventura-Ríos L, Sánchez-Bringas G, Pineda C, Hernández-Díaz C, Reginato A, Alva M, et al. Tendon involvement in patients with gout: an ultrasound study of prevalence. Clin Rheumatol. 2016;35(8):2039-44.
4. Karadimas EJ, Kotzamitelos D, Kakagia DD, Hatziyiannakis A. Spontaneous rupture of the patellar tendon and the contralateral quadriceps tendon, associated with lupus erythematosus: analysis of the literature. Case Rep Orthop. 2011;2011:569363.
5. Thaunat M, Gaudin P, Naret C, Beaufils P, Thaunat O. Role of secondary hyperparathyroidism in spontaneous rupture of the quadriceps tendon complicating chronic renal failure. Rheumatology (Oxford). 2006;45(2):234-5.
6. Kim BS, Kim YW, Song EK, Seon JK, Kang KD,Kim HN. Simultaneous bilateral quadriceps tendon rupture in a patient with chronic renal failure. Knee Surg Relat Res. 2012;24(1):56-9.
7. Ilan DI, Tejwani N, Keschner M, Leibman M. Quadriceps tendon rupture. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2003;11(3):192-200.
8. Siwek CW, Rao JP. Ruptures of the extensor mechanism of the knee joint. J Bone Joint Surg Am. 1981;63(6):932-7.
9. Verdano MA, Zanelli M, Aliani D, Corsini T, Pellegrini A, Ceccarelli F. Quadriceps tendon tear rupture in healthy patients treated with patellar drilling holes: clinical and ultrasonographic analysis after 36 months of follow-up. Muscles Ligaments Tendons J. 2014;4(2):194-200.
10. De Franco P, Varghese J, Brown WW, Bastani B. Secondary hyperparathyroidism, and not beta 2-microglobulin amyloid, as a cause of spontaneous tendon rupture in patients on chronic hemodialysis. Am J Kidney Dis. 1994;24(6):951-5.
11. Ribbans WJ, Angus PD. Simultaneous bilateral

rupture of the quadriceps tendon. Br J Clin Pract. 1989;43(3):122-5.
12. David HG, Green JT, Grant AJ, Wilson CA. Simultaneous bilateral quadriceps rupture: a complication of anabolic steroid abuse. J Bone Joint Surg Br. 1995;77(1):159-60.
13. Liow RY, Tavares S. Bilateral rupture of the quadriceps tendon associated with anabolic steroids. Br J Sports Med. 1995;29(2):77-9.
14. Clark SC, Jones MW, Choudhury RR, Smith E. Bilateral patellar tendon rupture secondary to repeated local steroid injections. J Accid Emerg Med. 1995;12(4):300-1.
15. Stephens BO, Anderson GV, Jr. Simultaneous bilateral quadriceps tendon rupture: a case report and subject review. J Emerg Med. 1987;5(6):481-5.
16. Preston FS, Adicoff A. Hyperparathyroidism with avulsion of three major tendons. Report of a case. N Engl J Med. 1962;266:968-71.
17.Wu W, Wang C, Ruan J, Wang H, Huang Y, Zheng W, et al. Simultaneous spontaneous bilateral quadriceps tendon rupture with secondary hyperparathyroidism in a patient receiving hemodialysis: A case report. Medicine (Baltimore). 2019;98(10):e14809.
18. Zribi W, Zribi M, Guidara AR, Ben Jemaa M, Abid A, Krid N, et al. Spontaneous and simultaneous complete bilateral rupture of the quadriceps tendon in a patient receiving hemodialysis: A case report and literature review. World J Orthop. 2018;9(9):180-4.
19. Vemuri VN, Venkatesh M, Kada V, Chakkalakkoombil SV. Spontaneous bilateral quadriceps tendon rupture in a patient with renal failure. BMJ Case Rep. 2018;2018.
20. Lim CH, Landon KJ, Chan GM. Bilateral Quadrice -ps Femoris Tendon Rupture in a Patient With Chronic Renal Insufficiency: A Case Report. J Emerg Med. 2016;51(4):e85-e7.
21. Gao MF, Yang HL, Shi WD. Simultaneous bilateral quadriceps tendon rupture in a patient with hyperparathyroidism undergoing long-term haemodialysis: a case report and literature review. J Int Med Res. 2013;41(4):1378-83.
22. Kurer MH, Baillod RA, Madgwick JC. Musculoskeletal manifestations of amyloidosis. A review of 83 patients on haemodialysis for at least 10 years. J Bone Joint Surg Br. 1991;73(2):271-6.
23. Hofmann GO, Weber T, Lob G. [Tendon rupture in chronic kidney insufficiency--"uremic tendonopathy"? A literature-supported documentation of 3 cases]. Chirurg. 1990;61(6):434-7.
24. Habas E, Sr., Eledrisi M, Khan F, Elzouki AY. Secondary Hyperparathyroidism in Chronic Kidney Disease: Pathophysiology and Management. Cureus. 2021;13(7):e16388.