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Case Report

Bilateral Simultaneous Patellar Tendon Rupture Following Trivial Trauma in a Middle Aged Man with End Stage Renal Failure Undergoing Long-Term Hemodialysis Managed with Open Repair: A Case Report

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Abstract

Bilateral patellar tendon rupture is a rare injury, but can be associated with systemic disorders that compromise tendon integrity. Patients with end-stage renal disease on long-term haemodialysis are particularly predisposed due to chronic metabolic derangements affecting collagen structure. This case report describes a male patient in his mid-fifties with end-stage renal disease on maintenance haemodialysis who presented with acute bilateral knee pain and inability to bear weight following trivial trauma. Clinical examination revealed loss of active knee extension with palpable infrapatellar defects and imaging confirmed bilateral patellar tendon rupture.

The patient underwent staged multidisciplinary optimisation followed by simultaneous bilateral surgical repair of patellar tendons, anterior knee capsule and retinaculi using trans-osseous sutures, suture anchors and protective cerclage wiring. Postoperative rehabilitation involved a structured protocol with gradual progression of weight bearing and range of motion. At 6 months, the patient achieved satisfactory functional recovery with 0–110° knee flexion and independent ambulation. At 2-year follow-up, radiographs demonstrated maintained patellar height with asymptomatic cerclage wire breakage in one knee.

This case highlights the importance of a high index of suspicion and early recognition of tendon injuries in high-risk population, the role of robust surgical repair techniques in situations where tendon quality is suboptimal due to chronic kidney disease.

Key words: Bilateral patellar tendon rupture, End-stage renal disease, Hemodialysis, Extensor mechanism injury.

Keywords: Femoral Bone Defect; Vascularized Fibular Graft; Induced Membrane Technique; Limb Salvage; Open Fracture

Abbreviations

CAD: Coronary Artery Disease; CKD: Chronic Kidney Disease; DM: Diabetes Mellitus; DVT: Deep Vein Thrombosis; EDS: Ehlers-Danlos Syndrome; ER: Emergency Room; ESRD: End-Stage Renal Disease; HO: Heterotopic ossification; HTN: Hypertension; NVD: Neurovascular Deficit; SLE: Systemic Lupus Erythematosus; USG: Ultrasonography

Introduction

Patellar tendon rupture is a serious injury caused by direct or indirect trauma to the knee that requires prompt diagnosis and

surgical management [1,2]. Bilateral patellar tendon rupture though rare is usually associated with systemic disorders weakening collagen structures and the extensor mechanism of the knee joint such as renal failure, connective tissue disorders such as Ehlers-Danlos Syndrome (EDS), Systemic Lupus Erythematosus (SLE), rheumatoid arthritis and hyperparathyroidism; chronic stress around the patellar tendon, medications, obesity or sedentary lifestyles [1,2,5]. Patients with End Stage Renal Disease (ESRD) who are on long-term haemodialysis, are susceptible to such injuries due to metabolically compromised tendons [1,2,5].

This case report describes the presentation and management of bilateral patellar tendon rupture in a patient with ESRD undergoing long-term hemodialysis managed in a tertiary care orthopaedic unit. It will be an addendum to the limited literature regarding the diagnosis and surgical management of similar cases.

Case Presentation

A male patient in his mid-fifties consulted the ER (Emergency Room) with complaints of severe bilateral knee pain and inability to bear weight 6 hours following a trivial trauma to both of his knees. The trauma was described as feeling of a sudden giveaway of the anterior knee tendons when he suddenly knelt down breaking a fall from a standing height after losing balance on a slippery floor. He gave history of type 2 Diabetes Mellitus (DM), systemic Hypertension (HTN), Coronary Artery Disease (CAD), hypothyroidism for which he was on regular medications and CKD maintained on-thrice weekly hemodialysis.

On clinical examination, both of his knees showed diffuse large swelling. There was tenderness over the infrapatellar region with a palpable large gap at the inferior pole of the patella in both knees. Active knee extension was absent bilaterally and knee flexion was restricted with significant pain. Patellar tap was positive bilaterally indicating symptoms of significant knee effusion. However, the neurovascular elements of both lower limbs were intact.

Plain radiographs of both knees showed no evidence of bony injuries and bilateral patella alta. An ultrasonography (USG) of the knees confirmed complete avulsion of both patellar tendons with significant retraction of the fibres and large effusion. Differential diagnoses of quadriceps tendon rupture or tibial tubercle avulsion were excluded.

The patient was transferred to the Orthopaedic Department immediately and was initially treated with splintage of both knees and standard analgesia with local cold compresses. Multidisciplinary inputs were obtained from nephrology, cardiology, endocrinology and anaesthesia teams over the next one week and was scheduled for bilateral knee surgery after medical optimisation. A plan of surgical repair of the patellar tendons were explained to the patient and kin and informed written consent was obtained.

Surgical Technique

Patellar tendon reattachment is often accompanied by an encerclage wiring to protect the repair and additional repair of capsular tears using suture anchors or sutures through bone tunnels are necessary to maintain the continuity of the extensor apparatus of the knee.

Under general anaesthesia, the patient was positioned supine on a radiolucent table with radiographic access to both knees after standard prepping and draping. Anterior midline longitudinal incisions were used alternatively on both knees extending from a point 5 cm proximal to the superior pole patella to another point of tibial tubercle. Following a layered dissection, a complete rupture of the patellar tendon from the inferior pole of the patella, extensive anterior capsular avulsion from proximal tibia and retinacular injury on either sides with exposure of the articular cartilage were noted. The joint was pulse lavaged to remove the clots and debris.

The tendon ends were debrided to healthy tissue. Multiple suture anchors (ALL SUTURE ANCHOR) were deployed in the proximal tibial bone closer to articular cartilage margin. 3 parallel drill holes were fashioned equidistantly through the patella from inferior to superior exiting at quadriceps insertion on patella using a 2 mm drill bit. Inferior pole of the patella was debrided of remaining soft tissues and prepared with a motorised burr to yield a healthy bone bed. Multiple Krackow sutures were passed through the substance of the patella tendon using 2 mm suture tapes (Arthrex). The resulting 4 suture limbs were taken through the drill holes from inferior to superior direction (the 2 holes on the sides received one suture limb each and the one drill hole in the centre received 2 limbs of the suture). The retrieved suture limbs at the superior pole of patella were tied between each other

at 30-degree flexion of the knee under C-arm guidance to confirm an acceptable patellar position and the suture ends trimmed burying the knots in the quadriceps tendon. An excellent tendon to bone approximation was achieved. The sutures from multiple suture anchors taken through the anteromedial and anterolateral capsule in a horizontal mattress fashion were also tied in full extension. The retinacular rents were sutures using no 1 Vicryl sutures. Complete closure of the knee capsule was ensured at the end of the repair. The safe range of knee movement was ascertained to be between 0-70 degrees flexion.

A drill hole was made in the tibial crest 1 cm distal to the tibial tubercle in a mediolateral direction preserving adequate anterior bone bridge. No:18G stainless steel wire was taken through the quadriceps tendon close to the superior pole of the patella, laced through the drill hole in tibial crest and tightened and secured at 70 degrees of knee flexion forming an encerclage repair protection construct. After wound lavage, the wound was closed in layers and aseptic dressings were applied. The opposite knee was opened in the similar fashion and the similar steps of repair of the first knee were repeated as the injuries mimicked each other. At the completion of the surgery both knees were immobilised in a hinged knee brace locked at zero degrees. The patient remained comfortable and afebrile throughout the post-operative period with clinical evidence of deep vein thrombosis or Neurovascular Deficit (NVD). Wounds were clean at discharge with no signs of infection.

Post operatively, the patient was put on a strict non weight bearing protocol utilising wheelchair mobilisation with knees flexed to a maximum of 45 degrees for the first six weeks while sitting. Passive patella mobilisation was started in the immediate post-op along with static quadriceps drills. Adequate Deep Vein Thrombosis (DVT) prophylaxis was also started.

From 7th week onwards the patient was mobilized on axillary crutches with partial weight bearing and knee flexion exercises were started with flexion range beyond 45 degrees. At 12 weeks from surgery, the patient was allowed unsupported full weight bearing once he achieved good quadriceps control as evidenced by an active Straight Leg Raising without extensor lag. The patient was encouraged to wear a hinged knee support brace while ambulating until 6 months from surgery.

Results

At 6 months follow up the patient achieved zero to 110 degrees of active knee flexion range, good quadriceps control and independent ambulatory status. X ray taken in the immediate post-operative period showed acceptable patellar height and encerclage wire position in both knees. Serial follow up X-rays were taken at 6 months interval and at the last follow up of 2 years, the X-ray showed acceptable patellar height, no evidence of Heterotrophic Ossification (HO). One of the knees (Left) showed a broken encerclage wire on X-rays at 2 years follow-up. Since the patient was asymptomatic, no further procedure was advised to remove the broken wire (Fig. 1-5).

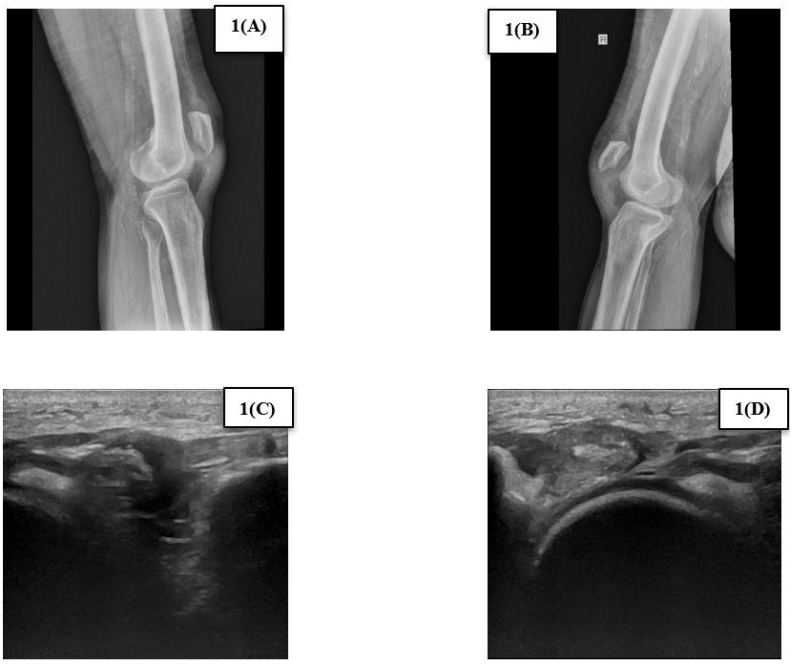

Figure 1: Pre-operative X-ray images and USG of both knees showing ruptured patellar tendons with traumatic patella alta.

Figure 2: Intra-operative image showing complete rupture of patellar tendon, anterior capsule and retinaculum.

Figure 3: Intra-operative image showing complete tendon to bone approximation after repair.

Figure 4: Post-operative X-rays at two-year-follow-up showing restored patellar height.

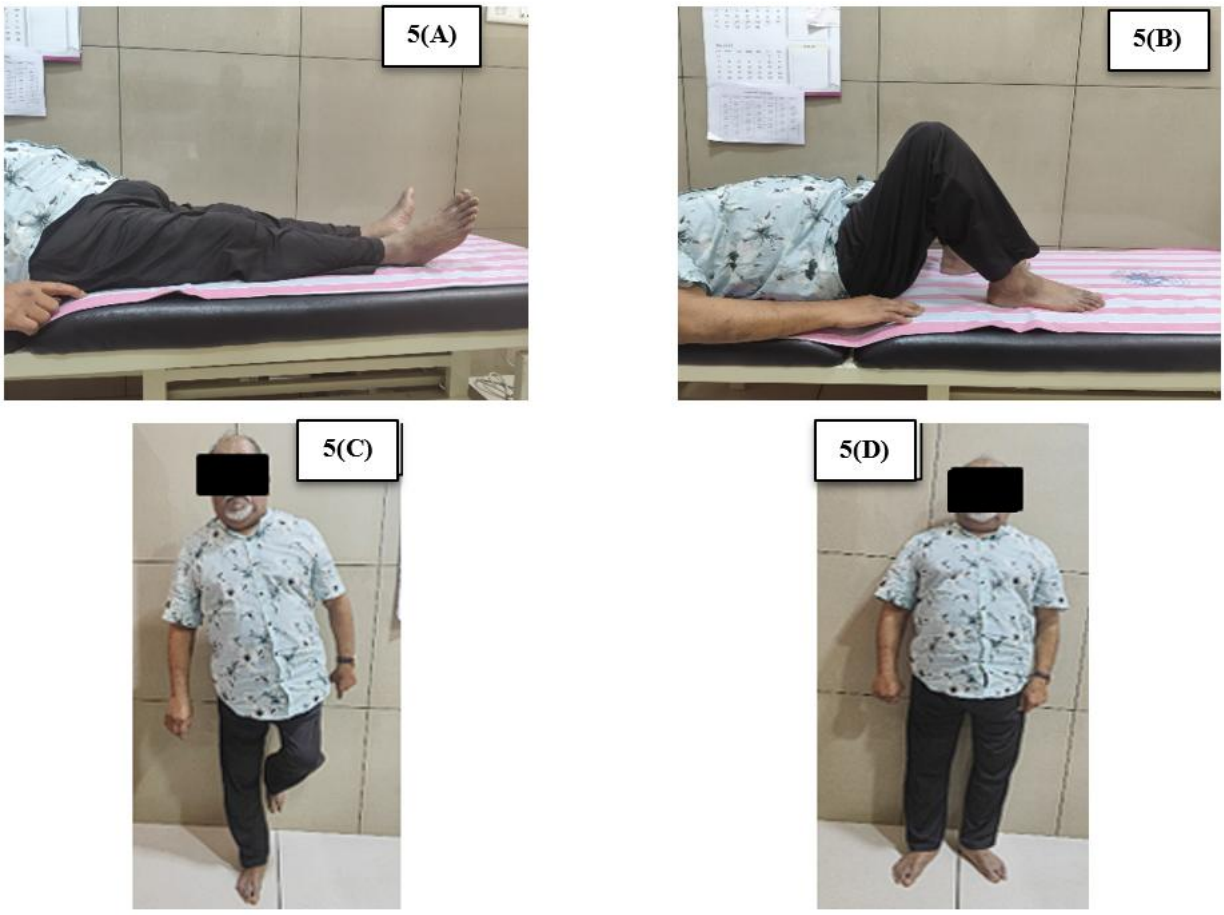

Figure 5: Clinical images showing acceptable functional range of motion of both knees at two-year follow-up.

Discussion

Simultaneous bilateral patellar tendon rupture is a rare clinical condition following trivial trauma that raise suspicion of an underlying systemic pathology (Fig. 6). Among the various predisposing conditions, patients undergoing long-term haemodialysis for CKD have been consistently identified at significant risk due to its profound effects on tendon quality and collagen metabolism. The present case reiterated this association, as the injury occurred following a low-energy mechanism in a patient with ESRD on haemodialysis [1,3,5].

Even though the pathophysiology underlying tendon rupture in ESRD is multifactorial, chronic metabolic derangements including secondary hyperparathyroidism, β2-microglobulin amyloid deposition, metabolic acidosis and disturbances in calcium–phosphate homeostasis, contribute to progressive weakening of the tendon matrix [1,6]. These changes impair collagen cross-linking and reduce tensile strength, rendering tendons susceptible to rupture even under minimal stress [1,2]. Moreover, chronic comorbidities such as diabetes mellitus and hypothyroidism, as seen in this case, further compromises the tendon quality through microvascular changes and alter connective tissue turnover, increasing the risk of tendon rupture [3,5].

Clinically, bilateral involvement often presents dramatically with acute pain, inability to extend the knee and functional disability. However, diagnosis may be delayed or missed, particularly in the absence of significant trauma. The presence of bilateral patella alta on radiographs, along with palpable infrapatellar defects and loss of active extension were highly suggestive of patellar tendon rupture in our case [3]. Ultrasonography serves as a rapid and effective diagnostic adjunct, especially in resource-constrained or emergency settings, allowing confirmation of tendon discontinuity and retraction [3]. Early and accurate diagnosis is critical, as delays in intervention are associated with poorer functional outcomes due to tendon retraction and fibrosis [1].

Surgical repair remains the gold standard for complete patellar tendon rupture, particularly in bilateral cases where conservative management is not feasible. Various repair techniques such as those utilising trans osseous sutures, suture anchors and augmentation methods have been described [5]. In this case, a combination of transosseous tunnel repair of patellar tendon with capsular repair utilising suture anchors and protective cerclage wiring of the construct was employed providing robust fixation and allowing early controlled mobilization [5]. Literature suggests that augmentation techniques may be particularly beneficial in patients with poor tendon quality, such as those with ESRD, as they reduce the risk of repair failure and facilitate biological healing [5].

Postoperative rehabilitation plays a crucial role in functional recovery, especially in bilateral injuries where mobility is significantly compromised. A staged rehabilitation protocol balancing protection of the repair with gradual restoration of range of motion and quadriceps strength is essential [5]. The favourable outcome observed in this patient, with satisfactory range of motion and independent ambulation at midterm follow-up highlights the importance of a meticulous surgical technique combined with a structured rehabilitation strategy [5]. Despite satisfactory outcomes, complications such as re-rupture, infection and hardware-related issues remain concerns in this patient population. The occurrence of cerclage wire breakage in one knee at long-term follow-up, although asymptomatic, underscores the need for continued surveillance. Similar findings have been reported in the literature, where hardware failure does not necessarily correlate with clinical deterioration if tendon healing is adequate [5].

From a broader perspective, this case adds to the growing body of evidence emphasising the need for heightened clinical vigilance in patients with chronic kidney disease presenting with musculoskeletal complaints. Given the increasing prevalence of ESRD globally, such cases may become more frequently encountered, warranting further research into optimal surgical techniques and rehabilitation protocols tailored to this high-risk population [3,5]. As missed injury or delayed treatment can cause contracture of the extensor mechanism of the knee resulting in suboptimal knee flexion or the need for quadriceps tendon plasty that often leads to weakness of extensor mechanism. Hence, early detection, diagnosis and treatment of such injuries need to be addressed carefully.

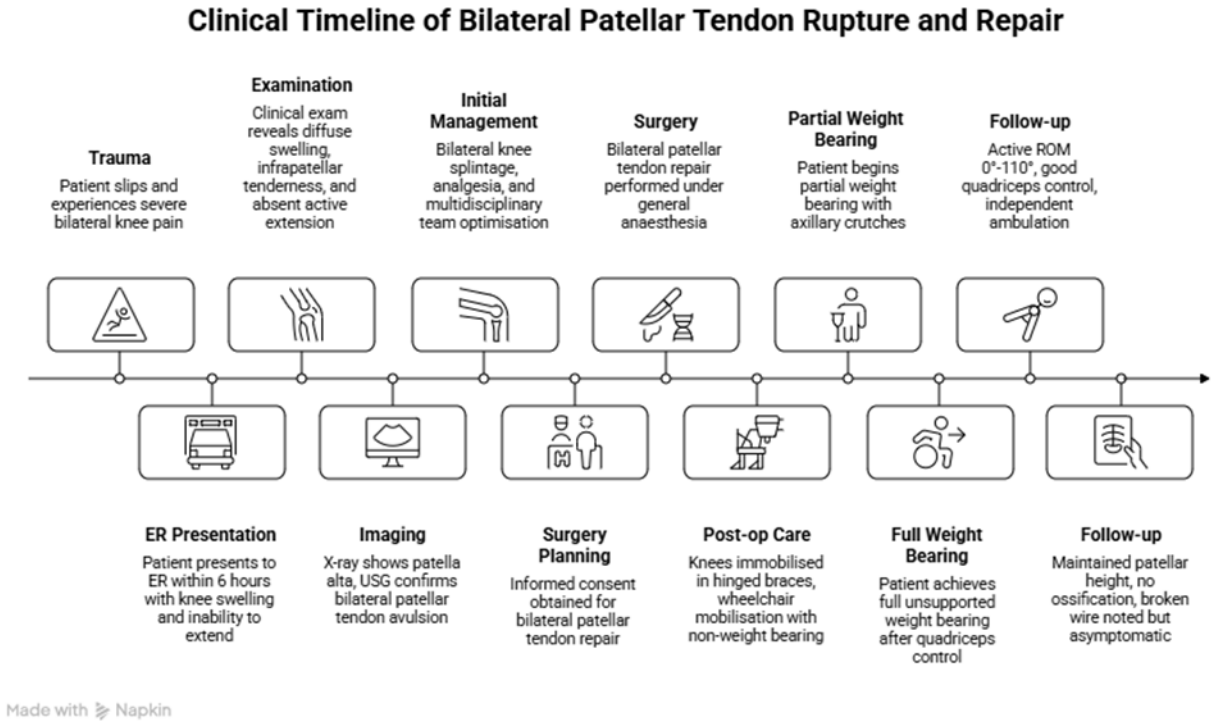

Figure 6: Clinical timeline of bilateral patellar tendon rupture and repair.

Conclusion

In conclusion, bilateral patellar tendon rupture in patients on long-term haemodialysis represents a rare but serious manifestation of systemic tendon degeneration. This case highlights the interplay of metabolic, mechanical and systemic factors that contributing to tendon failure and underscores the importance of early diagnosis and comprehensive management in achieving favourable functional outcomes.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Informed consent was obtained from the patient for publication.

Authors' Contributions

All authors contributed equally to this paper.

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