

Open Patellar Tendon Rupture in an 11-Year-Old Boy Following Penetrating Trauma: A Case Report

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Abstract

Case Report

Patellar tendon rupture is rare in children and adolescents. In this age group, traumatic injuries of the knee extensor mechanism more commonly involve tibial tubercle avulsion fractures or patellar sleeve fractures than isolated tendon ruptures, and open ruptures caused by penetrating trauma are particularly uncommon. We report the case of an 11-year-old boy who sustained an open injury to the left knee after falling onto a glass object with the knee flexed. Clinical examination revealed an 8-cm transverse infrapatellar wound over the tibial tubercle, exposure of the anterior tibial cortex, and complete inability to actively extend the knee. Plain radiographs showed no fracture but demonstrated patella alta on the lateral view. Computed tomography (CT) confirmed a large infrapatellar soft-tissue defect with soft-tissue air and multiple radiopaque foreign bodies consistent with glass fragments. Emergency surgical exploration, performed after removal of the glass fragments and thorough irrigation, revealed a complete rupture of the patellar tendon at its distal third, approximately 2 cm proximal to its insertion on the tibial tubercle, associated with a tear of the lateral patellar retinaculum. Primary tendon repair was performed with three Krackow sutures using absorbable Vicryl 2, after patellar realignment under fluoroscopic guidance, followed by repair of the lateral retinaculum reinforced with simple sutures. Postoperative management included amoxicillin-clavulanic acid for 15 days and immobilization in a windowed long-leg cast with the knee in extension for eight weeks to allow local wound care, followed by progressive supervised rehabilitation. At follow-up, the patient had recovered near-full knee range of motion (0-160°) with a stable, functional joint. Open patellar tendon rupture in children is extremely rare. Prompt recognition, early surgical repair, adequate debridement, and structured rehabilitation are essential to restore extensor mechanism function and achieve a favorable outcome.

Keywords: Knee extensor mechanism injury, open tendon injury, patellar tendon rupture, pediatric knee trauma, penetrating knee injury.

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INTRODUCTION

Injuries of the knee extensor mechanism are uncommon in children and adolescents. When they do occur, they usually involve osteochondral structures rather than the tendon itself, because the immature osteotendinous junction is biomechanically more vulnerable than the tendon substance. Pediatric extensor mechanism trauma therefore more often presents as a tibial tubercle avulsion fracture or a patellar sleeve fracture than as a true patellar tendon rupture [1,2].

Patellar tendon rupture is itself uncommon even in the general population, accounting for only 0.6% of musculoskeletal tendinous injuries [3]. It is rarer still in children, in part because rupturing a normal patellar

tendon requires very high force; as a result, bony avulsion injuries predominate over pure tendinous disruption [3]. In the largest available pediatric series, acute traumatic patellar tendon rupture accounted for only five of 71 acute extensor mechanism injuries (7%), underscoring how exceptional this diagnosis is in skeletally immature patients [3].

Most pediatric patellar tendon ruptures reported in the literature follow an indirect mechanism, typically forceful eccentric quadriceps contraction during jumping, landing, sports activity, or a hyperflexion injury [3,4]. Open rupture caused by penetrating trauma is far more unusual, and pediatric reports remain limited to isolated cases, including sharp-trauma and glass-related injuries [3,5].

Diagnosis is primarily clinical and should be suspected in any child presenting with acute knee pain, swelling, and loss of active knee extension. A palpable infrapatellar gap may be present, although it is not always appreciable in the acute setting [3]. On imaging, patella alta is the hallmark diagnostic sign, and the Insall-Salvati ratio remains the classic radiographic reference for assessing patellar height [3,6]. Cross-sectional imaging is particularly useful in atypical or penetrating trauma, where it helps define the extent of soft-tissue disruption and identify retained foreign bodies. We report a rare case of open distal patellar tendon rupture in an 11-year-old boy following penetrating knee trauma from glass, successfully treated with urgent irrigation, debridement, primary repair, immobilization, and supervised rehabilitation.

CASE PRESENTATION

An 11-year-old boy was admitted to the emergency department after falling onto a glass object

with his left knee flexed. The injury caused a deep laceration to the anterior aspect of the left knee.

Clinical examination revealed an approximately 8-cm transverse infrapatellar wound over the left tibial tubercle. The wound exposed the anterior tibial cortex and was associated with complete loss of active knee extension, suggesting disruption of the extensor mechanism. Distal neurovascular examination was unremarkable.

Plain anteroposterior and lateral radiographs of the knee showed no associated fracture; however, the lateral view demonstrated patella alta, raising suspicion of patellar tendon rupture. Preoperative CT revealed a substantial infrapatellar soft-tissue defect with soft-tissue air and multiple radiopaque foreign bodies consistent with retained glass fragments, without an associated bony fracture (Figure 1).

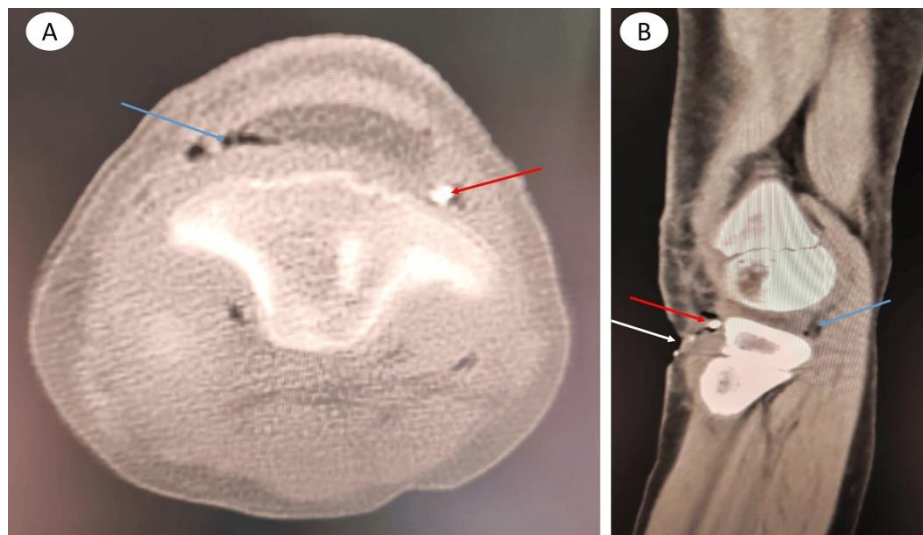


Figure 1: Preoperative computed tomography of the left knee

(A) Axial view and (B) sagittal view showing intra-articular/soft-tissue air (blue arrows) and radiopaque foreign bodies consistent with glass fragments (red arrows), without associated bony fracture.

(B) also demonstrates infrapatellar soft-tissue loss (white arrow).

The patient was taken urgently to the operating room. Surgical exploration was performed after removal of multiple glass fragments, followed by copious irrigation and meticulous wound debridement. Intraoperative findings revealed a complete transection of the patellar tendon at its distal third, approximately 2 cm proximal to its insertion on the tibial tubercle, along with a tear of the lateral patellar retinaculum.

Intraoperative views documented the tendon disruption during repair, the post-debridement appearance after reconstruction of the extensor

mechanism, and the immediate postoperative result after skin closure (Figure 2).

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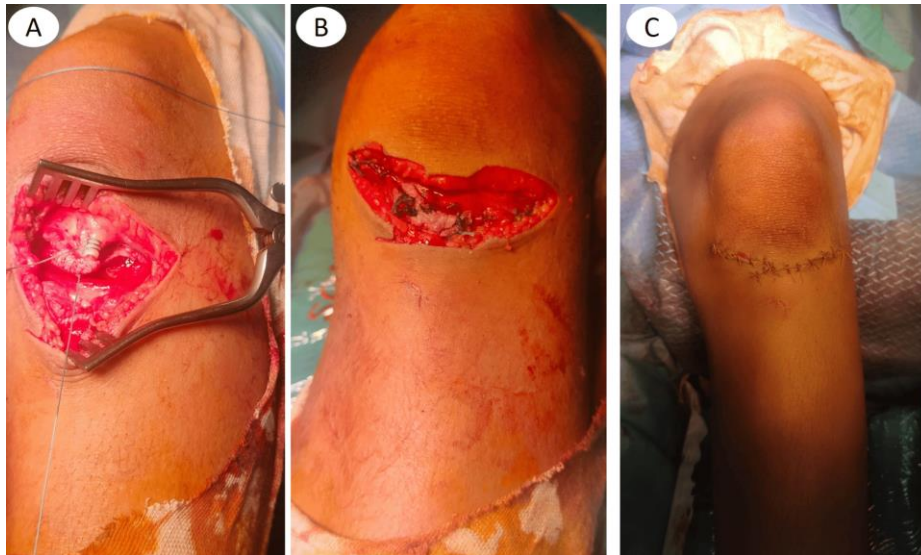


Figure 2: Intraoperative and immediate postoperative views of the left knee

- (A) Intraoperative view after wound exploration, showing complete distal patellar tendon rupture during repair with Krackow sutures.
 (B) Intraoperative view after debridement and tendon repair, demonstrating restoration of the extensor mechanism.
 (C) Immediate postoperative appearance after skin closure.

Anatomical repair of the patellar tendon was performed using three Krackow sutures with absorbable Vicryl 2, after patellar realignment under fluoroscopic guidance. The lateral patellar retinaculum was repaired and reinforced with simple absorbable sutures.

Postoperative management included antibiotic therapy with amoxicillin-clavulanic acid for 15 days and immobilization in a windowed long-leg cast with the knee in full extension for eight weeks, allowing regular local wound care.

After cast removal, a progressive, supervised physiotherapy program was initiated. Passive knee flexion was allowed from 0° to 45° during the first two weeks, increased to 90° over the following two weeks, and to 135° over the next two weeks, with full flexion achieved after two months of rehabilitation.

The postoperative course was favorable. At follow-up, the patient had regained near-complete knee range of motion (0-160°) and demonstrated a stable, functional knee without an extension deficit.

DISCUSSION

This case is notable for three reasons: the young age of the patient, the direct penetrating mechanism of injury, and the surgical management chosen. The tendon was primarily repaired with absorbable Vicryl 2 sutures using a Krackow whipstitch technique, allowing stable anatomical reconstruction of the extensor mechanism.

The largest pediatric series currently available identified five patellar tendon ruptures among 71 acute traumatic extensor mechanism injuries in children, corresponding to 7% of cases [3]. In that series, all

patients were male, with a mean age of 13.6 years (range, 12-15 years), and four of the five injuries were sports-related [3]. This supports the notion that most pediatric patellar tendon ruptures result from indirect trauma, particularly during athletic activity. Our patient differs clearly from this pattern, as the rupture followed direct penetrating trauma from glass, causing not only tendon discontinuity but also soft-tissue violation, contamination, and retained foreign bodies.

The site of rupture reported in the literature varies and includes distal soft-tissue avulsion from the proximal tibia, proximal avulsion from the inferior pole of the patella, and midsubstance disruption [3]. This is relevant to our case, since the rupture here was likewise distal, occurring approximately 2 cm proximal to the tibial tubercle insertion. Associated retinacular tears may coexist with tendon disruption, consistent with the lateral patellar retinaculum tear identified in our patient [3].

Diagnosis relies primarily on careful clinical examination. Immediate knee pain and swelling, loss of active extension, and proximal displacement of the patella are typical findings [3]. However, the absence of a palpable infrapatellar gap does not exclude the diagnosis, particularly in the presence of swelling or an open wound [3]. This is especially important in penetrating trauma, where attention may initially focus on the cutaneous wound rather than the underlying disruption of the extensor mechanism. Delayed diagnosis has been reported in pediatric patients and can complicate subsequent treatment [3,7].

Imaging provides important complementary information. Standard radiographs remain essential for identifying patella alta, assessing patellar height with the

Insall-Salvati ratio, and excluding associated fractures [3,6]. In pediatric patients, magnetic resonance imaging is often useful for closed injuries or combined osteotendinous lesions, whereas CT can be particularly valuable in penetrating trauma, as it identifies retained radiopaque foreign bodies, soft-tissue air, and the extent of soft-tissue violation [2,5,8]. In our patient, plain radiographs demonstrated patella alta without an associated fracture, while CT documented retained glass fragments and soft-tissue air.

Management of acute patellar tendon rupture is surgical. Several repair techniques have been described according to the site of rupture and any associated lesions, including transosseous fixation, transpatellar suturing, suture anchors, Krackow-type locking sutures, and, in selected cases, reinforcement constructs [2-5]. Although no single technique has proven superior, all approaches share the same objective: prompt anatomical restoration of tendon continuity with a construct stable enough to allow healing and graduated rehabilitation [2-4].

Open injuries carry additional priorities beyond tendon fixation. Thorough irrigation, meticulous debridement, and removal of foreign bodies are essential to reduce infectious risk and optimize the local environment for healing [5,7,8]. In our patient, urgent debridement and primary anatomical repair were followed by protected immobilization, local wound care, and supervised rehabilitation, resulting in near-complete range of motion and a stable knee.

Neglected forms of this injury also warrant comment. Delayed or missed diagnosis can convert an acute, repairable lesion into a chronic extensor mechanism deficiency, making treatment more complex and often requiring augmentation or reconstructive procedures rather than simple primary repair [7]. Reports of delayed distal patellar tendon avulsion in adolescents illustrate how diagnostic delay can compromise outcomes and prolong rehabilitation [7], further underscoring the importance of early recognition and prompt surgical treatment in acute pediatric cases.

Postoperative immobilization is essential to protect the repair during early healing and should be followed by early, supervised, progressive rehabilitation. Published series and case reports generally describe good to excellent outcomes after timely repair, with recovery of active extension and useful range of motion, although persistent deficits may occur in delayed or neglected cases [3,5,8]. In the largest pediatric series, all patients recovered functional motion, with final active range of motion ranging from 0-120° to 0-137°, no terminal extension lag, a mean Knee Society Score of 91.8, and a mean return-to-sport time of 22 weeks [3]. These findings support the principle that early repair, stable fixation, and structured rehabilitation lead to good to

excellent outcomes - consistent with our patient's stable knee and near-full range of motion at follow-up.

Overall, this case adds to the limited pediatric literature on open traumatic patellar tendon rupture and reinforces a practical message: in any child presenting with an infrapatellar laceration and inability to actively extend the knee, disruption of the extensor mechanism should be strongly suspected, and urgent operative management should be undertaken.

CONCLUSIONS

Open patellar tendon rupture in children is an exceptionally rare injury. This case highlights the importance of early recognition of extensor mechanism disruption in penetrating knee trauma, particularly when active knee extension is absent and patella alta is present on imaging. Prompt surgical exploration, meticulous debridement, anatomical repair, appropriate antibiotic therapy, protective immobilization, and structured rehabilitation can lead to excellent functional recovery.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Abir Manni, Yacine Zouirech

Disclosures

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