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## Case Report

# Bilateral patellar tendon rupture following low-energy trauma in a young patient without predisposing risk factors

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## ABSTRACT

We describe the case of a 25 year old male who presented with a bilateral patellar tendon ruptures without any of the identified risk factors for tendon injuries. Our patient is the youngest adult reported to date with confirmed bilateral, unprovoked, patellar tendon ruptures. We accompany our case with an up-to-date literature review on this topic. A degree of clinical suspicion is required for emergency room physicians as well as orthopaedic surgeons assessing such patients to avoid missing bilateral injuries. Point of care ultrasound may be utilised when there is doubt regarding the diagnosis. Prompt surgical management and a specific rehabilitation programme are both required to ensure maximum recovery of these patients.

## Background

Bilateral patellar tendon rupture is a rare entity particularly in patients without predisposing risk factors. It is often associated with systemic disease such as connective tissue disorders, chronic renal failure, systemic lupus erythematosus or rheumatoid arthritis. Long term corticosteroid use and flouroquinolone antibiotics have also been implicated in elevated risk of tendon rupture [1].

While there are other reports of bilateral patellar tendon rupture in patients without risk factors, these are generally reported in patients in the fourth or fifth decade of life. We present the case of a young man in his twenties, who presented following low-energy trauma and provide an up-to-date review of the modern literature on this topic.

## Case presentation

Our patient is a 25-year-old, Caucasian male who fell during a hurling match. He reports injuring his left knee as he planted his foot to strike the sliotar. This position resulted in eccentric contraction of his flexed left knee. His right patellar tendon ruptured as he fell and hit the ground. He described the sensation as immediate bilateral knee pain that felt like 'a pipe hit his knee'. At the time of the injury, he was wearing a support bandage on his right knee due to a previous sporting injury. He described feeling 'clicking' in this knee prior to the injury but he had no formal investigations or diagnosis for same.

He had no medical history and had no previous surgeries. He was not taking any medications and denied any illicit steroid use.

Our patient was 180 cm in height and his BMI was 23.4 kg/m<sup>2</sup>. On examination, both knees were swollen, tender and he was unable to weight bear bilaterally. On the left side, he was unable to actively straight leg raise, had a reduced range of motion and had a high riding patella. His right knee was slightly less tender than the left but had a palpable gap under a high riding patella. He was also unable

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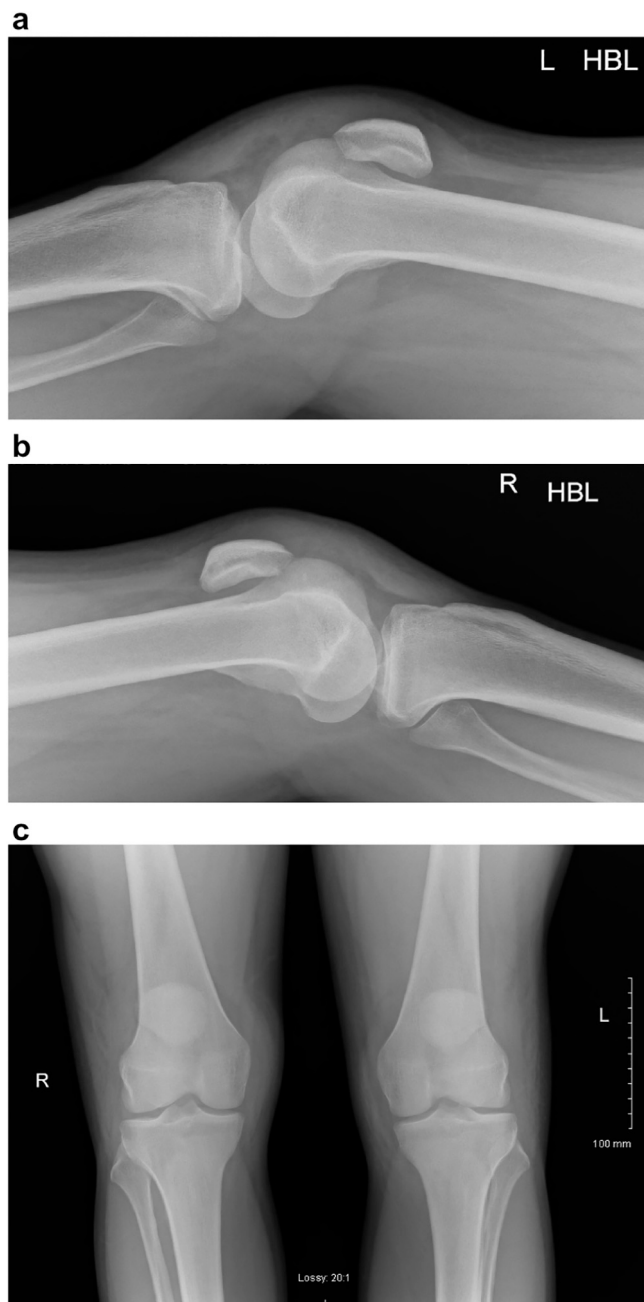
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to actively straight leg raise on the right side. There was no associated neurovascular deficit in either knee.

Bilateral knee radiographs were performed. The results combined with the clinical findings suggested patellar tendon ruptures and bilateral surgical exploration was performed the next day.

### Investigations

Our patient had bilateral anteroposterior and lateral radiographs of his knees which showed bilateral patella alta. This was associated with bilateral joint effusions and anterior soft tissue swelling without any obvious fracture (Fig. 1A, B, C). Laboratory investigations including a connective tissue disease screen, rheumatoid factor and anti-CCP were all within normal limits.



**Fig. 1.** A: Lateral radiograph of the left knee demonstrating a patella alta with adjacent soft tissue swelling and a knee effusion. B: Lateral radiograph of the right knee showing a patella alta. C: Anteroposterior radiograph of both knees with high-rising patellae and no obvious fracture or avulsion.

## Differential diagnosis

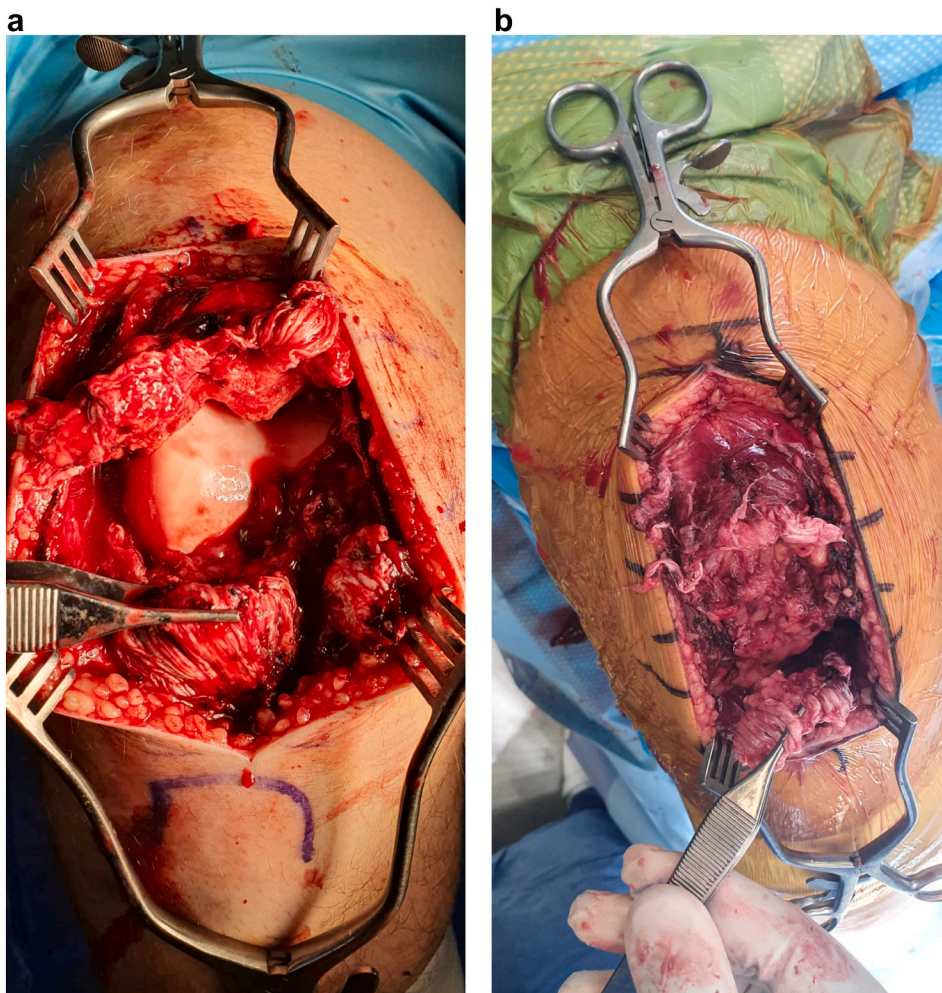
Our patient had disruption of his extensor mechanism in both knees. A fracture of the patella or patellar sleeve avulsion was deemed unlikely by the radiographs on presentation. As there was a palpable gap at the insertion of both patellar tendons and he could not straight leg raise bilaterally, complete tendon ruptures were deemed the most likely diagnosis.

## Treatment

Our patient underwent simultaneous bilateral patellar tendon repair through midline incisions. Both tendons were completely ruptured from the inferior patellar pole at their proximal margins. In addition, the lateral and medial retinacula were discontinuous bilaterally. There were no obvious abnormalities noticed with either tendonous structure (Fig. 2A & B). The tendons were both repaired according to Krackow's technique and using transosseous tunnels. The inferior pole of the patella was prepared and curetted before passing an ACL guide pin longitudinally through the patella to direct the medial and lateral ends of No.5 Ethibond sutures through 3 transosseous tunnels. This was reinforced with interrupted sutures. The medial and lateral retinacula were repaired with No. 1 Vicryl, absorbable suture. Examination under anaesthetic demonstrated both knees were stable against varus/valgus stress and the ACL and PCL were intact.

## Outcome and follow-up

Post-operatively, our patient was immobilised in bilateral Don-Joy braces (DJO Global, Vista, CA, USA) locked in extension (Fig. 3). He was permitted to weight bear as tolerated and began a supervised rehabilitation protocol immediately. His range of motion (ROM)



**Fig. 2.** A: An intraoperative photograph demonstrating complete rupture of the right patellar tendon. B: An intraoperative photograph showing complete rupture of the left patellar tendon.

was increased to 30° at 2 weeks, 60° at 4 weeks and 90° at 6 weeks bilaterally. Unrestricted ROM in the brace was permitted from 8 weeks and at 10 weeks after surgery the braces were slowly weaned. At 3-months follow-up, both knees had a full active ROM 0–120° and our patient was mobilising without limitation. Despite bilateral quadriceps wasting, our patient had resumed all daily activities. The right knee had an extensor lag of 10° on SLR and the left knee had no extensor lag. Our patient was advised to continue supervised physiotherapy and return to sport gradually after 6–8 months. His final radiographs showed patellae in a satisfactory position with no evidence of osteochondral damage (Fig. 1A, B, C).

## Discussion

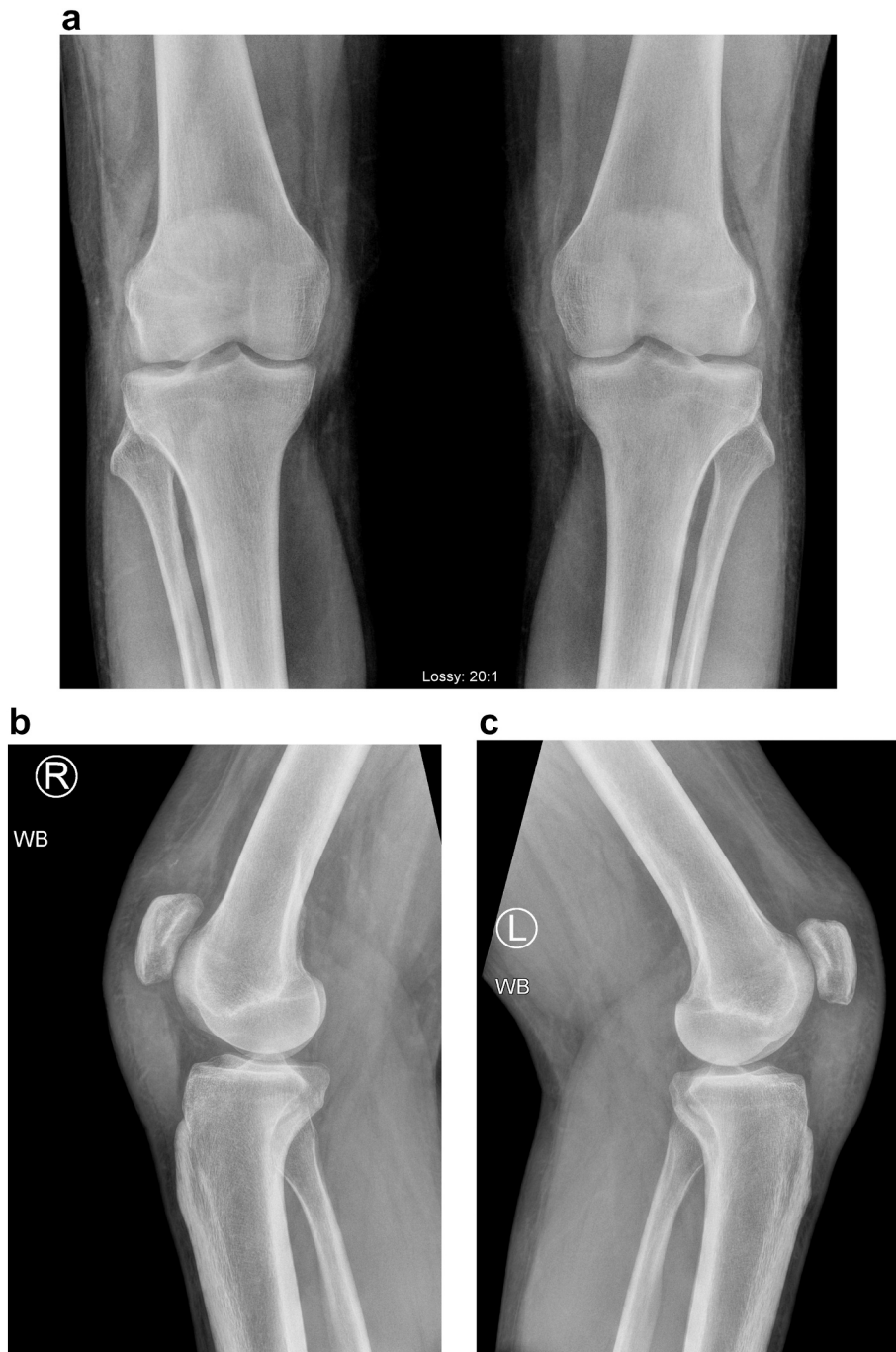
The knee extensor mechanism is formed from the quadriceps muscle and tendon, the medial and lateral patellar retinaculum, the patella, patellar tendon and the tibial tubercle. The medial and lateral patellar retinacula are either side of the patella and act to stabilize the joint. Typically tendon rupture occurs secondary to a weakness in the tendon or an underlying aetiology such as connective tissue disorders, autoimmune conditions, steroid or flouroquinolone use. Our patient had none of the identified risk factors for patellar tendon rupture.

We conducted a literature review of bilateral tendon ruptures in adult patients without predisposing risk factors using PubMed/MEDLINE, Scopus, Web of Science and Google Scholar. We limited our search to full text, English language publications for adult patients. We excluded studies in patients with risk factors present for tendon rupture, which yielded 17 suitable case reports (Table 1) [2–18]. Of note, there were three paediatric cases in the literature, one of which had a known diagnosis of Ehlers-Danlos syndrome.

The majority of patients were male (15 male, 2 female) and ranged in age from 26 to 75 years. Just two were patients in their twenties. In nearly all cases the tendon rupture was related to eccentric contraction of the quadriceps with the knee in flexion although the exact aetiology of spontaneous patellar tendon rupture is not understood. Patellar tendon ruptures can be classified according to the location of the rupture. Type 1 occurs when the rupture is at the origin of the patella's inferior pole, Type 2 occurs when there is a



**Fig. 3.** Our patient was managed with bilateral Don-Joy braces locked in extension. Knee flexion was incrementally increased by 30° every 2 weeks until 8 weeks when the braces were fully unlocked. Both braces were weaned towards removal from 10 weeks.



**Fig. 4.** (A, B, C): Bilateral knee AP and lateral weightbearing radiographs at 12 weeks follow-up. The patellae were in a satisfactory position without osteochondral damage.

midsubstance tear and Type 3 is when the rupture is at the insertion point of the patellar tendon to the tibial tubercle [5]. Typically, spontaneous tendon rupture occurs at its site of insertion on the distal pole of the patella and midsubstance tears are more commonly associated with pathological tendonopathy such as in rheumatoid arthritis and renal failure [19].

Our literature review also suggests that spontaneous, bilateral tendon ruptures generally occurred in younger men who were medically fit. All patients presented with similar symptoms of pain, swelling and an inability to weight bear or actively straight leg raise. These very general knee symptoms mean a high level of clinical suspicion is required to avoid misdiagnosis. It is estimated that up to 38% of isolated patellar tendon ruptures are misdiagnosed on initial consultation [20]. This may be even higher in patients with bilateral injuries. In fact, Cree et al. report a case which was only diagnosed on day 70 post injury [15]. Other studies suggest that point

**Table 1**  
Summary of the literature review and previous cases of bilateral, unprovoked patellar tendon rupture.

Authors	Gender	Age	Mechanism of injury	Management	Notes
Foley et al. [2]	Male	47	Tripped during football.	Internal brace with a swivelock anchor and the repair augmented with continuous suture	Patient had history of patellar tendinopathy to his left knee
Kamienski et al. [3]	Male	43	During softball.	Surgical repair	
Louka et al. [4]	Male	48	Fall down 2 m.	Krakow stitch to repair the tendon.	Patient had an acute ACL rupture 2 years previously which was treated conservatively.
Taylor et al. [5]	Male	36	Jumped playing soccer.	Surgical repair with Fiberwire suture with Krackow technique and supplemented with 18 gauge cerclage wire. The retinaculum was also repaired using an absorbable suture.	
Ogle et al. [6]	Male	38	Jumping from a ledge.	Article focused on the benefit of point of care ultrasound but mentions surgical repair was performed.	
Moura et al. [7]	Male	34	Sudden running stop, associated with a twisting motion.	An end-to-end primary Kessler-type tendon repair reinforced with intraosseous sutures was performed in both knees. This was temporarily protected with cerclage wiring, followed by immobilisation using a cylinder cast.	The patient was a professional basketball player between the age of 18–25 and practiced competitive weightlifting until he was 30 years. He reported taking a few cycles of oral and injectable steroids when he was competing but stated he had not used any in at least 3 years.
Savarese et al. [8]	Male	39	Slipped on wet ground.	Surgical repair using Krakow technique.	The patient had a notably elevated BMI
Kearns et al. [9]	Male	56	Slipped on ice.	Surgical repair using a Krakow suture via bony tunnels in the patella.	Long term history of Simvastatin use (40 mg).
Kellersmann et al. [10]	Male	34	Fall while walking on a steep sidewalk.	Surgical repair by suturing tendons and retinacula with Vicryl sutures followed by fixation with wire loops.	
Ho et al. [11]	Male	37	Fell while attempting to change direction in a soccer game.	Minimal local debridement was performed and two Super QuickAnchors were inserted into the inferior edge of the patellar tendon attachment. Sutures were then used to tie up the tendon using the Krakow technique.	
Tarazi et al. [12]	Male	45	Tripped on a step at work while unloading boxes.	Surgical repair using a Krakow technique.	
Burke et al. [13]	Female	27	Soldier who injured herself during a strength and conditioning exercise in work.	Surgical repair using a Krakow technique.	
Sibley et al. [14]	Male	37	Slipped on ice - fell from standing height.	Operative repair – no further details given.	Also sustained a partial ACL tear.
Cree et al. [15]	Male	75	Fell walking down an incline.	Reconstruction was performed using hamstring tendons bilaterally.	Only diagnosed at Day 70 post injury. Initially treated as infrapatellar bursitis
Barner et al. [16]	Male	27	Slipped with knee in flexed position while playing basketball.	Free ends of the tendon were debrided and three double-loaded Arthrex BioComposite Swivelock suture anchors were utilised to reapproximate the tendon and reattach to the inferior pole of the patella.	
Noteboom et al. [17]	Male	26	Chronic pain for 8+ years following a high school basketball career – pain was exacerbated by jumping.	Repair was made using three Mitek sutures placed into the inferior poles of the patella. These were sutured into the patellar tendon and reinforced with a number 5 Ethicbond figure of 8 suture.	
Gross et al. [18]	Female	49	Stumbled while walking down the stairs.	Tendon repair was carried out with polydioxanone sutures, with the anatomical position of both patellae protected with figure of 8 sutures.	Left ACL rupture was noted intraoperatively.

of care ultrasound imaging may be beneficial in identifying rupture when the diagnosis is in doubt [6].

All of the patients in the literature underwent surgical repair and similarly to our patient, the majority of surgeons favoured the Krackow technique. Complete patellar tendon ruptures require surgical repair to prevent disability and prompt surgical treatment improves long-term outcomes by preventing complications such as scarring, decreased function and retraction [21]. Non-surgical management should only be considered in patients with partial tears with an intact extensor mechanism or if the patient is an unsuitable surgical candidate. Primary repair of the tendon can be used in cases where the ends of the tendon can be approximated - with

the location of the tear dictating the type of repair [22]. An end to end repair can be used when the tear occurs in the middle of the tendon, while a transosseous tendon repair can be used in cases of proximal avulsion. Distal avulsion usually requires the surgeon to use a suture anchor repair. Patellar tendon reconstruction may be required for patients with severe disruption of the patellar tendon or when the ends of the tendon cannot be safely approximated [23]. This can be performed using autograft or allograft tissue [25] [24].

Post-operatively, almost all patients were placed in a brace with their knees in extension post-operatively. In two cases the patients had casts applied, Moura et al. [7] applied a cast post-operatively which was removed at day 3 before the patient was switched to a brace and Ho et al. casted their patient two weeks post-operatively for a total of four weeks. Rehabilitation depends on surgeons preference and local policy [26]. Our literature review found that the majority of patients were permitted to weight bear as tolerated in a knee brace locked in extension for the first couple of weeks. The following four weeks allow a graduated increase in passive knee flexion in a knee brace. After 6 weeks, the aim is to gradually increase weight bearing with the knee in flexion and begin active range of motion exercises. However, patients were typically still advised to avoid weight bearing in knee flexed past 70°. In the third and fourth month post-operatively the emphasis changes to developing and maintaining a normal gait without a brace. Patients are permitted a full range of motion and ideally should be able to squat to 70° of flexion with good control. They usually need to continue with ongoing physiotherapy and core strengthening before eventually making a gradual return to baseline activities or sport [26].

We found that patients with bilateral ruptures can expect to return to their normal baseline mobility, including a return to sports by 6–12 months post-operatively. Three patients had returned to their baseline level of mobility by six months post procedure [2,4,7]. Only one patient had a documented post-operative complication, with Taylor et al.'s patient developing a pulmonary embolism on post operative day 1, however they were successfully treated with heparin [5].

### Learning points/take home messages

- Our patient is the youngest adult reported to date with confirmed, bilateral, unprovoked, patellar tendon ruptures.
- These injuries present with a bi-modal distribution, among those aged 20–30 and those aged 40–50 years.
- Thorough examination and radiographs of both knees should be performed if there is clinical suspicion of bilateral extensor mechanism injuries.
- Early weightbearing with an incremental return to full range of motion over 8–10 weeks is a suitable rehabilitation protocol for young patients with bilateral patellar tendon ruptures.

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