



## Traumatic Rupture of the Ipsilateral Quadriceps and Patellar Tendons: A “Floating Patella”

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### Abstract

*Isolated traumatic injuries of either the quadriceps tendon or the patellar tendon have been well described. Bilateral ruptures of either the quadriceps tendons or the patellar tendons in the same patient have also been reported. This paper reports a case in which a patient presented with an open traumatic rupture of the quadriceps tendon with an ipsilateral rupture of the patellar tendon. The case outlines the treatment and successful outcome of this unusual injury.*

### Introduction

Traumatic injuries to the extensor mechanism of the knee are not an uncommon phenomenon. Typically disruption of the quadriceps tendon occurs in patients over the age of forty years, whereas the patellar tendon is more often affected in younger patients.<sup>1-4</sup> Bilateral ruptures of either both the patellar tendons or quadriceps tendons have been reported in the literature in several different case reports and case series.<sup>5-13</sup> We report a case where a patient presented with an open, traumatic rupture of the patellar and quadriceps tendon on the ipsilateral extremity. This is the first case to our knowledge reported in the literature. The case outlines the treatment and successful outcome for this extremely unusual injury.

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The patient was informed that data concerning his case would be submitted for publication.

### Case Report

A thirty-five year old man with no significant past medical history presented to our level one trauma center after he was involved in a motor vehicle accident. The patient was an unrestrained driver who was ejected through his windshield, and experienced loss of consciousness at the scene. After primary and secondary surveys, it was found that the patient had a four by three centimeter laceration over the anterolateral aspect of his right knee. His knee joint was grossly exposed. In addition, he sustained a left pneumothorax which required an emergent chest tube. Radiographs of his right knee (Figs. 1-A & 1-B) revealed no gross fractures, subluxations, or dislocations, but did show the soft tissue injury. After the patient was successfully resuscitated in the trauma bay, he was taken to the operating room to address his right knee injury.



Figure 1A and 1B- Lateral and AP of the right knee

In the operating room, upon inspection of the complex knee wound, it was discovered that the patient sustained a complete rupture of the quadriceps

and patellar tendons. The only attachment to the patient’s patella was part of the medial retinaculum. In addition, there was a chondral defect on his lateral femoral condyle measuring one by two centimeters. After irrigating the wound and debriding the chondral defect, the patellar tendon was first repaired using four drill holes across the midsubstance of the patella and number 2 Fiber Wire (Arthrex Inc. Naples, FL) using the technique described by Krackow et al.<sup>14</sup> After this repair was adequately tensioned and secured in place, the quadriceps tendon was repaired in the same fashion. The retinaculum was repaired using 3-0 PDS suture. The edges of the laceration were excised and the skin was closed over a drain. The patient was then placed in an



Figure 2A and 2B-29 month follow up clinical photograph

anterior/posterior long leg splint with his knee in full extension. The patient was brought back to the operating room two days later for a repeat irrigation and debridement of the knee. The repair was found to be completely intact at this follow-up surgery.

The patient’s postoperative course was uneventful. He was made non-weight bearing on the affected extremity with a hinged knee brace locked in extension. Once all medical issues were stabilized, the patient was discharged from the hospital eleven days postoperatively. On his first office visit, at four weeks after the initial injury, there was very limited active and passive knee motion. He was prescribed physiotherapy with short arc range of motion exercises from 0-30 degrees with active flexion and passive extension. The patient was instructed to continue use of a knee brace, locked in extension, at all times except during therapy. At his eight week follow-up visit, it was found that the patient had been non-compliant with regards to therapy, and his active range of motion was 0-40 degrees of flexion. He was, however, able to maintain a straight leg raise. He was instructed to wean from the knee brace over the next 8 weeks and to continue therapy. At sixteen weeks post operatively, the patient had 0-85 degrees of motion at the knee, and at seven months post operatively he had an active range of motion measuring 0-135 degrees. At this time, he also demonstrated quadriceps and hamstring strength nearly equal to his contralateral, unaffected side and was participating in all of his activities of daily living without pain.

The patient returned to our office 29 months after the initial surgery for final follow-up. At this time, he had full knee extension and 135 degrees of flexion without pain (Figs. 2-A & 2-B). There was no effusion present. His quadriceps and hamstring strength were graded as a five on manual muscle testing and were equal to his contralateral, uninjured lower extremity. His thigh circumference on the injured side revealed slight atrophy (51 centimeters compared to 53 centimeters on the contralateral side) (Fig. 3). He reported no pain with activities of daily living or work (which included heavy lifting and moving). The patient completed both the Lysholm<sup>15</sup> and the International Knee Documentation Committee (IKDC)<sup>16</sup> scoring systems. His Lysholm knee score was 99, while he scored a 90.8 on the subjective component of the IKDC scoring system. Both knee evaluations demonstrated that the patient had an excellent functional outcome.

## Discussion

Traumatic, acute isolated quadriceps and patellar tendon injuries have been well described in the literature. It has been shown that patients with disruption of their extensor mechanism as a result of one of these injuries do well with operative management, usually regaining at least 85% of their strength compared to the contralateral side.<sup>1-4, 17-19</sup> There have been several case series and case reports of bilateral injuries to either the quadriceps or patellar tendons found in the literature.<sup>5,6,9-13,20</sup> These bilateral injuries are almost exclusively due to underlying pathology such as steroid use or injections,<sup>6</sup> or systemic diseases such as lupus erythematosus, diabetes, renal failure, or thyroid disorders.<sup>5, 9-13, 20</sup>



Figure 3- 29 month follow up clinical photograph

Immediate repair has proven to result in better outcomes than late repair in ruptured quadriceps and patellar tendons.<sup>1-4, 17-19</sup> The majority of patients with either unilateral or bilateral injuries to their extensor mechanism are satisfied with their range of motion and strength when surgically treated soon after their trauma.<sup>1-4, 17-19</sup>

The mechanism of rupture of the patellar tendon has been well described as a violent contraction of the quadriceps muscle group which is resisted by knee flexion resulting in overload of the extensor mechanism and subsequent patellar tendon injury.<sup>2</sup> It has been estimated that 17.5 times body weight is required to cause rupture of the patellar tendon in a healthy patient.<sup>21</sup> While patellar tendon injuries are typically found in younger, more active patients, quadriceps tendon injuries are more common in patients over the age of forty and in those patients with underlying comorbidities such as an endocrine disorder or renal failure. The quadriceps tendon usually fails when it is eccentrically contracted while the knee is in a semi flexed position<sup>1</sup>. Spontaneous rupture of either the quadriceps or patellar tendons are usually attributed

to chronic steroid use or a systemic disease process where the tendon is weakened. Both patellar and quadriceps tendon ruptures can also result from direct blunt trauma.

In the literature there are only two cases involving bifocal disruption of the knee extensor mechanism.<sup>22,23</sup> The first case was a 90 year old woman with non-insulin dependent diabetes who fell directly on her left knee with a subsequent transverse fracture of the distal one third of the patella as well as a fracture of the anterior tibial tuberosity.<sup>22</sup> The second case in the literature of a bifocal disruption of the knee extensor mechanism describes a 13 year old boy without medical problems who sustained a traumatic injury to his right knee while skiing. In this case, the patient was found to have an avulsion fracture of his tibial tubercle with an ipsilateral quadriceps tendon rupture. In both of these cases, operative intervention led to an uneventful, full recovery.<sup>22,23</sup>

We believe our case to be the first reported in the literature where a patient sustained a rupture to the ipsilateral quadriceps and patellar tendons without concomitant bony injury to the extensor mechanism. The radiographs (figs. 1-A & 1-B) in this particular case revealed no obvious patella alta or baja since both tendons were ruptured. It was not until direct inspection in the operating room that the diagnosis of both tendon ruptures was made. In this case, the traumatic force sustained by the patient's right knee, either during the collision or during the ejection from the vehicle, may have directed a strong enough force to rupture the quadriceps and patellar tendons. Although the actual mechanism of injury is indeterminate, it is possible that direct damage to the peri-patellar tissues associated with the anterolateral laceration may have weakened the extensor mechanism and its constraints on the patella. The lateral femoral condylar defect may indicate that the patient's patella subsequently experienced a strong force directed posteriorly, causing first an impact between his patella and lateral femoral condyle. A second force directed medially may have resulted in dislocation of his patella and simultaneous rupture of his quadriceps and patellar tendons with sparing of the medial retinaculum. The patella may have spontaneously reduced due to additional trauma sustained during the ejection, or during the patient's pre-hospital stabilization. Another possible mechanism for the bifocal rupture of the extensor mechanism around the patella may include direct injury due to laceration, followed by sequential rupture of the peri-patellar tendons by superior and inferior forces acting directly on the patella during the trauma

This case reveals a unique injury to the extensor mechanism of the knee that to our knowledge has never been reported in the literature. In final follow-up (29 months), we found that the patient had near full active range of motion of his repaired knee. In addition, he did not complain of any knee pain or instability on the repaired side as demonstrated by his high scores on both the Lysholm and IKDC knee evaluation forms. In summary, we believe this to be an extremely unusual injury that with proper treatment can have an excellent functional outcome.

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