Patellar Sleeve Fracture With Ossification of the Patellar Tendon

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abstract

Patellar sleeve fractures make up greater than 50% of all patellar fractures. They are essentially only seen in the pediatric population because of the thick periosteum and the distal patellar pole apophysis in this group. These fractures can lead to complications if not treated appropriately and in a timely fashion. Complications of missed or untreated patellar sleeve fractures include patella alta, anterior knee pain, and quadriceps atrophy. These can all result in severe limitations in activity. The authors describe a case of a 16-year-old boy who sustained a patellar sleeve fracture 3 years prior to presentation. On presentation, he had patella alta, diminished strength, 5° of extensor lag, and radiographs that revealed bone formation along the patellar tendon. Despite this, he was able to maintain a high level of activity. This case report explores how the patient could have maintained a high level of activity despite having a patellar sleeve fracture. Also, because of the delayed presentation, the patella was ossified and the quadriceps was retracted, which led to a novel approach to reconstructing his distal extensor mechanism. This approach included a V-Y advancement of the quadriceps tendon and patellar tendon reconstruction using the patient’s hamstring tendon (semitendinosus). This technique, combined with physical therapy postoperatively, resulted in his return to varsity high school soccer. To the best of the authors’ knowledge, this technique has not been reported for this rare condition. [Orthopedics. 2017; 40(2):e357-e359.]

In the pediatric population, patellar fractures account for less than 6% of all fractures, with sleeve fractures making up 42% to 57% of patellar fractures.1-3 Patellar sleeve fractures occur when a large amount of resisted force is applied to the patella.2 They need to be treated early either nonoperatively (nondisplaced or minimally displaced fractures) or surgically (displaced fractures).2 In this report, the authors discuss an unusual presentation and novel surgical treatment option for a patellar sleeve fracture.

Case Report

A 16-year-old male soccer player presented with right knee pain and associated right lower extremity weakness. The provoking injury had occurred 3 years earlier when the patient was riding his bicycle and collided with a parked car, with the right knee making impact. Following the accident, his knee was painful and swollen and he had limited range of motion; however, he did not seek professional medical care.

During the next 2 months, the pain, swelling, and limited range of motion resolved. The patient progressed back to high-intensity physical activities. He had mild discomfort while playing sports, which he reported as a 2 at its worse (0-10 scale). He also reported difficulty with building strength in his right lower extremity. He noticed that his left quadriceps...
had hypertrophied, but the right lower extremity lacked that corresponding change.

On physical examination, he had significantly abnormal patella alta on his right with an irregular and firm density inferior to the right patella. Range of motion was decreased to 5° to 135° (normal, 0°-135°) in the right leg with both active and passive measurements.

Radiographs revealed 2 bone formations along the patellar tendon, measuring 4 × 0.5 cm and 2 × 0.5 cm. Also, there was no joint effusion on the radiographs (Figure 1).

A patellar sleeve fracture was diagnosed and treatment consisted of surgical debridement of the 2 ossified portions of the patellar tendon. Following debridement, reconstruction of the patellar tendon was accomplished by using a semitendinosus tendon autograft followed by a V-Y advancement of the quadriceps tendon to address the patella alta.

The patient had no major complications following surgery and was in a range of motion brace for 3 months. With the treatment and recovery plan, he was able to return to full activity after 9 months.

**DISCUSSION**

Patellar fractures are a rare injury in the pediatric population, accounting for from 6.5% to less than 1% of all fractures. The low injury rates are thought to be because of a thick layer of cartilage that surrounds the patella during childhood and adolescence. Patellar sleeve fractures comprise the majority of patellar fractures, accounting for 42% to 57% of all cases. The mechanism of injury for a patellar sleeve fracture is an explosive acceleration with a rapid contraction of the quadriceps while the knee is flexed. This mechanism causes an avulsion of the peristemum, retinaculum, and cartilage from the patella. Patients can present with anterior knee pain, inability to extend their leg, and effusion. Treatment consists of nonoperative options for nondisplaced or minimally displaced fractures. Displaced fractures require open reduction with various methods of internal fixation.

It has been observed that some patients may be able to actively extend their leg because of a posterior cartilaginous hinge or the defect can become a cartilaginous sleeve attached to the patella. If there is a delay in the presentation, complications can arise, including avascular necrosis of the inferior pole of the patella, patella alta, extensor lag, quadriceps wasting, anterior knee pain, and ossification of the patellar tendon or duplication of the patella.

The current patient presented 3 years after the injury occurred. He reported pain, effusion, and decreased range of motion, but they resolved after 2 months. On his initial presentation, he had complications of a missed patellar sleeve fracture. These included patella alta, quadriceps atrophy, anterior knee pain, and ossification of his patellar tendon. However, he was still able to participate at a high level of sport. The most likely explanation for his continued high level of play was because the patellar tendon was "replaced" with a cartilaginous sleeve that connected to the patella, which eventually ossified.

Treatment of patellar sleeve fractures depends on whether the fracture is displaced. If the fracture is not displaced, a cylindrical cast for 4 to 6 weeks is a viable option. If the fracture is displaced, then surgical correction is the treatment of choice. The standard of treatment is open reduction and internal fixation of the avulsion back to the patella. This results in the return of normal mechanics and also will limit potential growth problems. Because the current patient presented 3 years after the onset of his injury, the patellar tendon had 2 areas of ossification and there was retraction of the quadriceps. To obtain a good functional outcome, the patellar tendon would need to be reconstructed (Figure 2). The authors opted to...
use semitendinosus autograft because of its close proximity and use in other ligament and tendon reconstructions. Also, previous literature showed that semitendinosus augmentation with acute patellar tendon rupture resulted in immediate mobilization.9

The other issue that needed to be corrected was the retracted quadriceps. A V-Y advancement has been used with recurrent quadriceps tendon rupture with retraction.10 This technique was used to allow the patella to be approximated to its normal anatomical location (Figure 3). After 9 months, the patient was able to return to a high level of sport without recurrent pain. To the authors’ knowledge, this is the first time that this technique has been used.

CONCLUSION

This article has highlighted a case of a patellar sleeve fracture with an unusual and delayed presentation. A novel surgical technique using semitendinosus autograft to reconstruct the deficient patellar tendon, which was ossified and subsequently debrided, as well as a classic V-Y quadriceps lengthening to restore normal patellar height has been presented. An excellent result was obtained, with the patient returning to his competitive sport.

REFERENCES