

Tibial Tubercle Fracture With Avulsion of the Patellar Ligament: A Case Report

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Abstract

Fractures of the tibial tubercle are infrequent injuries in adolescents. A combined injury of the tibial tubercle and patellar ligament is an even more rare event. The literature includes only a few case reports of this injury pattern. In this article, we describe another case and a repair technique and try to increase awareness of this combined injury.

Fractures of the tibial tubercle are infrequent injuries in adolescents. A combined injury of the tibial tubercle and patellar ligament is an even more rare event. The literature includes only a few case reports of this injury pattern.¹⁻⁵ In this article, we describe a repair technique and try to increase awareness of this combined injury.

CASE REPORT

An adolescent boy was running up a hill and suddenly felt a pop in the right knee, which gave out. The boy fell to the ground and was unable to stand on the extremity. He was taken to the emergency department for evaluation. He could not actively

extend his knee, and x-rays showed a tibial tubercle fracture superiorly rotated 180° (Figure 1). He was instructed to follow up with a pediatric orthopedist.

At follow-up, the patient denied preexisting knee symptoms. On physical examination, he had a large

effusion, tenderness over the tibial tubercle, and a high-riding patella and was still unable to extend the injured knee. On further evaluation, a palpable defect was found in the location of the patellar ligament. Further scrutiny of the x-rays revealed patella alta and a calcification between the tibial tubercle and the patella (Figure 1). The patient was diagnosed with an Ogden IIB⁶ tibial tubercle fracture associated with either a sleeve fracture or a patellar ligament avulsion, and surgery was recommended.

At surgery, the tibial tubercle was completely displaced, and the patella ligament had pulled off its distal attachment with a small amount of bone (Figure 2). The surgeon reduced the tubercle and fixed it with a partially threaded cancellous screw. The patella ligament was repaired back to the tubercle with a running and locking No. 1 nonabsorbable suture through a bone tunnel in the tibia (Figures 3, 4). Length was determined radiographically. The repair was reinforced with absorbable suture



Figure 1. Emergency department x-rays show displaced tibial tubercle fracture with calcification between patella and tibial tubercle.

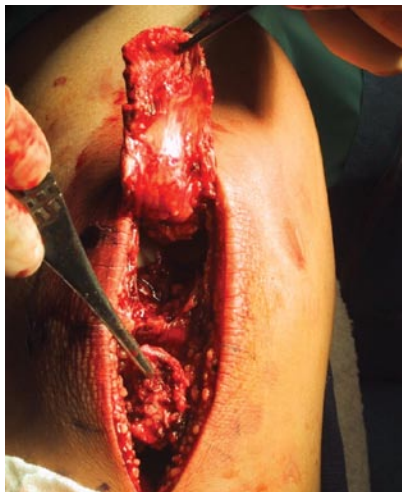


Figure 2. Displaced tibial tubercle and avulsed patella ligament.

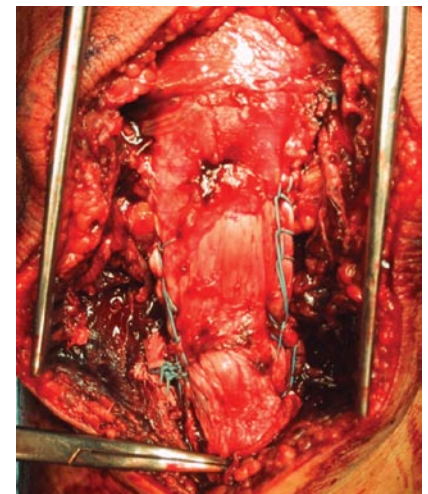


Figure 3. Repaired tibial tubercle and patella ligament.

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Figure 4. Postoperative x-ray.

to the periosteum. The knee was immobilized in extension in a cylinder cast for 4 weeks, then the patient was placed in a hinged knee brace. Quadriceps strengthening and active motion were gradually advanced. Four months after surgery, the patient was pain-free and had normal motion and strength. He was instructed to gradually resume activities as tolerated. One year after surgery, he was symptom-free.

LITERATURE REVIEW

Tibial tubercle fractures account for less than 1% of physeal fractures and approximately 3% of proximal tibia fractures.^{7,8} Whether there is an association with Osgood-Schlatter disease is unclear.

The developmental anatomy is critical in this injury. The proximal tibial physis extends anteriorly and distally below the tubercle. Physeal closure begins centrally and extends peripherally and then distally. Closure of the physis is complete at age 15 in girls and age 17 in boys.

The mechanism of injury is either quadriceps contraction with the leg extended or rapid passive knee flexion with the quadriceps contracting. Traction by the patella ligament exceeds the strength of the physis,

perichondrium, and periosteum, resulting in a tibial tubercle fracture. It is proposed that, after 180° of rotation, the soft-tissue attachments around the tibial tubercle prevent further displacement, and then the patella ligament avulses with continued force.

The initial classification of tibial tubercle avulsions by Watson-Jones⁹ was modified by Ogden and colleagues.⁶ Frankl and colleagues¹ added type IC, which is a patella ligament avulsion in addition to a IB injury.

Associated injuries are infrequent. They include collateral ligament, anterior cruciate ligament, meniscus, and knee extensor tendon avulsions. Compartment syndrome has been reported, but only in type III injuries. It is postulated that the anterior tibial recurrent artery is lacerated and retracts into the anterior compartment of the leg.^{10,11}

The history often reveals an athletic, mature-appearing male involved in jumping sports. The physical examination demonstrates an effusion and a palpable fragment, and the patient cannot actively extend the knee. Anteroposterior and lateral x-rays are critical in the diagnosis. Flexion and extension radiography or magnetic resonance imaging may be indicated if associated injuries are suspected.

Management focuses on restoration of the extensor mechanism. Type IA, IB, and IIA injuries are immobilized in a long leg cast for 4 weeks. Type IIB, IIIA, and IIIB injuries are treated with open reduction and internal fixation (ORIF). Type IC injuries require ORIF of the tubercle. In addition, reattachment of the patella ligament is necessary. A tension band, screws, or Kirschner wires can be used to obtain ORIF. Postoperative management consists of a long leg cast for 3 to 4 weeks and then active range-of-motion exercises at 4 weeks. Patients with type I and type II injuries can return to sports in 2 months,

and those with type III injuries in 4 to 6 months.¹² Complications are rare. They include compartment syndrome, loss of flexion, malunion, nonunion, patella infera, and fracture through the fixation device. A hypothetical complication in a young patient is genu recurvatum.

To the best of our knowledge, the literature includes only a few case reports of this combined injury pattern.^{1-3,5,13} We believe that the repair technique we have described allows for early rehabilitation and successful outcomes.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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