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Case Report

Tibial tubercle fracture with avulsion of patellar ligament

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ABSTRACT

Combined fractures of the tibial tubercle and the patellar ligament are rare. Here we report the case of an 18-year-old boy who fell to the ground while playing basketball and suddenly felt a pop in his left knee; thereafter he was unable to stand. In-hospital radiographic examination revealed a tibial tubercle fracture with a high-riding patella, and the diagnosis was a Salter-Harris type IV tibial fracture associated with a sleeve fracture. The patient underwent surgery using a wire loop, an Ethibond suture (Ethicon Inc., Somerville, NJ, USA), and a staple to repair the site of the injury. The knee was immobilized for 4 weeks and after 2 months of follow-up, the patient was pain free with normal motion and strength. In conclusion, combined tibial tubercle fracture and avulsion of the patellar ligament are rare. The authors assert that the repair technique that is described herein supports reduced pain, early rehabilitation, and successful outcomes.

1. Introduction

Fractures of the tibial tubercle are uncommon injuries in adolescents. Combined injuries of the tibial tubercle and patellar ligament are even rarer. The literature includes only a few case reports of such a combined injury.[1–7] This study describes a repair technique and seeks to increase understanding of this combined injury.

2. Case report

An adolescent boy (18 years old with a history of thalassemia) was playing basketball; he suddenly felt a pop in his left knee and fell to the ground. He could not stand on the extremity. He was taken to the emergency department for evaluation. The patient could not actively extend his knee and X-ray examination revealed a tibial tubercle fracture (Fig. 1). An orthopedist was consulted. The patient claimed to have no pre-existing knee symptoms. Upon physical examination, a large effusion, tenderness over the tibial tubercle, and swelling around the joint were found, with a moveable high-riding patella. The patient remained unable to extend the injured knee. Further evaluation revealed a palpable defect at the patellar ligament. The diagnosis was a Salter-Harris type IV[8] tibial fracture, associated with either a sleeve fracture or a patellar ligament avulsion, and surgery was recommended.

In surgery, the tibial tubercle was determined to have been completely displaced, and the patellar ligament had been pulled away from its distal attachment along with a small amount of bone (Fig. 2). The surgeon reduced the tubercle and it was initially fixed using 7.0 metric surgical steel (Ethicon Inc., Somerville, NJ, USA). An Ethibond suture (3-0; Ethicon Inc.,) was applied over the ligament. The stability of the construct was confirmed (Fig. 3). A staple was also applied 2 cm below the growth plate. The length of the growth plate was determined radiographically. After the fixation procedure had been completed, a 1/8 inch Hemovac drain (400 mL, 3.2 mm; Pacific Hospital Supply Co. Ltd., Taiwan) was placed in the muscular layer and another was placed in the knee joint. The knee was immobilized for 4 weeks in the extended position in a long leg splint. The quadriceps muscle became gradually stronger and active motion slowly increased. Three months after surgery, the patient was pain free and had normal motion and strength. He was instructed to resume tolerable activities slowly.

3. Discussion

Fewer than 1% of physeal fractures and fewer than 3% of proximal tibia fractures are tibial tubercle fractures.[9,10] Developmental anatomy is important in treating such an injury. The proximal tibial physis extends anteriorly and distally below the tubercle. Physeal

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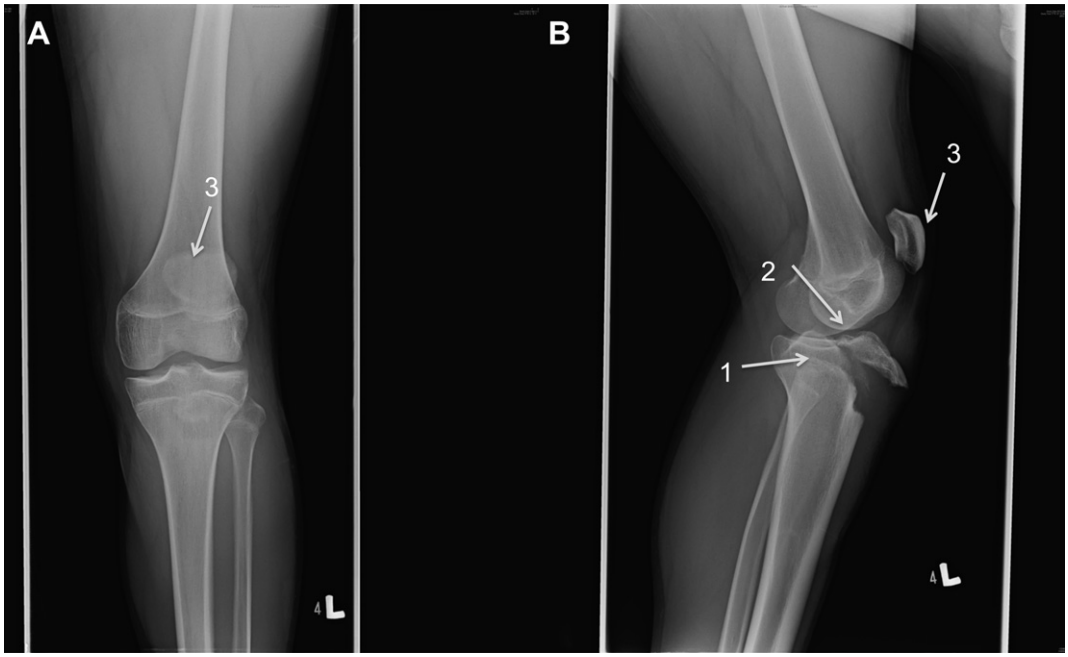

Fig. 1. X-Ray revealing a displaced tibial tubercle fracture with calcification between patella and tibial tubercle. (A) Anteroposterior view of the knee joint. (B) Lateral view of the knee joint. 1 = epiphyseal line; 2 = fracture line through the surface of the joint and tibial tuberosity, and completely avulsed ligament; 3 = patellar superior transposition.

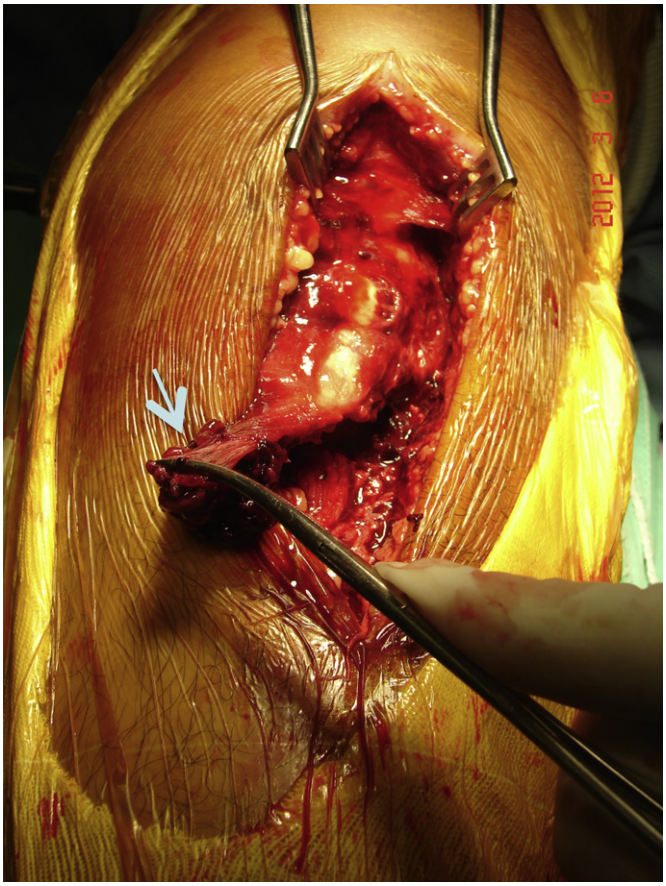

Fig. 2. Displaced tibial tubercle and avulsed patella ligament. Arrow = complete avulsion of patellar ligament from bone.

closure starts centrally and extends peripherally and then distally. The physis is completely closed at age 15 years in girls and age 17 years in boys.

Contraction of the quadriceps with the leg extended, or rapid passive knee flexion with the contraction of the quadriceps, causes the aforementioned injury. Overstrength traction of the patellar ligament on the physis, perichondrium, and periosteum will cause fracture of the tibial tubercle. After 180° of rotation, the soft-tissue attachments around the tibial tubercle prevent further displacement, but continued application of a force beyond this angle may then cause patellar ligament avulsion.[7]

Associated injuries are infrequent. Collateral ligament, anterior cruciate ligament, meniscus, and knee extensor ligament avulsions may occur as associated injuries. Compartment syndrome that is caused by laceration of the anterior tibial recurrent artery has been reported.[11,12]

The patient history commonly reveals an athletic, mature-appearing male who participates in jumping sports. Physical examination reveals an effusion and a palpable fragment, and the inability of the patient actively to extend the knee. Anteroposterior and lateral X-rays are crucial to the diagnosis. If associated injuries are suspected, flexion and extension radiography or magnetic resonance imaging may be indicated.[7]

Key to management of the injury is restoration of the extensor mechanism. Immobilization of the knee joint and open reduction and internal fixation (ORIF) are the preferred treatment for tibial tubercle fracture. The patellar ligament must also be reattached. A tension band, screws, or Kirschner wires can be used to obtain ORIF. In this case, a strong wire loop and staple were used to fix the detached ligament and to prevent the pain that would otherwise be caused by a screw.[13]

Postoperative management involves a long leg splint for 3–4 weeks followed by active range-of-motion exercises. Complications are rare, but include compartment syndrome, loss of flexion, malunion, nonunion, patella infera, and device-related fracture.

In conclusion, combined injuries of the tibial tubercle and patella are rare. The authors believe that the repair method discussed

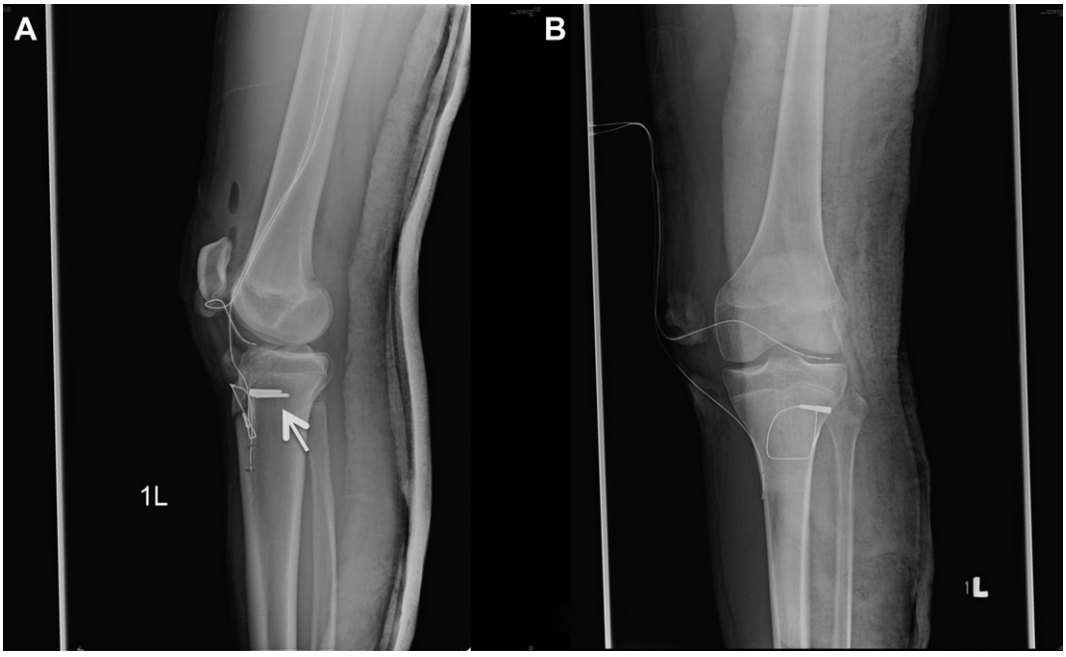

Fig. 3. Postoperative X-ray. (A) Lateral view of the knee joint. Arrow = staple was fixed 1.5 cm under epiphyseal line. (B) Anteroposterior view of the knee joint.

in this study supports reduced pain, early rehabilitation, and successful outcomes.

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