



MANAGEMENT OF TIBIAL TUBEROSITY AVULSION FRACTURE IN AN OBESE ADOLESCENT: A CASE REPORT

Orthopaedics

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ABSTRACT

Introduction- The avulsion of tibial tuberosity is a very rare injury seen in adolescent boys. **Presentation of case-** Here we have reported a case of a 14-year-old obese boy with acute tibial tuberosity avulsion due to a fall. The patient was obese weighing 115 kg. Clinicoradiological examination revealed closed acute tibial tuberosity avulsion without intra-articular extension. The patient underwent surgery with open reduction and fixation with two cancellous screws of 4 mm and addition augmentation with Krakow sutures with ethibond number 5. Following a comprehensive rehabilitation, the patient regained a complete range of motion and was back to routine activities in 5 months. **Discussion-** Fixation and rehabilitation was a challenge in this case due to increased weight and hence we want to publish this rare combination. To the best of our knowledge, only one such case is reported in literature. Acute tibial tuberosity injuries are very rare injuries commonly seen in adolescents. Associated injuries and comorbidities make the optimal treatment of such injuries challenging.

KEYWORDS

Adolescent obese, avulsion fracture, tibial tuberosity avulsion

INTRODUCTION:

Tibial tuberosity avulsion fractures (TTAF) are very rare injuries encountered in adolescent children between the age group of 12-16 years and occur due to high-energy trauma. They account for less than 1% of all paediatric fractures [1]. The initial classification of TTAF was given by Watson Jones, which was later on modified by Sir Ogden and his colleagues [2].

These fractures occur in athletic adolescent boys approaching physeal closure who have strong muscle pull of the quadriceps leading to avulsion of the tibial tuberosity following an eccentric contraction of the muscle due to forced extension of the knee on the fixed leg; as seen in sports like jumping, basketball or volleyball [3, 4]. These fractures may also be associated with patients of osteogenesis imperfecta and Osgood-Schlatter disease. These injuries are usually difficult to treat and many times are found to be associated with extensive soft-tissue injury, periosteal stripping, neurovascular compromise, intra-articular damage, and compartment syndrome [5].

In this case report, we present to you one such rare case of TTAF in a 14-year-old adolescent obese boy with a history of fall while walking downstairs, after which he was unable to walk or extend the knee after the fall. He presented to us after 10 days of injury. Obesity and late presentation were a challenge in fixation and rehabilitation in this particular case.

Case report:

A 14 years old adolescent obese boy weighing 115kgs presented to the emergency department of our institute with a history of fall while walking downstairs 10 days back with unable to ambulate or extend the knee following trauma. On examination, there was swelling around the knee with localized tenderness over the proximal leg anteriorly. He was unable to perform an active straight leg raise test. Radiographic examination confirmed tibial tuberosity avulsion of Ogden type 2. CT scan was done to rule out an intra-articular extension. The patient was immobilized in a long extension splint and informed consent for operative management was taken.

Under spinal anesthesia, a midline incision was taken. The fractured fragment with the patella tendon attached to it was lifted off and the crater was freshened. Periosteum was found to be interposed between the fracture fragment and the crater, which was cleared off. Intra-articular inspection was done to look for meniscal injury which is more commonly associated with these fractures. The fragment was attached to the crater and was temporarily fixed with 2 k-wires and the reduction

was confirmed under c-arm. Final fixation was done with 2 partially threaded 4mm cannulated cancellous screws under c-arm guidance. Additional augmentation was done by taking krackow sutures with ethibond number 5 in the patella tendon and then passing the end of the sutures in a transosseous tunnel distal to the crater and tying the knot. The stability was assessed with knee flexion and extension in a controlled manner under c-arm guidance.

The patient was immobilized in a long leg cast for 6 weeks. After 6 weeks the cast was removed and ROM exercises firstly actively and then passively. At 8 weeks post-surgery partial weight bearing followed by full weight bearing was started. At 15 weeks post-surgery complete union at the fracture site was seen radiographically. The patient resumed routine school activities 5 months post-surgery with back to sports after 6 months post-surgery. Owing to obesity weight bearing protocol was slightly delayed in this case. Figure 1 depicts pre operative radiographs, intra operative clinical and c arm photos. Figures 2 to 4 shows post operative radiographs on follow ups at 1st, 2nd, 3rd, 4th and 5th month, while figure 5 shows final clinical photos of the patient with full mobilisation.

DISCUSSION:

Tibial tubercle avulsion fractures (TTAFs) are less frequently seen in orthopaedic practice, they account for less than 1% of all physeal injuries in children and account for 3% of all proximal tibial fractures [6]. The incidence of these fractures is increasing owing to an increase in sports activities, and they typically occur in adolescents nearing skeletal maturity.

The pathophysiology of TTAFs is mainly due to the pattern of ossification in the knee joint. By birth, the proximal tibia has two ossification centers, the primary ossification centre is the tibial epiphysis which develops in compression whereas the tibial tubercle being the secondary ossification center develops in traction. The proximal tibial physis closes distally toward the tubercle apophysis during normal development, creating a mechanically vulnerable period in adolescence that predisposes the tubercle to potential avulsion injury. This makes tibial tubercle fractures common in adolescent boys near the end of their growth during physeal closure [7, 8].

Tibial tubercle fractures are most commonly produced due to eccentric loading of the knee extensor mechanism while landing or resisting jumping. These injuries are most commonly associated with sports injuries like basketball during jumping [9]. Associated injuries such as

meniscal tears, cruciate ligament laxity, patellar or quadriceps tendon avulsions, and compartment syndrome have mostly been reported in these patients [8].

So, the main objectives of treatment are to restore the extensor mechanism of the knee joint and the joint alignment. The surgical management includes open reduction with internal fixation with screws, washers, tension band wiring, or suture repair of the periosteum, as necessary, followed by immobilization till bone healing [10].

In our case, the patient was obese and well-built as a result fixation and rehabilitation were a challenge. The fractured fragment was fixed with two 4 mm CC screws under c-arm guidance. The patient was followed up for a period of 6 months. Additional augmentation was done by taking Krakow sutures in the patella tendon and then passing the end of the sutures in a transosseous tunnel distal to the crater and tying the knot. This was done to supplement the fixation owing to the weight of the patient.

The patient was immobilized in a long leg cast for 6 weeks. At 8 weeks post-surgery partial weight bearing followed by full weight bearing was started. At 15 weeks post-surgery complete union at the fracture site was seen radiographically. The patient resumed routine school activities 5 months post-surgery with back to sports after 6 months post-surgery. Owing to obesity weight bearing protocol was slightly delayed in this case. According to the literature, associated injuries are common, whereas in our patient, there were no associated injuries.

CONCLUSION

TTAF is a rare case in orthopaedic practice, resulting in acute quadriceps contraction, it predominates in teenage boys with open physis during school sports. Treatment can be conservative or surgical depending on the fracture type. However, complications are fortunately rare and functional recovery is usually complete. With this case report, clinicians should have a complete understanding of tibial tuberosity avulsion fractures in an obese adolescent, leading to enhanced patient care and recovery.

Clinical message

Tibial tuberosity avulsion fractures in an obese adolescent with no pre existing co morbidity is a very rare physal injury. Main aim in these injuries is to restore the extensor mechanism of the knee joint and the joint alignment. In our case we fixed the avulsed fragment anatomically to the crater with 2 cc screws, with further augmentation done with Krakow sutures due to heavily built nature of the patient and to have better results. This type of augmentation is rarely mentioned in the literature which adds value to our case report.

Conflicts of interest: None

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Consent: Patient gave consent for publication

Ethical approval: Approval taken from the institutional ethical committee

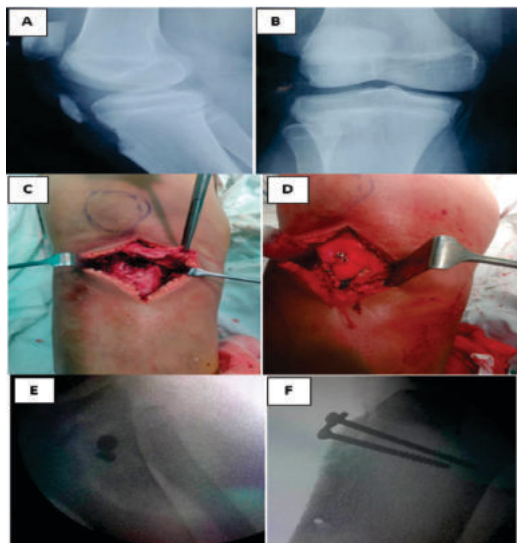


Figure 1: Pre operative radiographs (A and B), intra operative

clinical photos (C and D) and c arm photos (E and F) showing fracture fixation with 2 cannulated cancellous screws and augmentation with transosseous Krakow sutures.

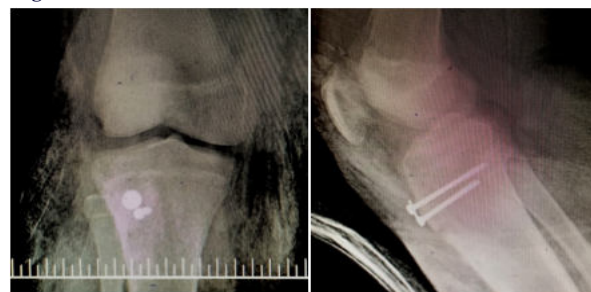


Figure 2: 1st month follow up radiographs (under long leg cast).

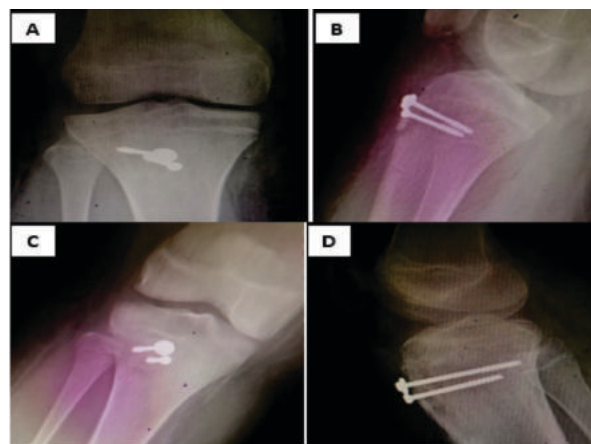


Figure 3: 2nd (A and B) and 3rd (C and D) month follow up radiographs.

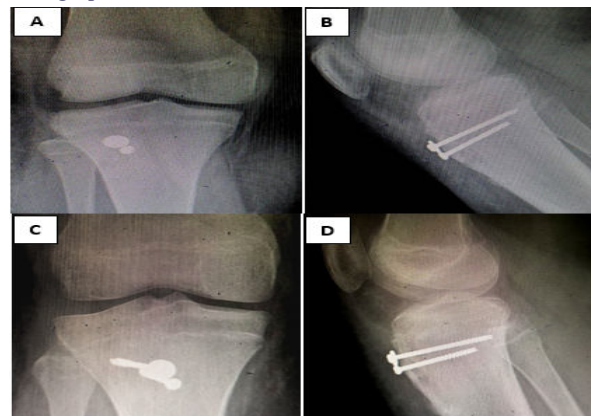


Figure 4: 4th (A and B) and 5th (C and D) month follow up radiographs.

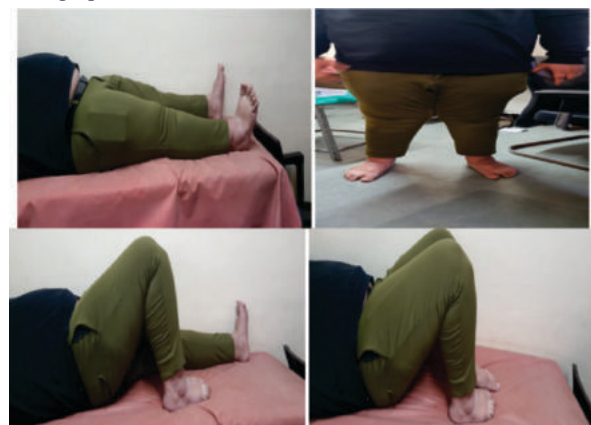


Figure 5: clinical photos at 5th month follow up with full range of motion with full weight bearing mobilisation.

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