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Case Report

Arthroscopy pull through for management of eminentia tibia fracture in 15 years old adolescent: a case report

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ABSTRACT

Tibial eminence fractures are rare injuries. Multiple treatment techniques are described and there is a lack of consensus with regard to the choice of treatment. In this case, we present the left eminentia tibia fracture which stabilized using arthroscopy pull through technique in a 15 years old male adolescent. A male 15 years old adolescent complained of pain on his left knee after climbing a tree and jumped with his left knee in hyperextention. On physical examination, tenderness was felt around the apex of patella. Left knee X-Ray confirmed a fracture of eminentia tibia. On arthroscopic evaluation, there was a fracture of medial eminentia tibia meyers and mckeever IIIA. The fractures were treated by using 1 mm ethibond which was inserted through the anterior cruciate ligament and pull through the tibia plateau. 10 weeks evaluation after the procedure, patient was able to walk independently with full weight bearing and was able to flex his knee in 130˚ and full extension without any pain. Management of displaced fracture of eminentia tibia is somewhat controversial and the ideal method of fixation has not been defined. In this patient, there were perfect anatomic and functional outcome without any serious complication. Arthroscopic reduction and internal fixation by pull through suture provide perfect anatomic and functional outcome for displaced type II and type III tibial eminence fracture.

Keywords: Eminentia tibia fracture, Adolescent, Arthroscopy, Pull through

INTRODUCTION

Tibial eminence fractures are rare injuries with an incidence significantly less than that of the more common intraligamentous tear of the anterior cruciate ligament (ACL). The majority of tibial eminence fractures occur in children and adolescents age 8-14 years (3/100.000), but these injuries can also be seen in adults and are the equivalent to an acute rupture of the ACL. Falls from a bike, motor vehicle accidents and sport activities (mostly football) are the most frequent causes in pediatric population.[1]

Tibial eminence avulsion fractures are often considered the paediatric equivalent to ruptures of the ACL. This happens because the epiphyseal ossification process reaches the tibial eminence only in late childhood or adolescence, leaving this area more vulnerable to tensile forces than the ACL itself. A greater ligamentous elasticity in children has also been advocated as possible etiology for this fracture. Moreover, treatment can be difficult since multiple treatment techniques are described and there is a lack of consensus with regard to the choice of treatment. Untreated tibial eminence fractures can result in knee instability.[2]

In the studies published before 2000, the preferred method was open surgery, and arthroscopy was seen as a diagnostic procedure and claimed that arthroscopy too often leads to insufficient fixation. Mah et al published the first study using an arthroscopic technique and stated, like other authors, that arthroscopy leads to less scar

tissue, less morbidity and a faster recovery. However, today arthroscopic knee surgery is widely used to treat a variety of conditions and hence more surgeons are trained and use arthroscopic surgery routinely.[3]

In this case, we present the left eminentia tibia fracture which stabilized using arthroscopy pull through technique in a 15 years old male adolescent.

CASE REPORT

A male, 15 years old adolescent come to the orthopaedic polyclinic with chief complain of pain in his left knee since 5 days prior to admission. Patient was climbing a tree with 1.5 meters high, jumped with hyperextention of knee. No history of fracture in the past. His parents denied any history to the bone setter before.

On physical examination, we found swelling around his left knee (Figure 1), without any bruise or deformity. Tenderness was felt around the apex of patella, warm on palpation, and positive patellar tap test. Active range of motion (ROM) of left knee was limited due to pain. Anterior drawer test and posterior drawer test didn't find on physical examination. Left knee X-Ray AP and lateral view was taken (Figure 2) and confirmed a fracture of eminentia tibia meyers and mckeever IIIA.

Figure 1: Swelling on patient's left knee.

Figure 2: Left Knee X-Ray AP and lateral view shows fracture of eminentia tibia meyers and mckeever IIIA.

In this patient, arthrocentesis was done at policlinic and 20cc blood was aspirated (Figure 3). Patellar tap test was negative after that procedure done. Patient brought to the operating theatre two days later. In the operating theatre, patient was on a supine position under spinal anesthesia with a leg free tourniquet control. Trochar was inserted to anteromedial and anterolateral side of left knee. Standard diagnostic arthroscopy was performed using a 30˚ 4.0-mm arthroscope to visualize and probe structures to assess the integrity**.**

Figure 3: 20 cc blood aspirated on arthrocentesis.

On arthroscopic evaluation, there was a fracture of medial eminentia tibia meyers and mckeever IIIA. On meniscus evaluation, lateral and medial meniscus found intact without any injury. 1 mm ethibond was inserted through the ACL and pull through technique to the tibia plateau was done. On fracture reidentification after the procedure, found that the fracture already compressed and on stability evaluation found the fragment already stable (Figure 4).

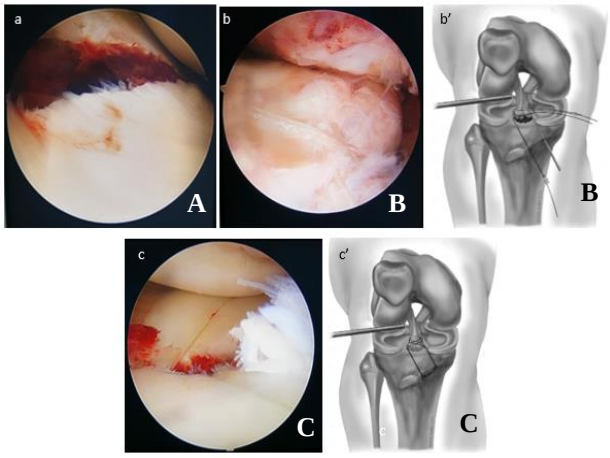

Figure 4: (A) Fracture of tibial eminentia mayers and mckeevers type IIIA (B) ethibond suture was inserted through ACL and pull through the tibia plateau (C) fracture site already compressed and stable on evaluation.

After the operation, left knee X-ray (Figure 5) was taken and robert jones bandage was applied and maintained for 3 weeks to give additional external support and prevent the swelling. Patient was allowed to mobilize in full weight bearing as tolerated. Active ROM knee exercise was done and allowed limited to 60˚ of flexion for the

first week, continued to 90˚ of flexion on the second week, and full flexion for the third week.

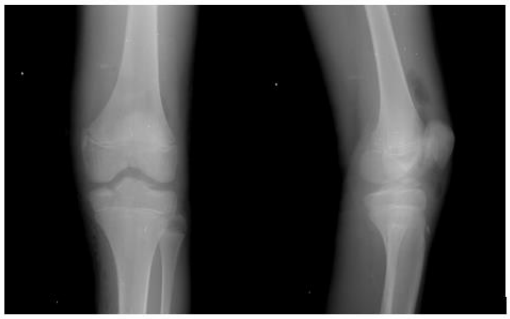

Figure 5: Left Knee X-ray AP/lateral view post operation shows fracture fragments already reduced and compressed.

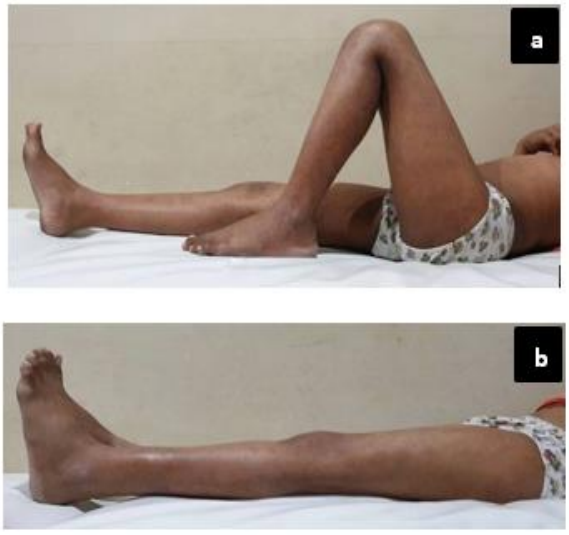

Figure 6: (A) patient able to flex his knee in 130˚ on 10 weeks post operation (B) patient able to do full extension without any pain.

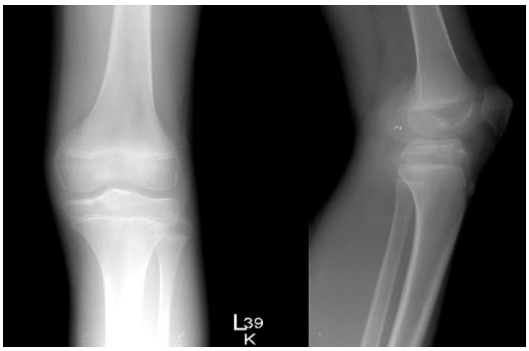

Figure 7: Fracture healing and disappearance of the fracture line.

On the 8 weeks evaluation after the operation, patient able to walk independently full weight bearing without any support. There was no swelling and patient able to flex his knee in 130˚, but there are 20˚ lack of extension. Patient was suggested to do physical therapy routinely to prevent joint stiffness. On 10 weeks evaluation, full knee range of motion was achived without any pain. (Figure 6). Left knee X-ray (Figure 7) shows progression of fracture healing and disappearance of the fracture line.

DISCUSSION

Biomechanical studies have demonstrated that ligament failure characteristics are influenced by overall age and skeletal maturity. In young age, the epiphysial bone offers less resistance to traction forces than does the ACL substance. This lower resistance can generate these fractures. Similar loads cause rupture of the ligament in adults.[5] While successful nonoperative treatment of nondisplaced meyer and mckeever type I fractures has been reported, management of displaced fractures is somewhat controversial. Furthermore, the ideal method of fixation, suture versus screw, has not been defined.[1] In this case the patient jumped from 1.5 meters high, with his left knee in hyperextention. Immaturity of bone in this 15-year-old patient cause the lower resistance of epiphysial bone rather than the ACL substance and cause the tibial eminence fracture.

Anterior cruciate ligament avulsion fractures may cause knee instability, and the intra-articular fragment may cause mechanical blocking to knee flexion and extension. Most authors agree that anatomical reduction and a stable internal fixation are required to restore normal knee biomechanics.[5] There are many Suture and screw fixation are the most commonly described fixation techniques. An open approach was traditionally utilized; however, most operatively treated fractures are now managed arthroscopically.[1] In children, tibial eminentia fracture is due to less violent injuries than in adults and in adults it is therefore often associated with other severe injuries to the knee.[2]

The treatment approach against knee injuries has critical importance for the need to preserve both functionality of the knee and the integrity of the physis. In etiology, the tibial intercondylar eminence fracture is equivalent to the ruptures of the anterior cruciate ligament, thus anatomic reduction is needed to preserve the stability of the joint. The prognosis is basically related to the type of fracture, anatomic reduction, articular congruity, and age of patient. Most of the previous studies is on the arthroscopic management of tibial intercondylar eminence fracture in literature. Currently arthroscopy method is more preferred than open technique. In the most recent literature, the preferred method can be described as a pull through suture where a suture is passed through the ACL just proximally to the avulsed bony fragment. After placing the suture, a small incision is made just medial to the tibial tuberosity and the bone is exposed. Then two tunnels are drilled from the lateral and medial border of the fracture bed to the anterior tibia. The suture is pulled through these tunnels and tied on the

anterior surface of the tibia. In another suture technique, the suture is tied to a screw placed in the anterior part of the tibia. Mah et al published the first study using an arthroscopic technique and stated, like other authors, that arthroscopy leads to less scar tissue, less morbidity and a faster recovery. Bong et al reported increased initial mean ultimate strength with suture repair (319 N) compared with screw fixation (129 N) (p=0.0038).[2]

In this case, the operation started with insertion of trochar to anteromedial and anterolateral side of left knee. 30˚ 4.0 mm was used to visualized and probe structures to assess the integrity. We found fracture of eminentia tibia meyers and mckeever IIIA (Figure 8).[3] 1 mm ethibond was inserted through the ACL and pull through technique to the tibia plateau was done. On fracture reidentification after the procedure, found that the fracture already compressed and on stability evaluation found the fragment already stable.

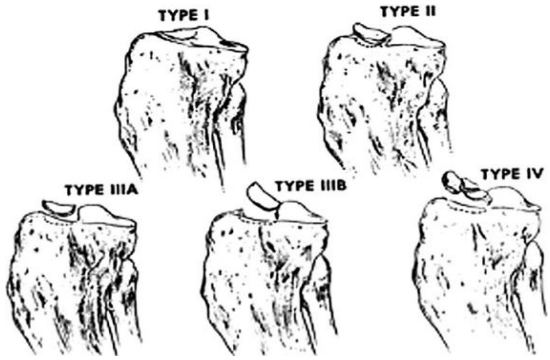

Figure 8: Modified meyers and mckeever classification according to Zaricznyj.[3]

Study from Bogunovic et al clinical stability was assessed in all patients treated with suture (12 studies/172 patients) instability was identified in 13% of patients treated with suture fixation and 27% of patients treated with screw fixation (p=0.0069). Lachman and/or anterior drawer testing was assessed in nine suture fixation studies (140 patients) and five screw fixation studies (66 patients). An abnormal result was found in 5.7% of suture fixation patients and 20% of screw fixation patients (p=0.0052). Pivot shift was assessed in five suture fixation studies (38 patients) and four screw fixation studies (57 patients). There was no difference in the percentage of patients with a>+2 pivot shift (13% suture vs. 11% screw, p=0.750).[1]

In post-operative care of tibial eminence avulsion fracture, drainage is usually unnecessary. Hospitalisation is 3-7 days long. The patient is kept in a hinged brace, and mobilisation is started immediately on the day after surgery. Early passive and active range of motion should be encouraged with a goal of 0-90° to be achieved by the first week. Full range of motion should be obtained by the sixth postoperative week. Weight bearing is restricted for 6-12 weeks, with this range depending on the fracture pattern and the patient's bone quality and needs. Radiographic follow-up is recommended and should guide the progression from non-weight bearing to partial and full weight bearing. Thromboembolism prophylaxis is given until the resumption of weight bearing.[6]

In this patient, after the operation, robert jones bandage was applied and maintained for 3 weeks to give additional external support and prevent the swelling. Patient was allowed to mobilize in full weight bearing as tolerated. Active ROM of knee exercise was done and allowed limited to 60˚ of flexion for the first week, continued to 90˚ of flexion on the second week, and full flexion for the third week.

Tibial eminence avulsion fracture can be complicated by compartment syndrome. Compartment syndrome due to fluid extravasation, is a worrying but a rare early complication. Deep venous thrombosis and pulmonary embolism may complicate every fracture of the lower limb treated with a surgical procedure followed by non-weight bearing or immobilisation. Misalignment, infection, malunion, non-union and stiffness may complicate the procedure at long-term follow-up. In this patient there is no serious complication was found with patient able to walk independently full weight bearing without any support after 10 weeks post-operation.[6]

CONCLUSION

In summary, arthroscopic reduction and internal fixation by pull through suture provide perfect anatomic and functional outcome for displaced type II and type III tibial eminence fracture. In this case, earlier weight bearing and full range of motion can be achieved faster for the pull through suture fixation of tibial eminence fracture. Arthroscopic reduction and internal fixation by pull through suture can be considered as treatment of choice for tibial eminence fracture in adolescent.

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