
Arthroscopy-Assisted Pinning of Tibial Spine Avulsion Fracture: A Simple Technique

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Abstract: Introduction: tibial spine avulsion fractures, also known as intercondylar eminence fractures, are uncommon knee injuries that predominantly affect in children and young adults. Material and methods: a 22-year-old-male no relevant medical history went to the emergency department after sports injury, in the performed X-ray was identified a displaced type III tibial eminence fracture. The tibial spine avulsion is identified and inspected. An incision is made medial and distal to the tibial tubercle, an ACL guide is inserted anteromedially and an 18 mm Kirshner wire is placed closed to the stump of the ACL with its end curved intraarticularly. The bone fragment is then pulled with gentle traction and a near anatomic reduction is verified on fluoroscopy. Results: the score function of Lysholm at decasting at last follow-up was 98. Radiographs were obtained at 1, 3, and 6 months postoperatively. At final follow-up, the Lachman test was used to evaluate the stability of the knee. Patient did not show any signs of laxity and returned to his preinjury activity level 8 months after surgery. Conclusion: the treatment of the displaced fractures requires surgical reduction and fixation in order to achieve adequate tension in the anterior cruciate ligament and to reduce the risk of laxity. The aim of our study is to evaluate the clinical and radiological results of the arthroscopically assisted pinning of ACL avulsion fractures and to show that it is a very simple and effective technique.

Keywords: Knee, Anterior Cruciate Ligament, Fracture, Avulsion, Arthroscopy, Fixation

1. Introduction

Anterior tibial spine fractures are relatively rare injuries, they can lead to pain, instability and functional limitation. The mechanism of injury occurs when a patient hyperextends the knee with simultaneous rotation of the knee on the tibia, such as the case while playing soccer, falling off a bicycle, or participating in other forceful sporting activities. Hyperextension of the knee places a significant tension on the ACL, which originates from the lateral femoral condyle and inserts onto the anterior tibial spine, thus resulting in an avulsion fracture of the latter site [1]. Concomitant injury to the ACL, meniscus, or other surrounding structures can also occur, and should be evaluated [2]. Surgical options include reduction and fixation through arthrotomy or arthroscopic technique. Arthroscopic technique is

more popular and reduced morbidity. This study describes a patient with an avulsion fracture of the anterior cruciate ligament (ACL) treated by a simplified, reproducible method of fixation using a Kirshner-wire.

2. Materials and Methods

A 22-year-old-male with no relevant medical history went to the emergency department after sports injury. He complained of left knee pain, was admitted to hospital 2 hours after the injury. Patients will present with a swollen and painful knee with an inability to bear weight on the affected extremity. Lachman test is positive. Radiographs and computed tomography (CT) images of the left knee showed a displaced type III tibial eminence fracture (Figures 1 and 2).



Figure 1. Preoperative x-ray showing tibial spine avulsion.



Figure 2. CT scan knee showing a McKeevers stage III avulsion fracture of the tibial eminence.

2.1. Technique

The patient is installed on an ordinary table and a tourniquet is applied around the proximal thigh. Standard knee arthroscopy is performed using a 30° arthroscope. Only 2 standard anterolateral and anteromedial portals for knee complete diagnostic arthroscopy is performed. There was no damage to the articular cartilage. After diagnostic arthroscopy and clearing of the fracture site, The ACL femoral attachment is intact. The tibial spine avulsion is identified and inspected. An incision is made medial and distal to the tibial tubercle, an ACL guide is inserted anteromedially and an 18 mm Kirshner wire is placed closed to the stump of the ACL with its end curved intraarticularly. The bone fragment is then pulled with gentle traction and a near anatomic reduction is verified on fluoroscopy (figure 3). The outer free end is then cut close to the skin, curved and buried into the anterior tibial cortex. The knee is flexed and extended to check for stability and re-examined under direct arthroscopic visualization.



Figure 3. Postoperative x-ray AP view showing near anatomic reduction of tibial eminence fracture.

2.2. Post-Operative Management

A plaster cast was applied for 2 weeks with the knee in the extended position. Isometric exercises to strengthen the quadriceps muscle were started 2 days postoperatively.

Partial weight bearing on clutches up to the first 3 weeks. Bone union was achieved after 8 weeks (figure 4). The Lysholm knee scoring scale was also used to evaluate outcomes of knee ligament surgery, particularly symptoms of instability. The scale included eight items: limp, support, locking, instability, pain, swelling, stair climbing, and squatting. The score function of Lysholm at decasting at last follow-up was 98. Radiographs were obtained at 1, 3, and 6 months postoperatively. At final follow-up, the Lachman test was used to evaluate the stability of the knee. Patient did not show any signs of laxity and returned to his preinjury activity level 8 months after surgery.



Figure 4. Follow up knee x-ray AP view demonstrating bony union after 8 weeks.

3. Discussion

Tibial spine avulsion fractures correspond to a disruption of the ACL. The presence during the clinical examination of a large painful post-traumatic knee should suggest the diagnosis and leads to the realization of a radiological assessment of the knee [3]. The standard x-ray of the knee the front and from profile generally establishes the diagnosis [4]. CT scan or even magnetic resonance imaging is requested in case of diagnostic doubt in order to establish a precise lesion assessment [5]. Tibial spine avulsion fractures can progress to knee laxity and functional disability [6]. The choice of treatment method is primarily determined by the type of avulsion fracture. The characteristics that determine management include the size, the degree of displacement, the comminution and orientation of the fracture fragment, and the integrity of the attached cruciate ligament. Avulsed fragments that are of a sufficiently big size may be treated arthroscopically, including fixation with a cannulated cancellous screw or Kirshner wire, or suture fixation [7-9]. However opinions are still divided as to treatment. Casalonga *et al.* [4] adopt orthopedic treatment for slightly displaced type II; the team of Louis ML [10] prefers surgical reduction. The studies

have recommended reduction and rigid fixation of all fracture types [11]. The factors responsible for residual laxity and instability: imperfect reduction of the fracture avulsion and plastic deformation of the ligament before ultimate failure and avulsion fracture [12]. Several methods of arthroscopic suture fixation have been described in the literature; the most recommended ones are reduction and fixation with fiber suture or cannulated screws [13-15]. Screws and sutures are the primary surgical modalities for tibial spine fracture repair, both having exhibited very good clinical and radiographic outcomes. Cannulated screws have shown good fracture repair with almost immediate weight bearing postoperatively, but a second surgery is frequently necessary for removal of the hardware [16]. The Advantages of our technique also included low morbidity, the ability to diagnose and treat concomitant injuries, anatomic reduction of the fragment and stabilization in a limited surgical time and early rehabilitation, pin removal is easy. To the best of our knowledge, it is the first study that investigates the arthroscopic treatment of displaced fractures of the tibial intercondylar eminence using a kirshner pin but with a minimum followup of 1 year. This study had some limitations, including a relatively short followup and a small sample size. Surgery should not be delayed more than 1-week after the injury in order to achieve an accurate reduction of the fracture. Since there is no validated scoring system to assess the results of the treatment of the displaced tibial intercondylar eminence fractures, the IKDC score was used in combination with the Lysholm knee score and considered as the best available scoring system. The advantages of our technique are: it aids in reduction, it the use of material that is cheap and simple, it easy and quick technique, it provides stable fixation in comminuted fractures and also this technique is not yet investigated in the literature review.

4. Conclusion

Arthroscopy-assisted pinning of tibial spine avulsion fracture is an easy and effective method, with an excellent anatomic reduction and ligamentous stability. This surgical procedure was convenient and requiring no special surgical instruments. In general, our technique is simple reproducible but requires a prospective study to better choose the indications.

Competing Interests

All the authors do not have any possible conflicts of interest.

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