

ORIGINAL RESEARCH

Functional Outcome of Arthroscopic Suture Pull Out Fixation of Displaced Tibial Spine Avulsion Fracture: A Prospective Analysis

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ABSTRACT

Background: Anterior cruciate ligament avulsion common in young adults and teenage group, other mechanism of injuries includes sports injuries fall. The present study was conducted to assess the functional outcome of arthroscopic suture pull out fixation of displaced tibial spine avulsion fracture.

Materials&Methods: The present prospective hospital-based study was conducted over a period of 1 year with a sample size of 40. Diagnostic arthroscopy was performed under spinal or general anesthesia through the standard anterolateral portal. Patients who had pain and disability resulting from tibial spine avulsion inactive patient type II, type III and type IV, Age: < 60 years were included in the study.

Results: In the present study majority of subjects were in the age group 18 to 30 years (60%). In the study, 85% were males and 15% were females. 15% had fall from the cycle, 60% had fallen from motorbike and 25% had fall while playing. Status of Pysis in 62.5% was closed and open in 37.5%. In the study 72.5% had Type III and 37.5% had Type IV Meyers and McKeever's classification. At 3 months, the mean Post op Lysholm score was 85.14±1.45, at 6 months was 96.83±2.03 and at 12 months was 97.14±1.35. There was a significant increase in Post op Lysholm score at 6 months and 12 months. At 12 months when compared to 6 months Post op Lysholm score, there was no significant increase in Post-op Lysholm score. 10% subjects had Post-op Knee Stiffness.

Conclusion: The present study concluded that Arthroscopic suture pull-out fixation for type III and IV tibial spine avulsion shows excellent outcomes without any significant complications.

Keywords: Arthroscopic Suture Pull Out Fixation, Tibial Spine Avulsion Fracture, Functional Outcome.

INTRODUCTION

Anterior tibial spine fractures are relatively rare with an incidence of approximately 3/100,000/year.¹ Anterior cruciate ligament (ACL) avulsed mostly from tibial attachment. According to Meyers and McKeevers classification² these injuries can be classified in to 3 types. Type 1: minimal or no displacement and is usually treated conservatively; Type 2: partially displaced, where posterior hinge attached to tibia and only anterior fragment avulsed and superiorly displaced, showing as beak in lateral X-ray. Type 3: complete fragment elevation anteriorly and posteriorly; it has two sub types Type 3a: involves small portion of eminence Type 3b: involves the majority of the eminence. Type 4: displaced, comminuted fracture and type 4 added by Zaricznyj.³ Type I fractures are usually treated non-operatively with cast immobilization, while closed reduction or arthroscopic evaluation can be attempted for the treatment of type II fractures. For displaced type III or IV fractures, open or arthroscopic reduction and fixation are generally required.⁴ Interestingly, the outcome of arthroscopic fixation in children and adolescents is usually satisfactory, but the results in adults are less predictable.⁵ Hunter and Willis found that the younger the patient is, the better the outcome after arthroscopic fixation for tibial eminence fracture.⁶ In literature, the reported complication of tibial spine fracture includes anterior knee instability, extension loss, quadriceps weakness, and chondromalacia.^{7,8} The present study was conducted to assess the functional outcome of arthroscopic suture pull out fixation of displaced tibial spine avulsion fracture.

MATERIALS & METHODS

The present prospective hospital-based study was conducted over a period of 1 year with a sample size of 40. Patients who had pain and disability resulting from tibial spine avulsion inactive patient type II, type III and type IV, Age: < 60 years, the patient must be able to use crutches / walker, he patient should have sufficient muscle strength and motivation to carry out a rehabilitation program, closed injuries were included in the study. Patients with Type I tibial spine avulsion according to Meyers and McKeever classification, associated with Proximal tibia fracture, associated with Multiple ligaments injuries, present or past history of inflammatory arthritis, open injuries, previous operated or infected knee for any reason were excluded from the study. Diagnostic arthroscopy was performed under spinal or general anesthesia through the standard anterolateral portal. The joint and fracture bed was cleared of hematoma using continuous irrigation. Then, the standard anteromedial portal was established. Chondral and meniscal injuries were assessed and managed as per established guidelines. The tibial spine avulsion was identified, and the type of fracture was confirmed by probing. Next, 1-inch-long skin incision was made parallel and medial to the tibial tuberosity. The remaining dissection was done with care to arrive up to the periosteum protecting the pes anserinus tendons and underlying medial collateral ligament. The tip of the ACL tibial guide was subsequently placed via an anteromedial (AM) portal on the medial-most edge and at the equator of the avulsion crater. Next, a tibial tunnel was drilled using a 1.8 mm K-wire. Once the K-wire tip was visualized emerging out at the crater edge, the tibial guide was disengaged, and the K-wire was left in situ. A similar step was performed for the lateral edge of the crater with another K-wire keeping 1 cm of the bone bridge intact between two tunnels over the tibia. Once the needle tip was visualized on the lateral side of ACL, the PDS suture

was advanced through the lateral PDS loop. The advanced end of the PDS was pulled out of the joint via AM portal using an arthroscopic grasper. Frequently, the suture grasper was used to pull the PDS out of the lateral loop in a case where it did not enter into the lateral loop. A similar step was repeated by taking a bite through the anterior third of the ACL substance, and PDS was pulled out via AM portal. Next, the shuttling technique replaced the two PDS sutures by ethibond. Then, the needle and PDS loops were pulled out of the tunnel, which further pulls the ethibond sutures out of the joint through the tibial tunnels. Ethibond sutures were tied one by one over the bone bridge or suture button keeping the knee in 30-degree flexion.

RESULTS

40 patients with tibial spine avulsion were operated on with arthroscopic pull out suture technique. The majority of subjects were in the age group 18 to 30 years (60%). In the study, 85% were males and 15% were females. 15% had fall from the cycle, 60% had fallen from motorbike and 25% had fall while playing. Status of Physis in 62.5% was closed and open in 37.5%. In the study 72.5% had Type III and 27.5% had Type IV Meyers and McKeever's classification. At 3 months, the mean Post op Lysholm score was 85.14 ± 1.45 , at 6 months was 96.83 ± 2.03 and at 12 months was 97.14 ± 1.35 . There was a significant increase in Post op Lysholm score at 6 months and 12 months. At 12 months when compared to 6 months Post op Lysholm score, there was no significant increase in Post op Lysholm score. 10% subjects had Post Op Knee Stiffness.

Table 1: Age distribution of subjects

Age group(years)	N(%)
18-30	24(60%)
31-40	10(25%)
>40 years	6(15%)
Total	40(100%)

Table 2: Gender distribution of subjects

Gender	N(%)
Male	6(15%)
Female	34(85%)
Total	40(100%)

Table 3: Mode of trauma distribution

Mode of trauma distribution	N(%)
Fall from Cycle	6(15%)
Fall from Motorbike	24(60%)
Fall While Playing	10(25%)
Total	40(100%)

Table 4: Status of Physis distribution

Status of Physis	N(%)
Closed	25(62.5%)
Open	15(37.5%)
Total	40(100%)

Table 5: Meyers and McKeever's classification distribution

Meyers and McKeever's classification	N(%)
Type III	29(72.5%)
Type IV	11(27.5%)
Total	40(100%)

Table 6: Post op Lysholm score distribution

Post op Lysholm score	Mean±SD	p-value
3 months	85.14±1.45	
6 months	96.83±2.03	<0.001
12 months	97.14±1.35	<0.001

Table 7: Complication distribution

Complication	N(%)
Nil	36(90%)
Post Op Knee Stiffness	4(10%)
Total	40(100%)

DISCUSSION

Tibial eminence fractures commonly occur in children and adolescents and are less common in skeletally mature individuals.^{9,10} In adults the treatment option for displaced tibial eminence fractures are, suture or hardware fixation of the avulsed fragment and ACL reconstruction. Native ACL should be retained so as to maintain the proprioceptive function and neuromuscular control provided by the presence of mechanoreceptors in ACL.¹¹

In the present study majority of subjects were in the age group 18 to 30 years (60%). In the study, 85% were males and 15% were females. 15% had fall from the cycle, 60% had fallen from motorbike and 25% had fall while playing. Status of Physis in 62.5% was closed and open in 37.5%. In the study 72.5% had Type III and 27.5% had Type IV Meyers and McKeever's classification. At 3 months, the mean Post op Lysholm score was 85.14±1.45, at 6 months was 96.83±2.03 and at 12 months was 97.14±1.35. There was a significant increase in Post op Lysholm score at 6 months and 12 months. At 12 months when compared to 6 months Post op Lysholm score, there was no significant increase in Post op Lysholm score. 10% subjects had Post-Op Knee Stiffness.

Tsukada et al studied that there was significant anterior translation with cyclic loading in fractures treated with pullout suture compared with screw fixation.¹²

On the contrary, Bong et al, in their study of screw versus pull out suture fixation concluded that fibre wire fixation was stronger than screw fixation.¹³

Ballal MM et al found that fractures were united within 3 months after surgery in all 30 cases. The Lysholm score was improved to 98(98.17 ± 1.599). In 2 patients, post operative knee stiffness was noted and arthrolysis was done for the same. All patients returned to their pre-injury physical activities at the last follow-up.¹⁴

Sapre V et al evaluated all patients at 18 months after the surgery. Radiographs showed that all fracture healed anatomically at an average duration of 3 months after surgery. At the final follow-up, all patients reported no symptoms of instability, such as giving – way episodes, clinical signs of anterior cruciate ligament deficiency were negative. The mean Lysholm score was 96.9 (range 91-100), mean IKDC score was 87.9 (range 83-93), and all patients achieved their preinjury Tegner activity levels. One patient had postoperative arthrofibrosis with the loss of terminal extension of 5° which responded to arthroscopic adhesiolysis and physiotherapy. We had no case of infection.¹⁵

CONCLUSION

The present study concluded that Arthroscopic suture pull-out fixation for type III and IV tibial spine avulsion shows excellent outcomes without any significant complications.

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