

Functional Outcome of Arthroscopic Suture Pull-Out Fixation in Tibial Spine Avulsion of Anterior Cruciate Ligament

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ABSTRACT

Background: Tibial spine avulsion of the anterior cruciate ligament is a rare intraarticular injury of the knee. In this condition, the tibial attachment site of the anterior cruciate ligament is detached from the knee. The mechanism of the injury is hyperextension of the knee and rotation with valgus force. There are so many treatment options. This study aims to find out the functional outcome of Arthroscopic Suture pull-out fixation in this injury.

Methods: This is a retrospective study done from August 15, 2019, to August 14, 2022. The outcome was analyzed by comparing the preoperative and 12-month postoperative International Knee Documentation Committee Score, Tegner Lysholm Score, Knee Range of motion, and Visual Analog Scale Score.

Results: Twenty-two patients were included with a mean age of 18.95 (13-31). Among them 15(68.2%) were male and 7(31.8%) were female. Arthroscopic suture pull-out fixation was done in all the cases. The knee range of motion was improved from preoperatively 35.00 ± 7.86 to 135.68 ± 3.50 at the final follow-up. The Tegner Lysholm score was improved from preoperatively 34.68 ± 1.28 to 94.54 ± 2.97 at the final follow-up. Preoperatively the VAS score was 8.04 ± 1.27 which improved to 0.60 ± 0.50 at the final follow-up. The IKDC score was 23.86 ± 1.42 preoperatively which improved to 92.72 ± 3.28 at the final follow-up with p-value < 0.001

Conclusions: Arthroscopic Suture pull-out fixation of tibial spine avulsion of the Anterior cruciate ligament is a good technique that restores the functions of the knee and has an excellent outcome

Keywords: Anterior cruciate ligament; suture pull-out fixation; tibial spine avulsion.

INTRODUCTION

Tibial spine avulsion of the anterior cruciate ligament (ACL) is a rare knee injury.¹ This has been frequently reported as increasing incidence.² The mechanism of injury is hyperextension of the knee with valgus force during sporting activities.² Meyers and McKeever classified this injury.³ Type I is avulsion with minimal displacement, type II is avulsion with an elevation of the anterior half of the fragment with an intact posterior hinge, and type III is avulsion with complete displacement. Zaricznyj added avulsion fracture with comminution as type IV.⁴ Type I variety is treated with the conservative method by knee immobilization in a long leg cast.⁵ Surgery is required for Type II, III, and IV.⁶

Surgical procedures include reduction by open or arthroscopic methods with screws or sutures.⁷

Arthroscopic technique has nowadays become the preferred treatment because of less morbidity.⁸ Various arthroscopic techniques include fixation with staples, metal screws, or non-absorbable sutures.⁹

METHODS

This is a retrospective study done from August 15, 2019, to August 14, 2022, after approval from the Institutional Review Board (Ref. No. 726/2079/80). The statistics of a total number of 22 patients who were treated with the arthroscopic suture pull-out technique and met the criteria for the study were analyzed. The data were obtained from the medical record section of the National Trauma Center. The data were analyzed for demographics, mode of injuries, surgical findings, preoperative and post-operative knee range of motion (ROM), and complications. The patients' questionnaire

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included the Lysholm knee scoring system¹⁰ the International Knee Documentation Committee (IKDC)¹¹ form, and the Visual Analogue Scale (VAS) Score.¹²

In all the cases Spinal anesthesia was used. The affected knee was positioned in a leg holder at 90 degrees of knee flexion. The tourniquet was placed around the thigh. Painting and draping were done. The tourniquet was inflated. The standard anterolateral portal was made and diagnostic arthroscopy was done. The craters were cleared of the soft tissues with the help of a shaver. The two strangulation knots were made around the base of the ACL. With the help of an ACL zig, a transtibial tunnel was made. All strands of sutures were arranged in such a fashion that they covered the fragment from all sides and all the strands were pulled from the tunnel. Trial reduction of the avulsed fragment was done. All the strands of the suture were tied to the anterior cortex of the tibia with the help of a titanium button. Arthroscopic visualization of the avulsed fragment was done through knee flexion and extension to confirm the anatomic reduction. The knee was immobilized in a long knee brace and rehabilitation was done according to the protocol. The stitches were removed on the 10th postoperative day. The knee range of motion, IKDC Score, and Lysholm knee score were assessed at 6 months and 12 months postoperatively.

The statistical analysis was done by spss version 20 and preoperative and postoperative data were compared using paired t-tests and p values < 0.05 were considered statistically significant.

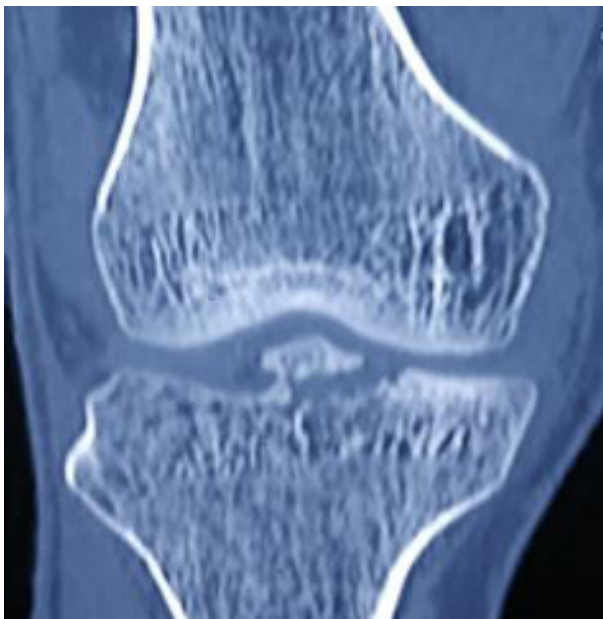


Figure 1. Coronal CT image of affected knee with Tibial spine avulsion.



Figure 2. Lateral X-ray image of affected knee with tibial spine avulsion.



Figure 3. X-ray AP View after fixation with suture pull-out technique.



Figure 4. X-ray lateral View after fixation with suture pull-out technique.

RESULTS

Twenty-two patients who met the inclusion criteria in this study and who did complete follow-up were enrolled in this study. Among them 15 were male and 7 were female with a ratio of 2.14:1. The mode of injury was mainly sports injury i.e. futsal injury followed by road traffic accident (RTA) i.e., fall from the motorcycle. Meyers and Mckeever type III classification outnumbered other types. The mean time from injury to fixation was 8.8 days. We compared the preoperative VAS score, Tegner Lysholm score, IKDC score, and knee ROM with 12 months of postoperative follow-up data which came out to be significant. ($p < 0.001$). At 12 months follow up there were no signs of ACL deficiency and no symptoms of knee instability. The knee ROM was significantly improved. IKDC Score, VAS Score, and Tegner Lysholm score were improved significantly. There were no major complications. Some patients complained of minimal knee pain and swelling on and off which was relieved with rest and analgesics.

Table 1. Demographic variables of the patients.

SN	Variables	Number of patients (%)
1	Gender	
	Male	15(68.2%)
	Female	7(31.8%)
2	Side of affection	
	Right	12(54.5%)
	Left	10(45%)
3	Mean age (years)	18.95(13-31)
4	Meyers & Mckeever Classification	
	Type II	2(9.09%)
	Type III	17(77.27%)
	Type IV	3(13.63%)
5	Mode of trauma	
	Sports Injury	13(59.09%)
	RTA	9(40.90%)
6	Associated injuries	
	None	16(72.72%)
	Medial meniscus Tear	2(9.09%)
	Lateral Meniscus Tear	4(18.18%)

Table 2. Preoperative and 12-months follow-up scores

SN	Variables	Preoperative	12 months Post-op	p-value
1	IKDC score	23.86±1.42	92.72±3.28	<0.001
2	TegnerLysholm score	34.68±1.28	94.54±2.97	<0.001
3	VAS score	8.04±1.27	0.60±0.50	<0.001
4	Knee ROM	35.00±7.86	135.68±3.50	<0.001

DISCUSSIONS

The incidence of tibial spine avulsion of ACL is increasingly found in sports injuries. Our study shows that road traffic accident i.e. fall from motorbike, scooter is second most common cause of tibial spine avulsion of ACL after sports injury This is a common entity in children and adolescents. However, this entity is increasingly reported in youths who are involved in sporting activities. These injuries are common in males.¹ There are so many techniques to fix avulsion injuries. The aim should be to preserve the native ACL and the anatomic reduction of the fragment. The advantage of the suture pull-out method is no requirement for further surgery for implant removal. In all of our cases, we use the suture pull-out technique as a standard technique for the fixation of ACL avulsion. In these cases, standard radiographs like knee X-rays with Anteroposterior and lateral view, CT scan with 3-dimensional reconstruction, and Magnetic Resonance Scan are very important for the proper evaluation of bony and soft tissue injuries. Postoperatively the operated knee was immobilized in a long knee immobilizer for 2 weeks and allowed

knee isometric exercises. After 2 weeks patients were subjected to gradual knee range of motion and partial weight bearing. Full weight bearing was allowed after 6 weeks.

This technique has many advantages. It allows complete visualization of any associated intraarticular injuries which can be addressed at the same time. It is less invasive. It allows visualization of fracture reduction. It uses a small tibial bone tunnel with subsequent tensionable fixation.¹ Bong et al. reported that the ultimate strength of the Fibrewire fixation is significantly greater than that of screw fixation.¹³ Quiceno et al. reported that this technique showed satisfactory results.¹⁴ T W Huang et al. reported that this technique restores ACL Length, stabilizes fragments, promotes early motion, and minimizes morbidity.⁷ Lutz et al. stated that excellent reliable ligamentous stability and high rates of return to high impact sports can be expected using arthroscopic suture fixation technique.¹⁵ Seon et al. reported that both screw and suture fixation has good functional outcome.¹⁶ Our study has showed the excellent outcome of arthroscopic suture pull out fixation for tibial spine avulsion of ACL. The limitation of our study is a small sample size. The follow up period was of relatively short duration.

CONCLUSIONS

Arthroscopic Suture pull-out fixation of tibial spine avulsion of the Anterior cruciate ligament is a good technique that restores the functions of the knee and has an excellent outcome.

CONFLICT OF INTEREST

None

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