

Management of Avulsion Fracture Tibial Spine by Open Reduction and Endobutton Fixation an Outcome Study

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Abstract:- Background Tibial spine avulsion fractures predominantly occur in adolescents and young adults. Displaced fractures are known to result in to nonunion and knee instability requiring surgical management for optimal functional outcome. This prospective study was designed to study functional results following open reduction with end button fixation via minimal incision in tibial spine avulsion fractures. Open reduction was done to prove that without arthroscop fixation of tibial spine can be done with comparable results.

- **Materials and methods**

The prospective study included 22 patients with tibial spine avulsion fractures referred to the Department of Orthopedics, GMC Kota were selected for this study. Meyer and McKeever type 2 and 3 were included in the study.

- **Discussion**

We have excellent results in 13 cases (59.91%), good in 9 cases (40.19%) according to the Lysholm score. Bony union was achieved in all patients within 3 months. All patients had a complete functional recovery and were able to return to work and to resume their sports activities after 6 weeks and 7 months respectively. At final follow up, the mean Lysholm score was 94.32.

- **Conclusion**

Using open reduction with endobutton is a safe and reliable technique for producing clinico-radiological outcome in displaced tibial spine avulsion fractures.

I. INTRODUCTION

Tibial spine avulsion fractures predominantly occur in children and young adults and are equivalent to anterior cruciate ligament (ACL) injuries in adults.^[1] Avulsion fractures account for only 1% to 5% of ACL injuries in adults.^[2] The Anterior Cruciate Ligament (ACL) contains large blood vessels and the avulsed bone fragment receives sufficient nourishment from this blood supply Atrophy of the ligament following its detachment at one end can be expected if the stimulus of tension thereby removed. Displaced fractures are known to be subject to nonunion and knee instability

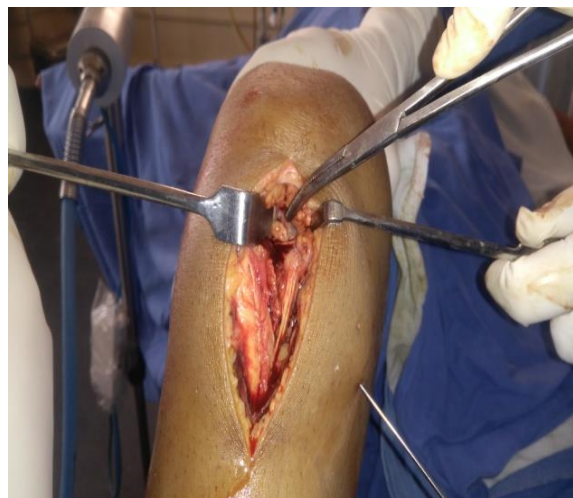
requiring surgical management for optimal functional outcome.^[3] Open reduction techniques have been described to reduce and stabilize displaced fractures including cannulated screws, Kirchner-wires, and sutures^[4,5,6] However, most techniques were related to several complications such as implant breakage, loosening or migration, infection and nonunion.^[7] Arthroscopic techniques have been successfully proposed to decrease open reduction induced morbidity. But it requires specialized equipment and person and it is also costly. Open reduction with endobutton fixation via minimal incision also provide equivalent results to arthroscopy and it does not require specialized equipment and person with cost effectiveness. This prospective study was designed to study functional results following open reduction with endobutton fixation via minimal incision in tibial spine avulsion fractures.

II. MATERIALS AND METHOD

This study was conducted in the Department of Orthopaedic, Govt Medical College and Associated group of hospitals, Kota during the year 2015-16. 22 cases of Tibial spine avulsion were included in this study. Meyer and McKeever type 2 and 3 were included in the study. Patients with ipsilateral meniscal injury were excluded.

After thorough preoperative evaluation including MRI, informed consent was taken for surgery. After spinal anaesthesia the patient was placed on the supine position on the operative table. Injured knee is flexed and midline incision given from inferior pole of patella to tibial tuberosity, infrapatellar fat removed and fracture site exposed. Fracture surface freshened, fragment reduced with the help of artery forceps, if communitation is present, reduction is taken through pulling of anterior cruciate ligament. K-wire inserted through fracture fragment to maintain reduction. Two guide wire inserted, one from medial side and one from lateral side of tibial metaphysis through fracture fragment and it was drilled with the help of 4mm cannulated drill bit. One transverse drill is done in metaphyseal area of tibia below prior drill. In double loop fashion polyester no. 5 RC suture passed through drilled canals with help of beath pin and tied laterally or medially over endobutton in extended knee position. If communitation is present polyester no. 5 RC suture passed through anterior cruciate ligament instead of fracture

fragment. The knee is flexed and extended to check for stability, and re-examined under direct visualization. A final intraoperative radiograph of the knee is taken to ensure that the tibial spine avulsion remains anatomically reduced. The wounds are then closed in the standard fashion. The knee is placed in a functional brace locked in extension and Static quadriceps exercises started from 2 nd day. Sutures will be removed on 12th -15th post-operative day. The brace is worn for a total of 8 weeks and held in extension during first two weeks, with gradually increased range of motion. Weight-bearing is recommended after suture removal postoperatively. Partial weight bearing recommended after suture removal and full weight bearing after 4 weeks postoperatively with knee brace on. Regular follow up of all cases was done at 6 weeks, 3 months, 6 months, 9 months and one year. At each follow up patients were evaluated clinically using the Lysholmscore [9] and radiologically with appropriate X-rays.



Preoperative X-ray



Postoperative X-ray



X-ray after healing



III. RESULTS

A total of 22 eligible patients were included in the study. The study sample included 20 males (90.9%) and 2 females (9.1%). The median age of patients was 31 years (range 21–52 years). 77.27% cases (17) had mode of injury road traffic accidents, 22.72% (5) cases are due to sports injury. At the final examination, Lachman's test and pivot shift tests were negative in all patients. There were no intraoperative or postoperative complications such as fixation, failure or infection. Bony union was achieved in all patients within 3 months. All patients had a complete functional recovery and were able to return to work and to resume their sports activities after 6 weeks and 7 months respectively. At final follow up, the mean Lysholm score was 94.32.

Final result	Score range	Number of patient
Excellent	94- 100	13 (59.91%)
Good	84- 93	9 (40.19%)
Fair	65- 83	0
Poor	< 65	0

IV. DISCUSSION

The aim of surgery in tibial spine avulsion is to maintain good range of motion and prevent symptomatic knee laxity. The avulsion fracture is repaired to the tibia using a variety of methods including the use of screws, button systems, anchors, and sutures. Screws and sutures are the primary surgical modalities for tibial spine fracture repair, both having exhibited very good clinical and radiographic outcomes.^[8] 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. Other possible disadvantages in screw fixation are possible breakage of fracture fragment during insertion, possible impingement of screw head during knee extension.^[1,8] The endobutton system allowed good compression with a strong holding power. According to Hapa *et al.* in a biomechanical study with cycling loading conditions in a bovine model, endobutton fixation of tibial eminence fracture provided significantly greater initial fixation strength, less displacement than suture anchor fixation or fixation with various high strength sutures.^[9] Moreover, the inferior ACL fibers are pulled down by the suture tightening, which helps to maintain normal ACL tension.

The benefit of arthroscopic reduction and fixation with sutures and absorbable anchors or endobutton is that open arthrotomy is not done and an additional surgery is not required for hardware removal. But arthroscopy is technically demanding procedure. Technically specialization and instrument are needed for arthroscopy. Open reduction with endobutton is cost effective and can be done by most of orthopaedics surgeon without special equipment. This technique is not associated with Hardware related problem and can be done in communitated fractures also. Endobutton is made up of titanium so it is MRI compatible.

This study had some limitations, including a small sample size. The absence of control group does not allow firm conclusions.

V. CONCLUSION

Open reduction of displaced tibial spine avulsion fractures using an endobutton provides a satisfactory functional outcome. This procedure does not require implant removal and allows early weight bearing and rehabilitation. In addition it is cost effective and does not require any technical skill and instruments.

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