ORIGINAL RESEARCH

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

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ABSTRACT

Aim: The aim of the present study evaluates the management of Avulsion Fracture Tibial Spine by Open Reduction and endobutton Fixation.

Methods: Total 18 cases of Tibial spine avulsion were included in this study. 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 2nd 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.

Results: 18 patients were included in this 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. 66.67% of the patients show excellent results followed by good outcome 27.78% and one patient show fair result and none of patients under poor outcome.

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.

Keywords: Avulsion Fracture, Open Reduction, Endobutton Fixatio.

INTRODUCTION

Tibial eminence avulsion fracture is a significant intraarticular injury in children and adults. It is used as a synonym of tear of anterior cruciate ligament (ACL) in adults.[1,2] The classification of these fractures was defined by Meyer's and McKeever[1] as type I: nondisplaced or minimal displaced fractures, type II: elevated fractures with intact posterior part of eminence, type IIIa: completely displaced eminence fractures without rotation, and type IIIb: displaced eminence fractures with rotation. Zaricznyj[3] modified that classification such that a comminute fracture should be classified as type IV. In particular, hyperflexion and rotation comprise the most common injury mechanism and can occur as a skier falls back while landing after a jump. The patient's symptoms are swelling, pain, and limited range of motion. The Lachman or anterior drawer testis positive as with a substantial anterior

cruciate ligament (ACL) tear.[3,4] Some authors have preferred to use computed tomography (CT) or magnetic resonance imaging as supplemental diagnostic imaging to confirm the diagnosis and to evaluate associated soft-tissue damage.[5] Traditionally, open reduction internal fixation was performed for displaced tibial eminence avulsion fractures. However, with the evolution of arthroscopic techniques, arthroscopic treatment has been more common in recent years. Although a pullout operation is usually performed under arthroscopic visualization, it is technically difficult to reduce the fragment with suture and keep appropriate tensioning during surgery.[6] 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 provides 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

MATERIAL AND METHODS

This study was carried out in the Department of Orthopaedics, IGIMS, Patna, Bihar, India from October 2019 to September 2020, after taking the approval of the protocol review committee and institutional ethics committee. Total 18 cases of Tibial spine avulsion were included in this study.

INCLUSION CRITERIA

- Meyer and McKeever type 2 and 3

EXCLUSION CRITERIA

- Patients with ipsilateral meniscal injury

METHODOLOGY

After MRI evaluation, informed consent was taken for surgery. After spinal anesthesia 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 communition 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 metaphysic 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 communition 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[7] and radiologically with appropriate X-rays.

RESULTS

18 patients were included in this 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. 66.67% of the patients show excellent results followed by good outcome 27.78% and one patient show fair result and none of patients under poor outcome.

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 6 months respectively. We found mean Lysholm score was 93.88.

Table 1. Demographic profile of the patients

Gender	Number of patients	Percentage
Female	15	83.33
Male	3	16.67
Age in years		
Below 25	3	16.67
25-40	8	44.44
Above 40	7	38.89
Mode of injury		
Road traffic accidents	12	66.67
sports injury	4	22.22
Others	2	11.11

Table 2. Outcome of the patients

Outcome (Score range)	Number of patient	Percentage
Excellent (94-100)	12	66.67
Good (84-93)	5	27.78
Fair (65-83)	1	5.56
Poor (<65)	0	0

DISCUSSION

As the young and athletic population increases, the number of sports injuries, falls, and road traffic accidents also increase accordingly. Thus the importance of ACL injuries and eminence fractures also increases compared to previous years.[4] With the improvements in radiology, diagnoses of these injuries are established more easily while need for better treatment options arises. If a tibial eminence avulsion fracture is not well treated, it can result in some complications such as nonunion, limited range of motion, and anterior instability of the knee. Although open reduction internal fixation had traditionally been performed for displaced fractures, McLennan[8] reported the usefulness of arthroscopic reduction in 1982 and emphasized its advantages including less invasiveness and rapid recovery of knee function compared with open surgery.

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.[9] 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.[7] 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 communited fractures also. Endobutton is made up of titanium so it is MRI compatible.

CONCLUSION

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

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