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Original Research Article

A Hospital Based Clinical Study to Evaluate the Functional Outcome of Dual Plate Osteosynthesis in Type V & VI Proximal Tibial Fracture

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Conflict of interest: Nil

Abstract

Aim: We studied the results of dual locking plate and buttress plating in management of proximal Tibial Schatzker V and VI tibial plateau fracture by using minimally invasive surgical technique.

Methods: The present study was conducted at department of Orthopaedics Jawahar Lal Nehru medical College & Hospital, Bhagalpur, Bihar, India for 10 months and total 50 patients with all Bicondylar Tibial plateau fractures (Schatzker type V, VI) admitted and treated with minimally invasive dual locking and buttress proximal Tibial plate having following mention inclusion and exclusion criteria were included in study.

Results: Age range of patients included was 18 years to 60 years, with mean age 38.45±15.16 years. 40 patients were male, while 10 were females. 12 patients had left side injury and 38 patients had right side injury. 43 patients had type V fracture and rest of the patients had type VI fracture. Out of 50 patients, 36 achieved excellent knee score (80-100), 20 achieved good (70-79), 4 achieved fair (60-69) and no patient had poor (<60) knee score. Mean range of knee flexion was 110 degrees. Complications included 5 superficial infection which were treated by IV antibiotics and surgical wound management. Malreduction or malalignment was not measured on the first postoperative radiographs.

Conclusion: The results of the study concluded that by using minimal invasive technique of bi condylar fracture fixation are excellent without any major complication.

Keywords: Tibial plateau fractures, dual locking and buttress Tibial plate, proximal Tibial Schatzker type V, VI fractures, minimally invasive surgical fixation technique.

Introduction

Knee joint is an important joint as it is involved in varied functions like load bearing, walking, running, sitting etc. Knee joint is comprised of distal femur, proximal tibia & patella. Injuries of the knee must be treated properly to maintain a good knee function. The tibial plateau refers to the flattened articular surface of the upper end of tibia. The fractures of the proximal tibia involving the articular surface are referred to as tibial plateau fractures (TPF).Fractures of the tibial

plateau represent 1% of all fractures and approximately 8% of fractures occurring in the elderly. [1,2]

Tibial plateau fractures occur when the proximal tibia bears an excessive axial load and commonly occur in road traffic accidents and sports injuries. It constitutes 1% of all orthopedic fractures and 8% of fractures in the elderly. [3] These fractures are intra-articular; therefore, their fixation is an important issue. [4] These fractures classically were described as bumper or fenders fractures. They gravely affect the biomechanics, stability, and range of motion of the knee joint. [5,6] The pattern of the fracture correlates to the magnitude of the force imparted on that lower limb. The higher energy fractures (Schatzker 4–6), [7] or those in pathological bone, are associated with severe articular disruption through axial loading of the tibial plateau in combination with a varus or valgus force loading. [8] This results in articular surface depression, condyle separations, metaphyseal comminution, and diaphyseal extension. [9] There is still controversy in selecting the type of surgical treatment. The goal of these types of fractures is to restore congruency, stability, alignment, and to attain full range of movement. [10] The blood supply of the tibia is precarious. Therefore, high-energy fractures are associated with compartment syndrome and neural or vascular injuries. [11]

Various methods of treatment for complex and compound fractures are being used now days for restoration and maintenance of reduction of the fracture with ultimate aim of prevention of occurrence of late degenerative arthritis and stiffness. Selection of proper implant play major role in such injuries. Casting and traction in these situations give poor results and functional outcome in displaced fracture. Till date common protocol of each type of complex Tibial plateau fractures has not developed. CT scan and MRI imaging techniques, are more helpful to studies fractures pattern. Surgical management of proximal tibial fracture is evolving from open reduction and internal fixation to arthroscopic assisted minimally invasive surgery. Currently such injuries are being managed by single medial or lateral/dual plating, fixator (hybrid, ring, JESS fixator) along with plate depending upon need of injury pattern and surgical expertise of surgeons. Locking plates are widely used now days [12] and techniques of fixation are continuously in process of evolution from LISS (less invasive stabilization system) to periarticular locking compression plate system (LCP). [13,14]

We studied the results of dual locking plate and buttress plating in management of proximal Tibial Schatzker V and VI tibial plateau fracture by using minimally invasive surgical technique.

Materials and Methods

The present study was conducted at department of Orthopaedics Jawahar Lal Nehru medical College & Hospital, Bhagalpur, Bihar, India for 10 months and total 50 patients with all Bicondylar Tibial plateau fractures (Schatzker type V, VI) admitted and treated with minimally invasive dual locking and buttress proximal Tibial plate having following mention inclusion and exclusion criteria were included in study.

Inclusion criteria

- Schatzker type V, VI proximal tibial fractures
- Open fractures up to Gustilo-Anderson Type II
- Age above 18 years & below 60 years

Exclusion criteria

- Fracture with ipsilateral neuro-vascular deficit
- Fracture with dislocation of knee joint
- Any previous pathology or fracture around knee joint
- Any past history of surgery around knee joint

Procedure: This study was approved by the Ethical Committee. Preoperative radiographs Anteroposterior view and Lateral view and computed tomography (CT) scans were used to diagnosed each bicondylar proximal Tibial fracture.

Open injury patients were underwent surgical debridement within 8 hours of injury after received tetanus prophylaxis Tet glob and intravenous antibiotics for prevention of infection. For open fractures, the wound was radically debrided and profusely lavaged with 3 to 6 litre of normal saline. The wound was closed either primarily or after 48 to 72 hours after a repeat irrigation with normal saline and debridement, depending on the level of contamination and amount of soft tissue damage. Intravenous Antibiotics (cefuroxime and metronidazole) were prescribed for the first 5 days. Clinical signs of soft tissue recovery included decreased swelling, healing of Fracture blisters, and wrinkling of the skin around the proximal tibia.(11,12) Decisions of fixation method, implant selection and timing were guided by the surgeon's experience.

All the patients in our study were managed by using minimally invasive dual anatomical pre contoured locking plate in sterile. Patient position was supine on a standard radiolucent orthopaedics operating table, after application of tourniquet, and put the small round bolster below the knee joint with four small incision two on lateral and two on medial side of proximal tibia. Elevation of depressed fragments of articular surface done by the punch and mallate under guidance of image intensifier after making of cortical window on the affected side and fixed it with subchondral k wires initially. Bone grafting at empty space below the depressed segment was done in 3 cases after taking graft from iliac crest. Medial anatomical pre-contoured locked plate was secured using locking screw.

Statistical methods:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements were presented on mean ± SD (Min– Max) and results on categorical measurements were presented in Number (%). Significance is assessed at 5% level of significance. Dependent variables were normally distributed, Samples drawn from the population were random, and Cases of the samples were independent. Chi-square/ Fisher Exact test was used for the significance of study parameters on a categorical scale between groups in, Non-parametric setting for Qualitative data analysis. Fisher exact test was used when cell samples were very small.

Results

Table 1: Patient details

Gender	No. of Patients
Male	40
Female	10
Side of Injury	
Left	12
Right	38
Left and Right	00
Type of Fracture	
Type V	43
Type VI	7

Age range of patients included was 18 years to 60 years, with mean age 38.45±15.16 years. 40 patients were male, while 10 were females. 12 patients had left side injury and 38 patients

had right side injury. 43 patients had type V fracture and rest of the patients had type VI fracture.

Table 2: Functional Outcome Evaluate by Knee Society Scoring System

Grading	Patient'sNumber	Percentage
Excellent	36	72
Good	10	20
Fair	4	8
Poor	0	0
Total	50	100

Out of 50 patients, 36 achieved excellent knee score (80-100), 20 achieved good (70-79), 4 achieved fair (60-69) and no patient had poor (<60) knee score. Mean range of knee flexion was 110 degrees.

Table 3: Complications

Complications	Affected number of Patients
Infection	05
Wound Dehiscance	00
Residual Deformity	00
Change to Work	00
Unable to Work	00
Significant Pain	00
Walking Difficulty	00
Stiffness in Knee Joint	00

Complications included 5 superficial infection which were treated by IV antibiotics and surgical wound management. Malreduction or malalignment was not measured on the first postoperative radiographs.

Discussion

The ideal treatment of high‐energy tibial plateau fractures remains controversial. Open reduction and rigid internal fixation achieves the goals of anatomic articular congruity and mechanical alignment restoration, while allowing early knee mobilization. [15-18] High‐energy tibial plateau fractures remain a challenge to the orthopedic surgeon. The use of open reduction and internal fixation techniques has historically been associated with wound complications, especially when a single midline incision or a Mercedes‐Benz incision is employed. This has led to the emergence of alternate methods of fixation such as Ilizarov ring fixation, external fixation with limited internal fixation, hybrid external fixation, etc., Achieving good reduction and stable fixation sparing knee joint is a challenging task in external fixation. [19] Rigid fixation with good articular reduction is an important goal of surgery to get good knee function. [20] Fractures of the tibial plateau have the potential to be devastating injuries especially when they have significant bony and soft tissue involvement along with knee instability and incongruity as in type V and VI injuries. [21] Management of intraarticular fractures has always been a matter of considerable ambiguity and confusion, with the proponents of conservative as well as surgical management claiming superiority over the other. Management of Tibial plateau fractures is no exception in this scenario.

In this study of 50 patients, mean age of the patients was 42.66 years with range of 23–64 years. There were 40 males (80%)

and 10 females (20%) showed there was a higher incidence in younger people and males. The higher incidence in males and Youngers indicated that they had more outdoor activities and also were more exposed to road traffic accidents. The majority of females, being housewives, were less exposed to high-energy trauma. Prasad et al [22] had conducted a study on the functional outcome of Schatzker V and VI fractures treated with dual plating. 40 patients were treated and followed up. The mean age of their study was found to be 40 years. There was a high incidence of males (33) than females (7). In the present study, 43 patients had type V fracture and rest of the patients had type VI fracture. There was no statistically significant difference in the number of patients between type V and VI fractures. In 2014 Dumbre Patil et al23 presented a series of 21 patients with posteromedial tibia condyle fragments (19 males, 2 females), there were 6 type IV, 10 type V and 5 type VI Schatzker fractures. Prasad GT et al, [21] in their study of 40 patients, had equal number of patients with type V and VI fractures (20 type V, 20 type VI). Thus, our study on type of fractures as per Schatzker classification matched with other series.

Out of 50 patients, 36 achieved excellent knee score (80-100), 20 achieved good (70-79), 4 achieved fair (60-69) and no patient had poor (<60) knee score. Mean range of knee flexion was 110 degrees. Prasad GT et al [22] in their study of 40 patients, reported mean range of flexion of about 1280 ranging from 1200–1350. Devadatta neogi et al. [24] reported a mean range of flexion of about 1240 ranging from 500- 1350 in 32 cases. Complications included 5 superficial infection which were treated by IV antibiotics and surgical wound management. Malreduction or malalignment was not measured on the first postoperative radiographs. The infection subsided completely after thorough debridement and IV antibiotic therapy according to culture and sensitivity. Low infection rate in our series may be attributed to gentle soft tissue handling, and perioperative antibiotic cover. We used third-generation cephalosporin (ceftriaxone + sulbactam 1.5gm) half hour prior to surgery and 3 days postoperatively. An Aminoglycoside antibiotic (Amikacin 500 mg) was also given for 3 postoperative days. Yong Zhang et al.21 in their study of 79 cases, reported a total of 9 infected cases with 6 being superficial and three being deep. Devadatta neogi et al. [24] reported four cases of superficial infections out of 32 cases. [25]

Conclusion

The double plate fixation with minimal invasive by the two small medial and two small lateral incision is the best effective and simple procedure to perform in surgical treatment of complex proximal Tibial fractures (Types V and VI of Schautzker classification) with lower risk for complication and good radiological and functional outcomes.

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