

TO EVALUATE THE FUNCTIONAL OUTCOME OF OSTEOSYNTHESIS IN POSTEROMEDIAL SPLIT FRACTURE OF PROXIMAL TIBIA - SCHATZKER TYPE V FRACTURES WITH COMPROMISED SOFT TISSUE

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Received : 25/08/2024
Received in revised form : 15/10/2024
Accepted : 30/10/2024

Keywords:

ProximalTibia Fracture, steosynthesis, compromised soft tissue.

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DOI: 10.47009/jamp.2024.6.5.154

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm

2024; 6 (5); 807-812

Abstract

Background: The fracture of the posteromedial column of the tibial plateau is one of the most challenging types of the tibial plateau fractures. Despite a plethora of articles, written in the past 50 years that have addressed the problems of classification and results of various treatments, the optimal method of management remains controversial. We have not found any literature for posteromedial column fracture fixation with plate and screws and cannulated cancellous screw fixation for lateral column fracture in Schatzker type V fractures with compromised soft tissue over lateral aspect of leg. So, the present study was designed to evaluate the functional outcome of osteosynthesis in posteromedial split fracture of proximal tibia Schatzker type V with compromised soft tissue over the lateral aspect of proximal leg. **Materials and Methods:** A total of 24 patients were included in the present study. Posteromedial approach was used to fix the posteromedial fracture of proximal tibial plateau. Posteromedial column was fixed first to create a stable strut followed by lateral column fixation. Follow up of patients was done at 2 weeks, 6 weeks, 3 months and 6 months. At 6 months, modified Rasmussen clinical scoring and HSS (Hospital for special surgery) scoring was used to assess the functional outcome. **Result:** There were 24 closed proximal tibial Schatzker type V fractures with compromised skin condition on lateral aspect of proximal leg. Fracture union was achieved in 20 (83.3%) cases with a period from 12 weeks to 18 weeks. 19 (79.2%) patients have good to excellent functional outcome based on modified Rasmussen functional score and HSS score. All the patients achieved more than 95° of knee flexion. No cases of nonunion/delayed union were found. The posteromedial supine approach is effective and reproducible for reducing and stabilizing posteromedial tibial plateau shear fractures. With damaged soft tissue after the high energy trauma causing proximal tibia fractures, conventional open reduction and internal fixation have often resulted in significant soft tissue complications. 19 (79.2%) patients had good to excellent functional outcome based on modified Rasmussen functional score and HSS score and these results were attributed to minimal soft tissue damage done on lateral side of proximal leg and fixation of bicondylar tibial plateau fractures. Post-operative knee stiffness was observed in 7 (29.2%) patients which might be due to prolonged immobilization and in whom where surgery was done more than 13 days after injury. **Conclusion:** Osteosynthesis in posteromedial split fracture of proximal tibia - Schatzker type V fractures with compromised soft tissue over lateral aspect of proximal leg with Buttress T plate and cancellous screws fixation for lateral proximal tibial fractures is a good option. It will definitely give good functional outcome.



INTRODUCTION

The fracture of the posteromedial column of the tibial plateau is one of the most challenging types of the tibial plateau fractures.^[1] Attention to these types of fractures markedly increased with the advances achieved in computed tomography (CT) technology.^[2] Road traffic accidents, fall from height and sports injury are common causes of tibial plateau fractures. Mechanism of injury is the axial loading with varus/valgus stress. Proximal tibial fractures account for approximately 1% of all fractures.^[3] Most proximal tibial fractures occur in men. Most proximal tibia fractures occur between 40 to 60 years in both genders.^[4] Most injuries affect lateral tibial condyle (55 to 70%) and isolated medial condyle fractures occur in 10 to 23% whereas the involvement of bicondylar lesions is found in 10 to 30% of the reported series.^[5] Despite a plethora of articles, written in the past 50 years that have addressed the problems of classification and results of various treatments, the optimal method of management remains controversial.^[6] Each type of tibial plateau fracture has its own characteristic morphology and the mode of treatment differs.^[7] It is highly recommended to know about the mode of injury causing fractures with the careful assessment of neurovascular injuries and soft tissue trauma before taking the patient for surgery. Management strategies of proximal one fourth leg bone fractures are traction and cast immobilization, external fixation, open reduction and internal fixation with single or dual plating, staged management initially by external fixator and later on definitive internal fixation, minimal invasive technique e.g. cannulated cancellous screw, hybrid external fixation with arthroscopic assisted minimally invasive internal fixation and primary knee arthroplasty. Aim of any surgery should be the high union rates, no infection and good functional outcome. We have not found any literature for posteromedial column fracture fixation with plate and screws and cannulated cancellous screw fixation for lateral column fracture in Schatzker type V fractures with compromised soft tissue over lateral aspect of leg. The purpose of the study was to evaluate the functional outcome of osteosynthesis in posteromedial split fracture of proximal tibia Schatzker type V with compromised soft tissue over the lateral aspect of proximal leg.

MATERIALS AND METHODS

This prospective intervention study was done in Kalpana Chawla Government Medical College, Karnal from May 2020 to April 2024 after approval from Institutional Ethics Committee. Proximal tibia Schatzker type V fractures with compromised skin over lateral aspect of proximal leg treated with posteromedial approach with Buttress T plate and screw fixation for posteromedial tibial condyle

fracture with cannulated cancellous screw fixation for lateral tibia condyle fracture.

Inclusion Criteria

Skeletally mature patients from 18 to 60 years with compromised skin condition on lateral aspect of proximal leg (blister, bruise, severe subcutaneous hemorrhage) and Schatzker type V fractures with posteromedial displacement of medial tibia condyle were included in the study.

Exclusion Criteria

Patients with closed proximal tibia fracture with good skin condition, Polytrauma patients, associated neurovascular injuries and open fractures of proximal tibia were excluded from the study.

Procedure: Before operating on the patients, informed written consent was taken from all patients. Preoperative radiographs and Computed tomography (CT) were taken for all cases. Patients were taken for surgery after clinical examination with relevant blood investigations. The patient was positioned supine on a radiolucent table. CT image of the fracture was shown in [Figure 1].



Figure 1

Posteromedial approach was used to fix the posteromedial fracture of proximal tibial plateau [Figure 2].



Figure 2: Posteromedial supine approach

The landmarks for the incisions were at medial femoral epicondyle proximally, the joint line, and the posterior tibial border at level of the metaphyseal-diaphyseal junction distally. After skin incision, subcutaneous tissue was incised, then the fascia was incised between the medial gastrocnemius and pes anserinus. The pes tendons were mobilized posteriorly and proximally, keeping their insertion intact. Fracture was now exposed and fixed with buttress T-plate and screws [Figure 3].



Figure 3: Post-operative image of fracture fixation

Then the lateral tibial plateau was fixed with cannulated cancellous screws with washers by stab incision. Then the interval between the gastrocnemius and the pretibial fascia was closed using absorbable sutures and the wound was closed over a suction drain. Posteromedial column was fixed first to create a stable strut followed by lateral column fixation. Follow up of patients was done at 2 weeks, 6 weeks, 3 months and 6 months. At 2 weeks surgical scar was inspected and suture removal was done. At 6 weeks, X-ray was taken to look for signs of fracture union and to see for reduction loss, if any. At 3 months, again X-ray was done and also clinically, assessment was done for fracture union. At 6 months,

modified Rasmussen clinical scoring and HSS (Hospital for special surgery) scoring was used to assess the functional outcome. In modified Rasmussen score – pain, walking capacity, knee extension, total range of motion, stability and power of quadriceps was taken into consideration. Maximum scoring was 30. Score between 28-30, 24-27, 20-23 and < 20 was considered excellent, good, fair and poor respectively. In HSS score – pain, function, range of motion, muscle strength, flexion deformity, instability and subtraction were considered to assess the functional outcome. Score \geq 85, 70-84, 60-69, \leq 60 was considered excellent, good, fair and poor respectively.

RESULTS

This was a prospective clinical intervention study consisting of 24 patients who underwent posteromedial buttress T-plate and screws fixation for posteromedial tibial condyle fracture and cannulated cancellous screw fixation for lateral tibia condyle fracture. Their demographic data and baseline information was given in [Table 1].

There were 24 closed proximal tibial Schatzker type V fractures with compromised skin condition on lateral aspect of proximal leg. [Table 2].

The mean age of the patients reported with tibial plateau fractures was 42.17 ± 10.8 years. Males 17 (70.8%) were more affected than females 7 (29.2%). Road traffic accidents was the most common mode of injury seen in 18 (75%) patients. Time elapsed between the injury and surgery was less than 5 days in 14 (58.3%) patients, between 6 to 8 days in 1 (4.2%) patient, between 9-12 days in 2 (8.3%) patients, between 13-15 days in 3 (12.5%) patients and more than 15 days in 4 (16.7%) patients [Table 3].

Fracture union was achieved in 20 (83.3%) cases with a period from 12 weeks to 18 weeks [Table 4].

In only 4 (16.7%) patients, union was observed in more than 18 weeks. 19 (79.2%) patients have good to excellent functional outcome based on modified Rasmussen functional score and HSS score. Fair functional outcome was observed in 5 (20.8%) patients as assessed by modified Rasmussen functional score and HSS score [Table 5].

Post-operative knee stiffness was observed in 7 (29.2%) patients [Table 6].

All the patients achieved more than 95° of knee flexion [Table 7].

Post-operative images of knee flexion and extension during follow-up was shown in [Figure 4].



Figure 4: Range of motion of Knee joint in flexion and extension during follow-up

Extension lag up to 15° was present in 2 (8.3%) patients. Only 2 (8.3%) patients developed post-operative wound infection and one (4.2%) patient need wound debridement and later split skin grafting when the wound was healed. One (4.2%) patient had varus deformity. No cases of nonunion/delayed union were found.

Table 1: Demographic data.

Demographic data	Number (N) and percentage (%)
Age (years)- (Mean±SD) – 42.17±10.8	
Gender	
Male	17 (70.8%)
Female	7 (29.2%)
Limb involved	
Right	19 (79.17%)
left	5 (20.83%)
Mode of injury	
Road traffic accident	18 (75.0%)
Fall from height	3 (12.5%)
Others	3 (12.5%)

Table 2: Closed proximal tibia plateau - classification

Type of Closed Proximal tibia fracture – Tscherne’s classification	No. of patients N(%)	Total patients N(%)
0	0	24 (100.0%)
1	7 (29.2%)	
2	17 (70.8%)	
3	0	

Table 3: interval in days between injury and surgery done.

Time between injury and surgery (days)	Number of patients N(%)
< 5 days	14 (58.3%)
6-8	1 (4.2%)
9-12	2 (8.3%)
13-15	3 (12.5%)
> 15 days	4 (16.7%)

Table 4: Union times in weeks.

Union time (weeks)	Number of patients N(%)	Total patients N(%)
12-14	5 (20.8%)	24 (100.0%)
15-18	15 (62.5%)	
>18	4 (16.7%)	

Table 5: Modified Rasmussen score and HSS Score

Functional Assessment	Excellent N (%)	Good N (%)	Fair N (%)	Poor N (%)
Modified Rasmussen score	10 (41.7%)	9 (37.5%)	5 (20.8%)	0
HSS score	9 (37.5%)	10 (41.7%)	5 (20.8%)	0

Table 6: Complications

Complications	Number of cases – N	Percentage
Knee stiffness	7	(29.2%)
Infection	2	(8.3%)
Deformity (varus)	1	(4.2%)
None	14	(58.3%)
Total	24	(100.0%)

Table 7: Range of knee flexion

Knee ROM (degrees)	N	Minimum (degrees)	Maximum (degrees)	Mean	Std. Deviation
	24	95	115	99.58	5.882

DISCUSSION

The incidence of Posteromedial split fracture of proximal tibia with fracture of lateral tibial plateau is relatively uncommon. Schatzker and the AO classifications failed to describe the posteromedial split fracture of proximal tibia because they do not differentiate when the fracture of the medial condyle is mainly posterior. The posteromedial supine approach is effective and reproducible for reducing and stabilizing posteromedial tibial plateau shear fractures.^[8] The Posteromedial approach allows fixation of the posteromedial fragment with a posterior antiglide buttressing plate respecting the fracture biomechanics without exposure of the neurovascular bundle.^[9]

The analysis of results was made in terms of – age of patient, gender distribution, mode of injury, side of limb involved, union time, functional assessment and complications. With damaged soft tissue after the high energy trauma causing proximal tibia fractures, conventional open reduction and internal fixation have often resulted in significant soft tissue complications, such as wound breakdown and deep infection.^[10,11] The small wire external fixator is an also good option for these injuries, but the problems of nonunion and pin track infections are common.^[12,13] Fixation of bicondylar tibial plateau fractures can be done with locking screws placed through the lateral tibial plate alone or stabilized with a medial plate as part of dual plating procedure.^[15-16] Double plating is done through two separate incisions which can lead to more soft tissue dissection and can be cause of delayed union or nonunion of proximal tibial fractures. Further dual plating was not feasible in present study because of poor soft tissue condition in our cases. Gostling T et al, in study of AO/ASIF C-type tibial plateau fractures, reported that unilateral plating with locking head screws is a reasonable option for treatment of bicondylar tibial plateau fractures.^[14] In study done by Rosario Spangnolo et al, lateral locked screw plating for management of these fractures reported a good clinical results.^[17] The degree of resulting comminution, soft tissue injury, displacement and the mechanism of injury determines their outcome, treatment and prognosis.^[18,19] The posteromedial approach was used principally for soft tissue preservation in a case of severe bicondylar fracture.^[20] Study done by Weil

YA et al showed no correlation between articular reduction or alignment and clinical outcome.^[8] In the study conducted by Lee et al, he included fifteen patients with bicondylar plateau fracture treated by open reduction and fixation with unilateral locked plate. Five patients (33.3%) were classified excellent while the remaining 10 (66.7%) were classified as good. Mal-reduction occurred in one patient (6.7%) because of inadequate reduction of the posteromedial fragment. Fixation loss was observed in three patients when partial weightbearing commenced. Fixation loss was mainly due to subsidence of the posteromedial fragment.^[21] In present series, we found low wound and soft tissue complications rates despite the high velocity trauma in many of these fractures. In present study the mean age of the patients reported with tibial plateau fractures was 42.17±10.8 years and it was almost similar to the other studies which had quoted 30-40 years was the commonest age group affected in proximal tibia fractures.^[22,23] Similarly, as reported in previous literature,^[24] males 17 (70.8%) were more affected than females 7 (29.2%) and road traffic accidents was the most common mode of injury seen in 18 (75%) patients in the present study. Study done by Wu Dankai et al showed that articular step-offs did not seem to impact the radio-clinical results in the short-term. The ROM and HSS score results in their study were highly satisfactory and all employed patients were able to return to their previous job.^[25] In the present study, 19 (79.2%) patients had good to excellent functional outcome based on modified Rasmussen functional score and HSS score and these results were attributed to minimal soft tissue damage done on lateral side of proximal leg and fixation of bicondylar tibial plateau fractures. Only 2 (8.3%) patients developed post-operative wound infection and were treated aggressively with antibiotics based on culture and sensitivity report and the infection resolved with antibiotics in one patient and one patient need wound debridement and later split skin grafting when the wound was healed. In present study, post-operative knee stiffness was observed in 7 (29.2%) patients which might be due to prolonged immobilization and in whom where surgery was done more than 13 days after injury. In present study, we have found no cases of nonunion/delayed union which might be due to minimal damage to soft tissue and preservation of blood supply during surgery.

Limitation of study: small sample size was the limitation of study. There was no comparative group and hence it was difficult to tell whether the surgical strategy was the better treatment or not.

CONCLUSION

Osteosynthesis in posteromedial split fracture of proximal tibia - Schatzker type V fractures with compromised soft tissue over lateral aspect of proximal leg with Buttress T plate and cancellous screws fixation for lateral proximal tibial fractures is a good option. It will definitely give good functional outcome.

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