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Predictors of functional outcome of surgical management in proximal tibia fractures

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Abstract

Background: Tibia plateau fractures constitute about 1% of all fractures and complex bicondylar fractures constitute 30% of all Tibial plateau fractures. These fractures pose an inherent difficulty in treatment due to the extent of soft tissue damage, fracture comminution, instability, displacement of articular fragments and increased risk of compartment syndrome. Present study was carried to find out functional outcome in different fracture management technique.

Material and methods: A total 25 cases of tibial plateau fracture treated with different implants from April 2019 to September 2019 in Santokba Durlabhji Memorial Hospital were followed for minimum of 6months. Patients less than 18 years and more than 60 years of age, Compound trauma and fractures due to pathological conditions were excluded. Functional outcome was measured using Rasmussen's grading system at 6month follow up.

Results: Maximum study subjects (36%) were in age group of 31-40yrs, 80% had road traffic accidents as a mode of injury. 32% were of type V Schatzker fracture classification. 48% subjects were operated by ORIF with LCP Plating, 24% subjects were operated by LCP Plating plus CC screw, 20% were operated by bicondylar plating, 8% were operated by CC screw. Most of the subjects with plates had either excellent or good outcome.

Conclusion: ORIF with plating gives excellent to good functional outcome with minimal soft tissue complications.

Keywords: Predictors of functional surgical management proximal tibia plateau fractures

Introduction

There are different types of proximal tibia fractures which include articular depression, condylar displacement, metaphyseal fracture extension. Tibial plateau fractures constitute about 1% of all fractures and complex bicondylar fractures constitute 30% of all Tibial plateau fractures ^[1].

The fracture patterns are very complex and may involve medial, lateral or both the tibial plateaus. All fractures have different morphology and require individualized treatment. Knowledge about type of trauma, either high energy or low energy, meniscal tears and ligament injuries helps in determining the further mode of management ^[1].

The complex Tibial plateau fractures resulting from direct forces due to high-velocity injuries are classically described as "explosion or shattered" fractures. These fractures pose an inherent difficulty in treatment due to the extent of soft tissue damage, fracture comminution, instability, displacement of articular fragments and increased risk of compartment syndrome. Forclosed management of these complex fractures with cast bracing and traction generally has been ineffective in reducing and maintaining the congruency of the articular surface and axial alignment leading to mal-union and secondary degenerative arthritis ^[2].

Various modes of treatment are available for treatment of tibial fractures which include definitive external fixation, dual plating, but the best treatment method still remains controversial ^[1]. Different surgical approaches and various modes of fracture fixation have been developed to treat these fractures. These techniques of open reduction and internal fixation of individual tibial plateau helps maintain anatomic articular congruity and restoration of mechanical alignment and allows early mobilization of knee joint. Sometimes, these techniques of open reduction and internal fixation, especially done through injured soft tissues

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have been associated major wound complications [1].

Although many treatment pushed back into history and some has come with improvement and some newly developing approaches, never implants and plates, there are some pros and cons of each one over other and no standard treatment yet to decided so present study was carried out to find out functional outcome in different fracture management technique.

Material and methods

A prospective observational study was carried out for duration of April 2019 to September 2019 among subjects with proximal tibial fracture at Santokba Durlabhji Memorial Hospital which is well known for treatment of complex tibial fracture. Patients less than 18 years and more than 60 years of age, Compound trauma and fractures due to pathological conditions were excluded. Fractures were classified according to Schatzker fracture classification to decide treatment plan. After stabilizing patient in casualty, detailed history was taken and complete general and local examination of patient was carried out. Patients having shock were treated in Intensive care unit with prompt resuscitative measures. After stabilizing general condition of patient, X-rays were taken [AP, oblique, lateral and stress views if ligament injury was suspected]. According to the type of fracture, amount of displacement and depression treatment plan was decided.

All surgeries were performed under C-arm intensifier. Fractures fixation was done with close reduction with percutaneous screw fixation or MIPPO fixation or by open reduction and internal fixation. Indication for Single column and dual column fixation was decided according on the fracture pattern. The implants used for fixation were locking 3.5mm, 4.5mm T plate & 4.5mm L plate, 4.5mm locking hockey plate, 3.5 mm RAFT plate 4.5 mm cortical screws and 6.5 mm cannulated and non-cannulated cancellous screws.

Postoperative immobilization was done with an above knee slab. The suture removal was done on 14th postoperative day. Intravenous antibiotics were given till 3rd postoperative day, after that oral antibiotics were given for further 7 days. Postoperative X-ray immediately after surgery was taken.

Follow up

The first follow up after 2 weeks of suture removal was done, during this visit surgical scar and knee range of motion was started. During second follow up after 6 weeks check X-ray was advised to see signs of fracture union or displacement if present.

At the third follow up after 3 months check X-ray was advised to see status of bone union. Patients were advised partial weight bearing and than full weight bearing According to clinical and radiological signs of union. After that patients were advised for followed up at 6 months, on these visits anatomical and functional evaluation was done by using the Rasmussen scoring system.

Results

A total of 25 subjects with proximal Tibia fracture were included in study with age range of 20-58yrs and mean age of 42.12±11 yrs. Maximum study subjects (36%) were in age group of 31-40yrs and M:F was 5.2:1. Among study subjects 80% had road traffic accidents as a mode of injury. 32% were of type V Schatzker fracture classification. Associated injury was found among 5 subjects. Maximum (48%) were operated using LCP plates; 24% were operated using LCP plates plus screw 8% were operated with CC screw. only 2 (8%) subjects had infection as early complication and 4 (16%) had stiffness as late complication. Maximum 13 (52%) had good, 8(32%) had excellent, 2(8%) each had fair and poor functional outcome during follow up. Most of the 23 (92%) subjects had fracture union. Most of the subjects in different age group i.e. 20-30yrs, 31-40yrs, 41-50yrs and 51-60yrs had either excellent or good outcome. Among young subjects (20-30yrs) 25% and among elderly subjects (51-60yrs) 16.7% had poor functional outcome.

Table 1: Baseline study characteristics

Study variables	Frequency	Percent
Age group		
20-30yrs	4	16
31-40yrs	9	36
41-50yrs	6	24
51-60yrs	6	24
Gender		
Female	4	16
Male	21	84
Fracture type		
I	2	8.0
II	4	16.0
III	5	20.0
IV	3	12.0
V	8	32.0
VI	3	12.0
Surgery performed		
ORIF with LCP Plating	12	48.0
ORIF with LCP plus CC Screw	6	24.0
ORIF with bicondylar Plating	5	20.0
CC Screw	2	8.00
Implant		
Plates	17	68
LCP Plates plus Screw	6	24
CC Screw	2	8

Table 2: Functional outcome among study group

Functional outcome	Frequency	Percent
Excellent	8	32
Good	13	52
Fair	2	8
Poor	2	8
Total	25	100

Table 3: Relation between type of fracture and functional outcome

Type of fracture	Functional outcome				Total
	Excellent	Good	Fair	Poor	
I	2(100%)	0	0	0	2
II	3(75%)	1(25%)	0	0	4
III	2(40.0%)	3(60.0%)	0	0	5
IV	0	3(100%)	0	0	3
V	0	6(75%)	1(12.5%)	1(12.5%)	8
VI	1(33.3%)	0	1(33.3%)	1(33.3%)	3
Total	8(32.0%)	13(52.0%)	2(8.0%)	2(8.0%)	25



Fig 1: Instrument Set comprising various plates



Fig 2: Position of patient with bolster



Fig 3: Careful soft tissue dissection

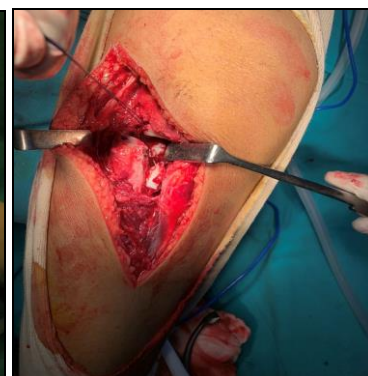


Fig 4: Meniscus tagged and raised before fixing plate



Fig 5: Lateral completion plate being fixed after reduction



Fig 6: IITV views taken during intraop



Fig 7: Pre-OP and Post OP X-rays of fracture with bicondylar plate fixation



Fig 8: Clinical photographs of patient after 6 months

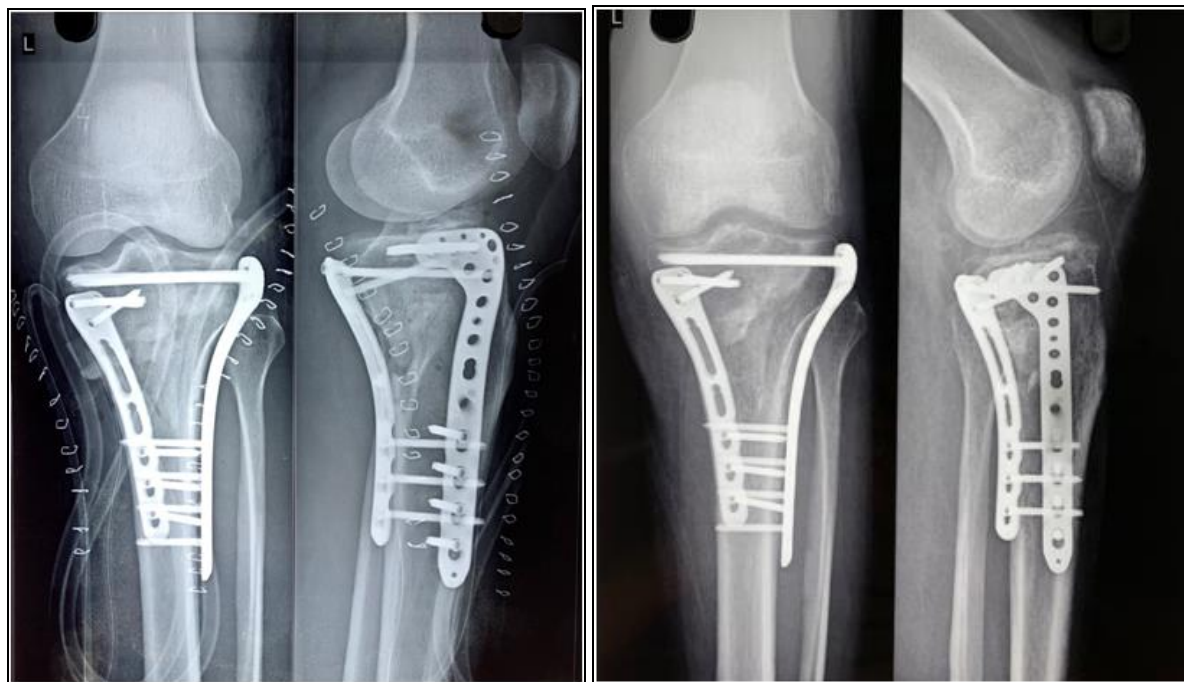


Fig 9: Immediate post op x-ray

Fig 10: Follow up X-ray after 6 months

Discussion

Proximal tibial plateau involvement is one of the most common intra-articular fractures. They occur as a result of either indirect trauma causing coronal fracture pattern or direct trauma causing axial compressive patterns. This comprises of 1% of all fractures [1]. The fracture patterns are very complex and may involve medial, lateral or both the tibial plateaus. All fractures have different morphology and require individualized treatment. Knowledge about type of trauma, either high energy or low energy, meniscal tears and ligament injuries helps in determining the further mode of management [1].

In our study, maximum subjects (36%) were in age group of 31-40 years, mean age of 42.12±11 years and most commonly due to RTA. Aseri MK *et al.* [3] had similar findings, that maximum incidence of proximal tibial fracture in the productive age populace i.e., 31-40 years (36.67%) with mean age 39.03 years and RTA as the most common cause. Seppo [4] also showed age incidence of 20-60 years with an average of 39.8 years, Neil Rohra *et al.* [5] found that the tibial plateau fractures were most commonly due to RTA and between the age group 24 to 65 years (mean age 46.20 years), similar with our study.

Our study had 84% male and 16% female participants and M: F 5.2:1. Neil Rohra *et al.* [4] found out of 34 patients, 29(85.29%) were males and 5 (14.71%) were females. Aseri MK *et al.* [3] found majority of the patients were male (83.33%).

In our study 32% were of type V fracture, 12% each were type VI & type IV and 52% had left sided fractures. Neil Rohra *et al.* [4] found that Type V were 13 (38.24%) and type VI were 21 (61.76%) and there was a slight right sided predominance (55.88%), compared to left side (44.12%). Aseri MK *et al.* [3] found that most of the patients were of type V (9 cases) and type VI (7cases) Schatzker's classification (53.33%).

In spite of associated injuries and complications, we found that 52% had good, 32% had excellent, 8% each had fair and poor functional outcome among study group during follow up. Study by Aseri MK *et al.* [3] had 30% excellent result, 60% good result (overall 90% acceptable result), 10% fair result in terms of functional outcome. Neil Rohra *et al.* [4] found that 24 patients (70.59%) had excellent, 8 patients (23.53%) had good and 1 patient (2.94%) each of poor and fair functional Knee Society Score.

In present study 32% subjects were operated by ORIF with LCP plating, 24% subjects were operated by LCP Plating plus CC screw and 20% were operated by bicondylar plating. Yu *et al.*, Prasad *et al.*, Zhang *et al.*, Oh *et al.*, Barei *et al.*, and Barei *et al.*, all did different studies and concluded that double plate fixation technique in high-energy Schatzker V and VI tibial plateau fractures via a 2-incision technique is a feasible treatment option for bicondylar and complex tibial plateau fractures and this is matching our findings [5, 6, 7, 8, 9, 10]

Infection was commonest early complication encountered in 2(8%) subjects and type VI fracture. However, Infection was

superficial & responded to antibiotics treatment. None of them had developed deep infection. Among late complications 4(16%) had developed stiffness which was found 1 in type V and 3 in type VI fracture type. Non union was found in 2(8%) subjects with type VI fracture. Study by Nabil A *et al.* ^[11] found that infection rate was among 4.3% and non union was among 1.7% subjects.

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