

Functional and radiological outcome of surgically treated tibial plateau fractures

Singh V, Patidar A, Bhinde S, Agrawal A, Jain P, Jain A, Chouhan R, Kothari N

Study performed at Department of Orthopaedics, R. D. Gardi Medical College & C. R. G. Hospital & Associated Charitable Hospital, Ujjain (M.P.)

Abstract

The present study included 30 patients (17 males; 13 females, mean age 40.33 ± 12.7 years; range, 18 to 65 years) with tibial plateau fractures who were treated with various modalities. In our series, all patients were treated operatively out of which 15 (50.0%) were managed by ORIF with lateral plate, 8 (26.7%) patients were managed by CRIF with CC screw, 4 (13.3%) ORIF with lateral plate with CC screw, 2 (6.7%) ORIF with medial plate and 1 (3.3%) CRIF with CC screw. In all patients, similar standard physical rehabilitation therapy was followed. All complications including intra and post-operative were assessed and recorded. The functional outcome was assessed using Harkonen-Jarvinen criteria after a mean follow-up of 8 months. The statistical analysis was done using the paired t-test. All patients showed excellent or good results according to H J criteria. In the present study, there were no cases of secondary loss of reduction, failure of the implant, malunion, or non-union.

Keywords: H J criteria; Functional and radiological outcome; tibial plateau fracture.

Address of correspondence

Dr Vivek Singh, Professor, Department of Orthopaedics, R. D. Gardi Medical College, Ujjain, (M.P), India

Email- drviveksingh29@rediffmail.com

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Introduction

Tibial plateau fractures occur when proximal tibia experiences an excessive axial load. The mechanism of injury and the energy required to cause these fractures are age dependent. Younger patients tend to sustain these fractures secondary to high energy trauma such as fall from height and motor vehicle accidents, while older patients sustain tibial plateau fractures secondary to low energy trauma such as low-level fall or stumble. The management of these types of injuries has for long been subject of controversies. The spectrum of treatment ranges from simple casting and bracing to skeletal traction and early motion to open reduction and internal fixation.^{1,2} Moreover, the appropriate treatment for injuries of different severities is unclear. A brief review of literature reveals that different avenues are being explored for these fractures. Ali, et al reported a 31% fixation failure for

tibial plateau fracture in their elderly population.³ Stevens et al noted that only 57% of cases showed good functional outcome after surgical management of tibial plateau fractures in less than 40 years age.⁴

Open reduction and internal fixation has a significant complication rate.^{5,6} So a middle path of minimally invasive technique of closed reduction by ligamentotaxis and stabilizing the fracture by limited internal fixation was developed and practised to overcome the drawbacks of non-operative and operative modalities.⁷⁻⁹ These techniques utilize percutaneous screws and Kirschner wires (K wires), external fixation frames or combination of external fixation with limited internal fixation.⁷⁻¹⁰ The minimally invasive technique of closed reduction by ligamentotaxis and fixation with percutaneous screws and K wires, combines attributes to both operative and non-operative philosophies.

Therefore, there are various modalities for surgical management of tibial plateau fractures ranging from percutaneous screw fixation to plating (unicondylar to bicondylar), MIPO technique of fixation to external fixator application. Various studies have shown efficacy of these methods of fixation with satisfactory results but no general consensus exists as to which modality is best in terms of results and functional outcome and proving superiority of one over the other. With this aim in mind, this study was conducted to determine the efficacy of different practiced methods of fixation of proximal tibial plateau fractures and if one method was superior to other.

Material and method

This is a prospective study done to assess the functional and radiological outcome of proximal tibial fractures treated by surgical method of treatment in 30 patients over the period of 2 ½ years from August 2020 to December 2022 at Department of Orthopaedics, CR Gardi Hospital at Ruxmaniben Deepchand Gardi Medical College and Hospital, Ujjain(M.P.).

After obtaining clearance and approval from the institutional ethical committee and patients fulfilling the inclusion / exclusion criteria were included in the study after obtaining informed consent.

Inclusion criteria was patients willing for surgical method of treatment, age of patient greater than 18 years, medically and surgically fit patients, patients who were ambulatory before injury, radiologically diagnosed tibial plateau fractures and patients consenting to participate in study.

Exclusion criteria was skeletally immature patients having age < 18 years, patients who are medically and surgically unfit or with life threatening illness or having neurovascular injury, patients treated with non-surgical modality of treatment and patients not consenting to participate in study.

30 cases of tibial plateau fractures were treated with various surgical modalities and were followed up for a period of 2 and half years and their functional outcome was evaluated using H-J criteria.



Figure 1 : Preoperative x-ray of 50 year old Male, Schatzker type – 4 operated with lateral condyle locking plate



Figure 2 : Immediate post operative x-ray



Figure 3: X-ray at 6 Month follow up



a. Cross legged sitting b. Flexion



c. Extension

Figure 4-Six months follow up showing good range of movements

Results

A total 30 number of cases were included in this study. Majority of patients were male 17 (56.7%) mostly because the most common mode of injury was road traffic accident (80%) and males are more involved in outdoor activities. Twenty-two patients were operated within less than 5 days of injury and showed excellent to good results.

Table 1: Age, gender, mode of injury, side of injury and surgery interval distribution

		N	%
Age groups	< = 30 years	9	30.0%
	31 - 40 years	7	23.3%
	41 - 50 years	6	20.0%
	> 50 years	8	26.7%
Sex	Female	13	43.3%
	Male	17	56.7%
Mode of injury	Fall from height	6	20.0%
	RTA	24	80.0%
Side injured	Left	11	36.7%
	Right	19	63.3%
Injury to surgery interval (in days)	<= 5 days	22	73.3%
	> 5 days	8	26.7%

Table:2 Schatzker type, procedure, follow up, surgery duration and outcome of the cases

		N	%
Schatzker type	1	8	26.7
	2	15	50.0
	3	4	13.3
	4	2	6.7
	5	1	3.3
Procedure	CRIF with CC screw	8	26.7
	ORIF with bicondylar plate	1	3.3
	ORIF with lateral plate	15	50.0
	ORIF with lateral plate with CC screw	4	13.3
	ORIF with medial plate	2	6.7
Surgery duration (in min)	<= 45 min.	16	53.3%
	>45 min	14	46.7%
Follow up time (in month)	<= 6 months	17	56.7%
	> 6 months	13	43.3%
Functional Outcome (H-J Criteria)	Poor	1	3.3%
	Average	5	16.7%
	Good	8	26.7%
	Excellent	16	53.3%

The distribution of patients according to Schatzker classification and their outcome of treatment are summarized. In our series all patients were treated operatively, out of which 22 (73.3%) were managed by CRIF with cannulated cancellous screws, 8 (24.7%) patients were managed by ORIF with various modalities. 16 (53.3%) cases were operated in less than 45 min. and 14 (46.7%) in more than 45 min. 17 (56.7%) followed less than 6 months and 13 (43.3%) more than 6 months. By H-J criteria in 16 (53.3%) cases excellent result, 8 (26.7%) good, 5 (16.7%) fair and 1 (3.3%) poor were found.

Discussion

Tibial plateau fractures, one of the commonest intra articular fractures, are major traumatic injury occurring due to road traffic accidents, fall from height, violence etc. It is sometimes associated with other bony or soft tissue injuries. Any fracture around the joint (especially weight bearing joint in the lower limb) is of paramount importance as it would result in significant morbidity and quality of life. Hence, the treatment of upper tibial fractures with intra articular extension has become a challenge for orthopaedic surgeons. Keeping this aim at high, we presented the clinical study of surgical treatment of 30 closed tibial plateau fractures. The analysis of the results was made in terms of age, sex distribution, mode of violence, analysis of the type, modalities of treatment, complications and the functional outcome. We have endeavoured to present the various types of tibial plateau fractures in our Indian setup. It is found that the zeal of modernization, mechanization and industrial development made more automobile accidents due to increase in population and automobiles. The majority of fractures occur between 20 to 50 years of age with maximum incidence involving productive age group of 30 to 50 years (43%). The mean age in this study was 40.33 years. In a similar study done by Rasmussen et al the average age of patients was 45 years.¹¹ In our series the majority of patients were male (56.7%). This can be attributed to our Indian set up where the female population largely remains indoors and is less prone to automobile accidents. In this study the commonest mode of injury was road traffic accident (80%) and next being fall. This

correlates well with previous study by Chiaux et al who in their series reported that 71% of the injuries occurred due to RTA. (12) There was a significant preponderance to the right side in laterality of the fracture (63.3%). In this series we studied 30 cases of simple tibial plateau fractures treated only by surgical method. Different authors use different criteria for surgical management of these fractures. Seppo E Honkoinen in his series of 130 tibial plateau fractures, conducted surgery taking into consideration condylar widening of >5 mm and lateral condyle step off >3 mm.(13) The indication for surgery in these types of injuries has evolved steadily with time. Burri, et al in his study in 1979 advised internal fixation at 1 mm of depression, Hohl et al and Segal et al advocated fixation at 5 mm of depression and Honkonen et al took 3 mm of depression in consideration in his study in 1993.¹³⁻¹⁶ In our series 8 patients were classified as Schatzker's type I, 15 patients were classified type II, 4 patients were classified type III, 2 patients were type IV and 1 patient was classified as Schatzker's type V fractures. Functional outcome by H-J criteria excellent results in 16 (53.3%) cases, good in 8 (26.7%), fair in 5 (16.7%) and poor in 1 (3.3%) case. These results are at par with other documented studies. Ebraheim et al in his series of 117 tibial plateau fractures had excellent results in 68% of cases, good in 13%, fair in 11% and poor in 8% of the patients.¹⁷

Conclusion

The surgical management of tibial plateau fractures is an orthopaedic challenge and needs a comprehensive understanding of fracture, soft tissue, time interval from injury to surgery and post-operative rehabilitation. Modalities like LCP in MIPPO and bone grafting can give excellent results in desirable patients but requires an optimum learning curve. The functional outcome is inversely proportional to the severity of the fracture. Bicondylar fractures, compound fractures, advanced age are less likely to have favourable results as compared to unicondylar fractures, closed fractures and younger age group patients. Infection rates are minimal in MIPPO as there is minimal soft tissue injury and preservation of vascularity and fracture hematoma. Malunion is one of the complications and therefore careful

attention has to be given to overcome this by achieving anatomical reduction and stable implant fixation.

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