



## A STUDY OF FUNCTIONAL OUTCOME IN 40 CASES OF TIBIAL PLATEAU FRACTURES TREATED BY OPEN REDUCTION AND INTERNAL FIXATION.

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**ABSTRACT** **Background:** Proximal tibia fractures are serious and complex injuries that pose difficulty in management. Their management is challenging because of the severe displacement of the bony fragments, the concomitant depression and impaction of the cancellous subchondral bone, and the inevitable associated cartilage injury. Often the associated complications, i.e., Compartment syndrome, cartilage destruction, soft-tissue envelope damage, post-surgery infection, knee instability or stiffness, early and late post-traumatic arthritis, are devastating.

**Methods:** A prospective study of 40 patients with Schatzker type I to type VI tibial plateau fractures treated with open reduction and internal fixation using anatomical LCPs. These patients were evaluated in the final analysis. The preoperative and intraoperative data was noted from the indoor files. The final evaluation was done using INSALL KNEE score.

**Results:** The patient was followed-up at 6 weeks, 3 months, and 6 months. In our study 75% of the patients were treated with ORIF AND anatomical locking compression plating and 25% with MIPPO technique. The average radiological fracture union was seen at 14.025 weeks. 62.5% of the cases showed Insall knee score between 80-100 (Excellent), 22.5% between 70-79 (Good), 10% between 60-69 (Fair) and 5% below 60 (Poor) results.

**Conclusions:** We conclude that open reduction and internal fixation of tibial plateau fractures gives excellent to good functional outcome with minimal soft tissue complications. The complications can be minimized with proper patient selection and soft tissue dissection.

**KEYWORDS :** Tibial Plateau fractures, Schatzker, INSALL knee score, locking compression plate

### INTRODUCTION

The knee joint is complex joint and is the commonly injured joint now a days because of increased vehicular trauma and sports related injuries.

Being superficial joint and more exposed to external forces, this joint easily gets injured. The first account of internal fixation was by a brass wire by A.M. Cart in 1770 since then fracture treatment has never looked back. Fractures of the proximal tibia, particularly those that extend into the knee joint are termed as tibial plateau or tibial condylar fractures. These fractures constitute about 1% of all fractures and 8% of the fractures in elderly. The lateral condyle is more frequently involved than the medial condyle<sup>1</sup>. Whereas the involvement of bicondylar lesions is found in 10 to 30% of the reported series<sup>2</sup>. The indications for non-operative versus operative treatment of tibial plateau fractures vary widely in literature. Different surgeons have advocated different treatment protocols, some in support of conservative and some against.

The objectives of treatment of tibial plateau fracture, is precise reconstruction of the articular surfaces stable fragment fixation allowing early mobilization and repair of all concomitant ligamentous and other soft tissue lesions<sup>3</sup>.

High velocity injury sustained in automobile disasters and increase in road traffic accidents is creating an ever-growing problem. Since man has taken to travelling at high speeds in the sitting position with the loading edge composed of flexed hind limbs, when the machine in which the subject is travelling stops suddenly, most of the impact is taken at first upon the patella, then the tibia and femur in varying proportions and at various positions.

The stationary lower limb may be struck by a moving object; this is the common pedestrian injury, the so called "Bumper Fracture", since the bumper of most vehicles being placed roughly at knee height. In the past two decades, with improvements in surgical techniques and implants, there has been a trend towards surgical management of these injuries. Thus, we have advanced from conservative approach to internal fixation mode of treatment.

Nevertheless, tibial plateau fractures remain challenging because of their number, variety and complexity. 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<sup>4</sup> particularly for high energy tibial plateau fracture (type IV, V, & VI.)

### METHODS

#### Source Of Data:

Patients with Tibial plateau fractures satisfying inclusion criteria admitted in Raja Rajeswari Medical College and Hospital, Bangalore.

### METHOD OF COLLECTION OF DATA

#### Sample Size

Cases satisfying the inclusion criteria admitted in Raja Rajeswari Medical College and Hospital, Bangalore during the study period of October 2018 to May 2020 will be included. According to the hospital statistics, an average number of 50 patients per year satisfying the inclusion criteria have undergone various surgical modalities in previous two years. Hence, I intend to study about 40 cases during the study period.

#### Inclusion Criteria

1. Tibial plateau fractures which are classified as high energy, based on the mechanism of injury (motor vehicle accident, motorcycle crash, fall from a significant height etc.) radiographic findings of comminution, and significant fracture displacement with associated soft tissue injuries and schatzker 1 - 6 fractures in non osteopenic bone.

2. Schatzker Classification for Tibial Plateau Fractures<sup>3</sup>

Type 1 Split type lateral plateau fractures

Type 2 Split depressed lateral plateau fractures

Type 3 Depressed lateral plateau fracture

Type 4 Medial Tibial plateau fracture

Type 5 Bicondylar plateau fracture

Type 6 Bicondylar fracture with meta-diaphyseal dissociation

3. Patient age above 18 years.

4. All gender patients will be included.

**Exclusion Criteria**

1. Patients with Grade III and above arthritic changes involving the knee based on Kellgren and Lawrence system of Classification.
2. Pathological fractures
3. Patients with Polytrauma and multiple lower limb bone fractures.

**Period Of Follow-up**

The follow up would be for one year with evaluation at 6 weeks, 3 months, 6 months and 1 year.

**Parameters For Evaluation**

Patients were evaluated both clinically and radiologically. Clinical evaluation is using KNEE SCORE (Insall modification 1993)<sup>4</sup>.

CRITERIA	MAXIMUM SCORE
PAIN	100
FUNCTIONAL SCORING	100
TOTAL SCORE	200

This scoring system is the version of knee score as modified by Dr John Insall in 1993<sup>4</sup>. This scoring system combines a relatively objective knee score that is based on clinical parameters and a functional score based on how the patient perceives that knee functions with specific activities.

The maximum knee score is 100 points and the maximum functional score is 100 points

**Investigations:**

- 1) Routine Blood investigations.
- 2) ECG
- 3) Chest X ray PA view
- 4) 2D ECHO (wherever indicated)
- 5) Plain X-ray of the affected knee with leg – Antero-posterior and lateral views.
- 6) Contrast CT scan of the affected knee. (wherever indicated)

**RESULTS**

The youngest patient in this study was 23 years and the oldest was 65 years. The mean age was 40.2 years with a Standard Deviation of ±12.88 years. Here 80% of patients were male and 20% female. 24 of the patients sustained injury on the right side and 16 on the left side. The mechanism of injury was grouped into 2 categories. Road traffic accidents with 87.5% and fall of 12.5%. All the fractures in this study are classified according to SCHATZKER' S CLASSIFICATION SYSTEM.

Out of which 5% of the patients were type I, 5% type II, 12.5% type III, 10% type IV, 27.5% were type V and 40% type VI. Within which there were 5 patients with associated injuries. 75% of the patients were treated with ORIF and Anatomical Locking Compression plates and screw 25% by MIPPO.

77.7% of the patients had to stay in the hospital for management for 2 – 3 weeks, and no patients were discharged within a weeks' time.

The following were the complications seen in this study of 40 patients, i.e., Knee stiffness, Failure to achieve primary closure, and Wound Infection with a total of 10%. The average time of fracture union in this study was 14.025 weeks with a Standard Deviation of ± 2.28 weeks.

Here 62.5 % patients had excellent outcome 22.5% with Good Outcome, 10% with Fair Outcome and 5% with Poor Outcome based on INSALL KNEE SCORE. 62.5% of the patients had a very good ROM of >120°, with an average ROM of 118°± 23.47° of Standard Deviation.

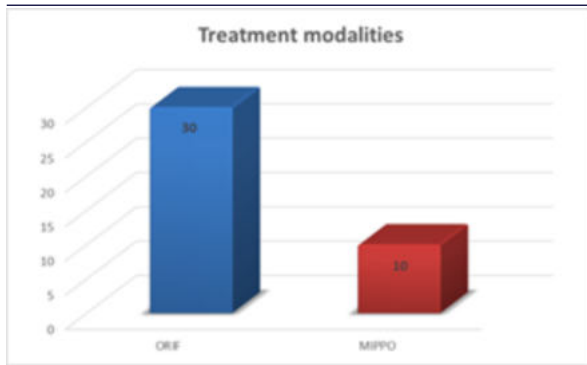
In our study the pain during follow up was mostly occasional pain in 16 patients, 8 patients with Pain with mild activity, 12 patients with Pain during regular activity and only 4 patients complained of persistent pain.



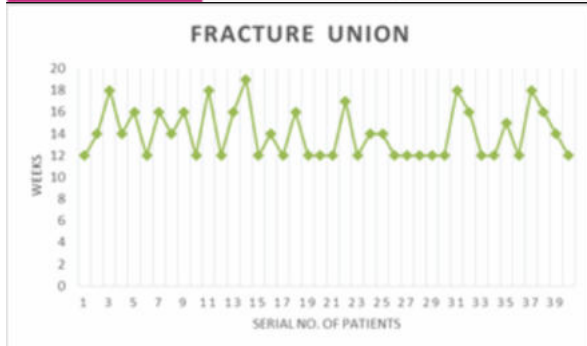
	3 MONTH	6 MONTH
<b>Data of patient</b>	<b>Values</b>	
1) AGE	40.2 ±12.88 years.	
2) SEX	Male: 32 Female: 8	
3) EFFECTED SIDE	Right: 24 Left: 16	
4) FRACTURE TYPE	SCHATZKER'S I - 2                      IV - 4 II - 2                     V - 11 III - 5                    IV - 16	
5) MODE OF INJURY	RTA: 35 Fall: 5	



Treatment modalities	Number of patients	Percentage %
ORIF	30	75
MIPPO	10	25
Total	40	100



Time Of Union	Number Of Patients	Percentage %
12-14 weeks	34	85
16-20 weeks	6	15



Score	Inference
80-100	Excellent
70-79	Good
60-69	Fair
Below 60	Poor

Knee Society		
<b>Knee Society Rating</b>		
Pain (50 points)	Points	Subst. Score
None	50	= 50
Mild or occasional	45	
Stairs only	40	
Walking and stairs	30	
Moderate-occasional	20	
Severe	0	
Range of Motion 5 degrees = 1 point	25	= 25
	0	
	0	
Anteroposterior Stability (maximum movement in any position)	10	= 10
<5mm	5	
5-10mm	0	
Medial Lateral Stability	15	= 15
<5 degrees	15	
6-9 degrees	10	
10-14 degrees	5	
15 degrees	0	
Deformities	0	= 0
Flexion contracture		
5-10 degrees	2	
10-15 degrees	5	
16-20 degrees	10	
>20 degrees	15	
Extension lag		
<10 degrees	5	
10-20 degrees	10	
>20 degrees	15	
Alignment	0	3 points each
5-10 degrees	0	
0-4 degrees	0	
11-15 degrees	0	
Other	0	
<b>Function Rating</b>		
Walking	50	= 50
Unlimited	40	
>10 blocks	30	
5-10 blocks	20	
<5 blocks	10	
Housebound	0	
Stair	0	= 50
Normal up and down	50	
Normal up down with rail	40	
Up and down with rail	30	
Up with rail, unable down	15	
Unable	0	
Deformities	0	= 0
Cane	5	
Two canes	10	
Crutches or walker	20	
<b>Score</b>		
Knee Rating= 100		
Function= 100		
(Adapted from: Insall JN, CORR 1969; 24B:12)		

**DISCUSSION**

The main purpose of the study is to evaluate outcome of the surgery of the study group: hence all the patients that included in the study are of the operative group. We have not included any conservatively managed patients. Cast, bracing, and external fixator is not done in any of the patient as this is not considered as a preferred modality of the treatment. Our study shows the effectiveness of the operative treatment as the articular surface was restored anatomically and fixed with anatomical locking compression plates and screws for early mobilization. The ideal treatment for these fractures of the tibial plateau remains controversial. Open reduction and rigid internal fixation achieves the goals of anatomic articular congruity and mechanical alignment restoration, while allowing early knee mobilization. But open reduction and internal fixation specifically through compromised soft tissue, has historically been associated with major wound complication. Alternate methods of treatment have been described, each with its own merits and demerits<sup>6,9</sup>. Tibial plateau fractures are more commonly seen in the younger age group due to high-energy trauma like in RTAs. This study group comprises of 40 patients of whom 30 patients were treated by ORIF WITH ANATOMICAL LCP AND 10 patients with MIPPO technique. These patients were followed up for an average period of 12 months. 40 patients were studied

- 30 patients were treated by ORIF WITH ANATOMICAL LCP
- 10 patients with MIPPO technique.
- These patients were followed up for an average period of 12 months.

Based on the INSALL KNEE SCORING system.

- 62.5% excellent results,
- 22.5% good,
- 10% fair
- 5% poor

**CONCLUSIONS**

The correct method of management of intra - articular fractures of the proximal tibia depends on good clinical judgment. If rational treatment is to be instituted, the surgeon must have sound knowledge of the personality of the injury and a clear understanding of knee examination, imaging studies and must be familiar with the variety of techniques available at present for treating tibial condyle fractures. The outcome of the high energy complex tibial plateau fracture depends on triquet parameters.

*Firstly, by the condition of the soft tissue.*

*Secondly by the restoration of congruence of the articular surface.*

*Lastly by the stability of the mechanical environment which is achieved by fixation.*

**The Conclusions Of This Study Are:**

- Intra-articular fractures of proximal tibia, those belonging to Schatzker's type I to VI were treated by Open reduction and internal fixation and MIPPO techniques.
- Preoperative soft tissue status and their repair at right time significantly changes the outcome of the patient.
- DUAL PLATE fixation in severe bicondylar tibial plateau fractures is an excellent treatment option as it provides rigid fixation and allows early knee mobilization.
- Advantage of posteromedial incision includes the provision of access to directly reduce and buttress the fracture in a very stable manner. It also removes the need to raise large skin flaps which is important when soft tissues have already been injured.
- Medial side buttress plating is always desirable in bicondylar fracture pattern with unstable medial condyle, to prevent delayed medial collapse and undesirable varus collapse.
- In high velocity injuries belonging to Schatzker type I to VI results varied, and depended on the reconstruction of the articular surface and collapse of the fracture during post-operative period.

Conclusion drawn from this analysis cannot be generalized because of

- Small number of cases
- Short duration of study
- Surgery was performed by different surgeons with variation in exposure and technique which could be a confounding factor in assessing the outcome.
- MRI scan was not done, and various ligament and meniscus injury were not managed, thus soft tissue could have effect on outcome.
- Complication seen in our series are knee stiffness, infection and primary closure, these complications are mainly seen in high energy injuries. In our study there was no case of septic arthritis and non-union.

**Conflict of Interest:**

The Authors does not declare any competing conflict of interest

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