



STUDY OF FUNCTIONAL OUTCOME OF TIBIAL PLATEAU FRACTURES MANAGED BY VARIOUS MODALITIES

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ABSTRACT **INTRODUCTION:** Tibial plateau fractures are complex injuries produced by high- or low-energy trauma. Limb alignment, knee stability, articular surface restoration with adequate soft tissue healing allowing early functional range of knee motion are the main goals of the treatment. **OBJECTIVES:** To analyse the functional outcome of proximal tibial plateau fractures and the various modalities of treatment and complications. **MATERIALS AND METHODS:** The present prospective study was conducted in the department of orthopedics at Gandhi Medical College from November 2019 to June 2021. **RESULTS:** In spite of all the complex fracture patterns and soft tissue injuries and complications with proximal tibial fractures, the outcome was excellent in 22.50% of the study population and good results in 57.50% of the study population (overall 80% satisfactory results) with described standard fixation methods. In addition we have 20% fair and 0% poor results. **CONCLUSION:** Treatment of intra articular tibial plateau fractures is still unresolved completely. Choice of the approach/implant should be strictly based on the good clinical judgment of fracture pattern, appropriate classification(Schatzker /three column concept) , bone quality and intra operative fracture reduction.

KEYWORDS :

INTRODUCTION

Tibial plateau fractures are complex injuries produced by high- or low-energy trauma. They principally affect young adults or the 'third age' population. Incidence of proximal tibial fractures is 1% of all fractures and 8% of the fractures in elderly. Most injuries affect lateral tibial condyle (55 to 70%) and isolated medial condyle fractures occur in 10 to 23% whereas the involvement of both condyle fractures is found in 10 to 30% of the reported series^[1].

Tibial plateau fractures occur due to a combination of axial loading and varus/valgus applied forces leading to articular depression, misalignment and an increased risk of post-traumatic osteoarthritis (OA)^[2,3].

Open reduction and internal fixation (ORIF) is the gold standard treatment for these fractures. But techniques of open reduction and internal fixation compromise the soft tissues and the rate of wound infection is relatively high.

Various treatment modalities have been used over the years, with mixed results. These include traction^[3] or closed treatment with cast bracing^[4,5]. Surgical procedures including circular frames^[6], percutaneous screw fixation^[7], open reduction/internal fixation (ORIF)^[6,8] and arthroplasty have also been advocated. More recent techniques such as the use of fixed angle devices^[9], arthroscopically-assisted reduction^[10] and calcium based cement augmentation^[11] and the use of novel grafting methods to address articular depression^[12], constantly gain popularity amongst orthopaedic surgeons.

Tibial plateau fractures are serious injuries that commonly result in functional impairment. Limb alignment, knee stability, articular surface restoration with adequate soft tissue healing allowing early functional range of knee motion are the main goals of the treatment.

In the present study the functional outcome of tibial plateau fractures has been assessed after a minimum follow up period of 6 months by using Rasmussen score which have been treated by various modalities.

OBJECTIVES

- To analyse the functional outcome of proximal tibial plateau fractures treated by various modalities using Modified Rasmussen score.
- To evaluate the various modalities of management of tibial plateau

fractures.

- To evaluate the various complications associated with tibial plateau fractures.

MATERIALS AND METHODS

The present prospective study was conducted in the department of orthopedics at Gandhi Medical College, Secunderabad from November 2019 to June 2021 after getting clearance from hospital ethical committee.

A total of 40 patients, satisfying the inclusion criteria were treated for tibial plateau fractures using various modalities after taking the informed consent from them.

INCLUSION CRITERIA

- Age >18 years (after physeal closure)
- Closed injury
- Grade 1 and Grade 2 tibial plateau fractures

EXCLUSION CRITERIA

- Age <18 years.
- Grade 3 tibial plateau fractures
- Patient with distal neurovascular injury
- Polytrauma cases
- Cases with infection >3 weeks
- Cases with stiffness
- Patient not willing for surgery

PROCEDURE

- A detailed history was taken and patient was examined clinically and radiologically.
- The Schatzker classification was used to classify the fractures.
- Fractures will be considered unstable if depression >4 mm or displacement >10°.
- All cases were treated depending upon the type of fracture pattern and condyles involved.
- Fractures were treated using

- POP casing
- 'L' buttress plate
- 'T' buttress plate
- Proximal tibial locking compression plate
- 6.5 mm cancellous screws

6. 4.5 mm cortical screws
7. 3.5 mm cortical screws
8. 4 mm cancellous screws
9. K wires and external fixation

• Follow up and functional assessment was performed using Modified Rasmussen's clinical criteria after a period of 6months.

Modified Rasmussen's Criteria:

Parameter	Score
Pain	
None	6
Occasional	5
Stabbing pain in certain position	3
Constant pain after activity	1
Significant rest pain	-3
Walking capacity	
Normal walking capacity for age	6
Walking outdoor more than one hour	5
Walking outdoor 15 mins – 1 hr	3
Walking outdoor < 15 mins	1
Walking indoor only	0
Wheel chair or bed ridden	-3
Knee Extension	
Normal	4
Lack of extension <10°	2
Lack of extension >10°	0
Lack of extension >20°	-2
Total range of motion	
Full	6
Atleast 120°	5
Atleast 90°	3
Atleast 60°	1
<60°	-3
Stability	
Normal stability in Extension and 20° Flexion	6
Abnormal instability in 20° Flexion	4
Instability in Extension <10°	2
Instability in Extension >10°	0
Power of Quadriceps	
Grade 5	2
Grade 3-4	1
Grade < 3	-2
Grading (Maximum Score is 30)	
Excellent	28-30
Good	24-27
Fair	20-23
Poor	<20

RESULTS

The present prospective study was conducted in the department of orthopedics at Gandhi Medical College, Secunderabad from November 2019 to June 2021 after getting clearance from hospital ethical committee.

Table 1 Age And Gender Distribution

Parameter	Frequency	Percentage (%)
Age in years		
21-30	5	12.5
31-40	15	37.5
41-50	11	27.5
51-60	3	7.5
>60	6	15
Gender		
Male	31	77.5
Female	9	22.5

Table 2 Injury Related Characteristic Features

Parameter	Frequency	Percentage (%)
Side involved		
Left	18	45
Right	22	55
Mode of injury		
RTA	32	80
Fall from height	8	20

Table 3 Management Related Aspects

Parameter	Frequency	Percentage (%)
Schatzker classification		
Grade I	2	5
Grade II	7	17.5
Grade III	9	22.5
Grade IV	3	7.5
Grade V	10	25
Grade VI	9	22.5
Fixation		
LCP	14	35
Dual plating	6	15
Buttress plating	7	7.5
6.5mm cortical screws	5	12.5
Cortical screws and CLCP	2	5
K wire and external fixation	2	5
Conservative management	4	10
Complications		
Infection	3	7.5
Knee Stiffness	6	15
Screw pull out	1	2.5
None	30	80

Table 4 Functional Assessment At 6th Month

Functional assessment	Frequency	Percentage (%)
Excellent	9	22.5
Good	23	57.5
Fair	8	20
Poor	0	0

FIG 1 PREOP

FIG 2 POST



FIG 3 FOLLOW UP X RAY



4 FOLLOW UP KNEE ROM



DISCUSSION

Proximal tibia fractures which are one of the commonest intra articular fractures are occurring as a result of motor vehicle accident, accidental fall from height, violence etc. The management of proximal tibial fracture has always been a subject of discussion because of their complexity and variety.

Tibial plateau fractures are more commonly seen in the active, earning younger age group due to their exposure to high velocity motor vehicle

accidents. Closed treatment of these injuries has had very little success in reducing depressed or displaced fracture fragments; this initiated the need for open reduction and internal reduction in most displaced and unstable fractures. It is also extremely important to do a stable fragment fixation and ligament repair to regain the complete range of movements.

The aim of the treatment is to provide the patient a painless, mobile joint and it needs a very strong technical knowledge and surgical expertise. Good surgical techniques and implants are essential for accurate articular reduction.

Open reduction and internal fixation has the advantage of direct visualization of fracture, complete reduction and fixation, but there is higher risk of soft tissue complications, joint stiffness and deep compartment infection. The hybrid fixator system avoids these soft tissue complications, but risks are malunion, pin site infections and reduced patient compliance in maintaining the hybrid fixator.

In single incision technique there was higher incidence of wound breakdown and infection. With the advent of isolated lateral plating with locking compression plate the spectrum has shifted towards locking plate with medial fragment being stabilised by screws passed through lateral plate.

Varus collapse in these patients raised the question of its sustainability and the reason found to be inadequate fixation of posteromedial fragment. This has paved way for dual plating via two incision technique.

The concept of preserving the blood supply to the bone and minimally invasive technique lead to the development of more biological fixation techniques. By using this technique, soft tissue complications are very much reduced and show higher rates of union.

The invention of locking compression plates has allowed the surgeons in using MIPPO technique for unilateral plating with improved care and management in handling the soft tissue. Laterally applied locking compression plates provide better stability in context of complex proximal 1/3rd tibia fracture associated with metaphyseal comminution and serves as an good alternative to medial plate or external fixator which are used for additional support of the medial column when a nonlocking plate is used for bicondylar fractures. This plate allows fixation through single incision to avoid wound dehiscence, prolonged immobilization and infection associated with extensive approaches.

Aim of the present study was assessing the functional outcome of proximal tibia fractures treated using various modalities which were classified using Schatzker classification. This classification is easier to classify using conventional x-ray and treatment could be planned according to fracture pattern.

Mechanism of injury was road traffic accident for majority of these patients. The fractures were classified using Schatzker classification. In the present study 40 patients were assessed from November 2019 to June 2021 of which 31 cases were male and 9 of them were female. Most of the patients belong to 3rd and 4th decade.

In the present series majority of the patients were males (77%). The significance of tibial plateau fracture-related sex distribution was not available in literature to comment on them.

In the present study, there was right sided predominance, compared to the left side with right side 55% and left side 45%.

Patients treated conservatively for schatzker type 1, 2 and 3 had favorable functional outcome. Hence these can be treated conservatively after taking consideration of patients factor. This was supported by the study done in 2019 by Elabjer E et al [13] and 2020 by Rijal A and Rajthala A [14].

Likewise choice of the implant was decided on the fracture pattern, bone quality and intra operative reduction. In the present study most of the bicondylar fractures were treated using dual plates to prevent varus collapse.

In the present study 6 patients were treated by dual plates. In spite of

good clinical outcome two got complicated by infection and knee stiffness. Hence proper selection of patients is essential and good soft tissue condition is essential before planning the patient for dual plating.

In the year 2019 study by Arun SR et al [15], about the functional outcome of surgically treated Tibial plateau fractures. The surgical outcome was good following surgery but has to be planned after decrease in soft tissue swelling. The outcome was similar to our study.

In the present study 14 patients were treated by LCP through a single incision. The functional outcome was similar to dual plating. Hence treating fractures through a single approach help in wound healing due to less soft tissue damage. This was similar to results obtained by study done in 2019 by Srinivas C et al. [16]

The major problems faced by us during the course of the present study were knee stiffness and infection and screw pull out. The infection may be attributed to nosocomial infection. The period of immobilization was standardized to 4 weeks for all fractures.

In spite of all the complex fracture patterns and soft tissue injuries and complications with proximal tibial fractures, the outcome was excellent in 22.50% of the study population and good results in 57.50% of the study population (overall 80% satisfactory results) with described standard fixation methods. In addition we have 20% fair and 0% poor results. The above said results are comparable to the literature and on par with other documented standard studies.

CONCLUSION

Treatment of intra articular tibial plateau fractures is still unresolved completely. Choice of the approach/implant should be strictly based on the good clinical judgment of fracture pattern, appropriate classification (Schatzker/three column concept), bone quality and intra operative fracture reduction. The main aim of open reduction and internal fixation include accurate reconstruction of the articular surface with elevation of the depressed bone fragment, bone grafting or bone graft substitute, stable fragment fixation allowing early range of motion and repair of all concomitant ligamentous structures and other soft tissue injuries.

LIMITATIONS:

- Small sample size
- Difficulty in follow up due to COVID 19 pandemic
- A long term follow up of five to ten years could have been more significant to study the post traumatic arthritis.

Conflicts of interest: None

Source of funding: None

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