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### **Operative management of closed tibial plateau fracture treated with posteromedial plate with inclusion or exclusion of anteriolateral plate**

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#### **Abstract**

The proximal tibia is involved in body weight transmission through the knee joint and leg, it plays a vital role in the knee joint function and stability. Fractures of proximal tibia have historically been difficult to treat because of its subcutaneous location of the anteromedial surface of the tibia. Severe bone and soft tissue injuries are not infrequent and there is high incidence of open fractures compared to other long bones. This study was a prospective study done on 20 consenting cases of closed tibial plateau fractures who were admitted with posteromedial plate with inclusion or exclusion of anteriolateral and have come for follow up during the study period chosen based on the inclusion and exclusion criteria. In our study Average time for union of fracture was 18 weeks (range from 16-24 weeks). In our study two patients developed knee stiffness One patient with knee joint stiffness is due to lack of postoperative mobilization .Second patient developed knee stiffness due to patella fracture treated with TBW and physiotherapy and regain 90° of flexion.

**Keywords:** Closed tibial plateau fracture, posteromedial plate, anteriolateral plate

#### **Introduction**

Tibial plateau fractures represent a challenge, despite being common in incidence they are difficult to manage since they are mostly associated with soft tissue injuries. They usually occur as a result of high velocity injuries and are common in young age group turning into heavy socioeconomic burden to family. It is not uncommon in old age who have osteopenia and medical comorbidities. Tibial plateau is one of the most important weight bearing areas of the body with 80% borne by tibia and remaining by fibula. Any fracture in vicinity of the joint is of paramount importance since restoring articular congruity is an essential step for functional outcome. If unaddressed may lead to unstable knee and abnormal forces acting on it. Consequence of which may lead to early osteoarthritis of knee joint <sup>[1, 2]</sup>.

Tibial plateau fractures represents approximately 1% of fractures in adults. In men it tends to occur in younger age and as a result of high energy trauma. Elderly women has increasing incidence with advancement in age mainly during 6th and 7th decade which indicates fractures due to osteoporotic bone. Outcome depends on the force of the injury, mechanism of the injury, fracture pattern, associated injury to the surrounding soft tissues and type of surgical treatment opted <sup>[3]</sup>.

The Surgical Treatment of complex tibial plateau fractures with associated posterior shear fractures has been a challenge for a general Orthopaedic Surgeon. Accurate reduction of posterior tibial plateau fractures from the standard approaches is rather difficult technically due to an inadequate visualization of the fracture zone. Thus, posterior approaches and posteromedial supine approach to the tibial plateau were introduced through which not only the visualization of the posterior tibial plateau structures but also their osteosynthesis with a support plate is possible <sup>[4]</sup>.

The proximal tibia is involved in body weight transmission through the knee joint and leg, it plays a vital role in the knee joint function and stability. Fractures of proximal tibia have historically been difficult to treat because of its subcutaneous location of the anteromedial surface of the tibia.

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Severe bone and soft tissue injuries are not infrequent and there is high incidence of open fractures compared to other long bones. The proximal tibial fractures are one of the commonest intraarticular fractures, generally these injuries fall into two broad categories, high energy fractures and low energy fractures [4].

The majority of tibial plateau fractures are secondary to high velocity road traffic accidents and fall from height, where fractures result from direct axial compression, usually with a valgus (more common) or varus moment and indirect shear forces. Extra-articular fractures of the proximal tibia usually secondary to direct bending forces applied to the metadiaphyseal region of the upper leg. Older patients with osteopenic bone are more likely to sustain depression type fracture because their subchondral bone is less likely to resist axial directed load [5].

“The objective of surgical treatment of tibial plateau fractures is anatomic reconstruction of the articular surface and stable fracture fixation with a focus on restoring stability, limb alignment (avoiding Varus/ valgus), restoring ligamentous stability and early post-operative mobilisation, thus prevention of the development of Osteoarthritis of the knee”. Thus eventually can achieve functional painless and good range of motion in the knee joint. All these objects are best fulfilled by ORIF with Plate and screw fixation [6].

Few fractures are associated with limb threatening complications such as compartment syndrome. New methods have changed the surgical management of low energy tibial plateau fractures and high energy medial and bicondylar tibial plateau fractures.

## Methodology

This study was a prospective study done on 20 consenting cases of closed tibial plateau fractures who were admitted with posteromedial plate with inclusion or exclusion of anteriolateral and have come for follow up during the study period chosen based on the inclusion and exclusion criteria. Patients were informed about the study in all respects and written informed consent will be obtained. The follow up period was 6 weeks, 3 months, 6 months.

## Methods of collection of data

The sampling method to be applied for collection of cases was convenient sampling.

1. Evaluation of the pre-op X rays, CT SCAN of knee by the orthopaedic team.
2. Classifying the fracture based on Schatzker's Classification for Tibial plateau fractures.
3. PRE OP planning including the need for posteromedial plate in sagittal fracture configuration.
4. Evaluation of the post-op clinical and functional outcome using the Lysholm Knee Scoring Scale at 6 months.

## Inclusion criteria

1. Patients between 18 and 70 years of age.
2. All closed tibial plateau fractures admitted in hospital and treated with posteromedial plate with inclusion or exclusion of anteriolateral plate.
3. Radiological diagnosis of fracture with classification based on schatzker's classification.
4. Schatzker's classification type IV, V AND VI
5. Only posteromedial plate.
6. Both anteriolateral and posteriomedia plate together.

## Exclusion criteria

1. Age below 18 and above 70 years.
2. Schatzker's classification type I,II and III

3. Patients with pathological fractures.
4. patients with any associated fracture of distal femur
5. Neurovascular injury associated with any tibial plateau fractures.
6. Patient medically unfit for surgery.

Patients subjected to surgery which were followed up at regular intervals with clinical and radiological data. Assessment was done based on a Performa containing all necessary information regarding.

## Results

**Table 1:** Age-wise Distribution of Study Participants

Age in Years	Frequency	Percent
18-30	3	15
31-40	11	55
41-50	4	20
51-60	2	10
60-70	0	00
Total	20	100

In the present study of evaluation of age distribution we found that of the 20 cases in the study most patients belonged to the category 31-40 years (11 patients, 55%).

**Table 2:** Type of surgical plate

Type	Frequency	Percent
Single (posteromedial plate)	8	40
Double (anteriolateral and posteromedial plate)	12	60
Total	20	100

In the present study on evaluation of the type of plates used, we found that of the 20 cases in the study, single plate was used in 8 patients(40%) and double plate used in 12 patients (60%).

**Table 3:** Lysholm's grading of Cases

Grade	Frequency	Percent
Poor	1	5.00
Fair	2	10.00
Good	4	20.00
Excellent	13	65.00
Total	20	100.00

In the present study on evaluation of the final outcome of the fracture according to lysholm scoring scale most patients had excellent results (13 patients, 65%).

**Table 4:** Complications

Complications	Number of patients	Percentage
Knee joint stiffness	2	10
loss of reduction	1	5
valgus deformity	1	5
Infection(wound discharge)	2	10

We had no cases of any purely implant related complication like screw loosening screw breakage, plate failure.

- Average time for union of fracture was 18 weeks (range from 16-24 weeks).
- Two patient with knee joint stiffness. one is due to lack of postoperative mobilization
- Two patient developed superficial infection of operatives, second is due to patella fracture treated with TBW and physiotherapy and regain 90° of flexion with sutures

removed, thorough wash given and restored with appropriate antibiotics. Following which fracture united at 22 weeks follow up.

- One patient developed valgus deformity due to collapse of medial condyle post operatively. And there was significant articular step.

## Discussion

In our study we used both posteromedial plates for medial condyle fractures and anteriolateral plates for lateral condyle fracture. Gosling *et al.* [7] demonstrated that lateral locking screw plate could provide stabilization of the medial fracture fragment. However, the directions of screws were predetermined based on the design of the plate. The screws were usually in parallel with the fracture line of posteromedial fragment. Therefore, satisfactory fixation cannot be achieved. In a biomechanical study.

Posteromedial plateau fractures, medial fracture dislocations and wedge-like posterior metaphyseal fractures are best managed from a posteromedial approach [8]. two approaches are used more frequently in cases of multi fragmental fractures of the lateral tibial condyle with the posterior column damage. As the lateral condyle cannot be fixed with single posteromedial plate so in bicondylar fracture additional anteriolateral locking plates are fixed for lateral condyle [9, 10].

As a protocol, the patient after anaesthesia in the operating room, was imaged under C-arm guidance in three planes with mild traction.

Those fractures, which had a coronal plane fracture of medial condyle was fixed with a posteromedial buttress or locking plates. In case where lateral condyle fracture exists those are fixed open reduction and internal fixation through anteriolateral incision and fixed with precontoured locking plate.

In this study we approached medial condyle fragment by posteromedial approach in 8 cases for type (IV) and both anteriolateral and posteromedial approach in 12 cases (for type IV and VI).

In the study on evaluation of the final outcome of the fracture according to Lysholm scoring scale most patients had excellent results (13 patients, 65%).

In our study we had no cases of any purely implant related complication like screw loosening screw breakage.

In our study Average time for union of fracture was 18 weeks (range from 16-24 weeks).

In our study two patients developed knee stiffness. One patient with knee joint stiffness is due to lack of postoperative mobilization. Second patient developed knee stiffness due to patella fracture treated with TBW and physiotherapy and regain 90° of flexion.

- In our study two patients developed superficial infection of operative site, sutures removed, thorough wash given and gestured with antibiotics (Ceftriaxone and Gentamycin). following which fracture united at 22 weeks follow up.
- One patient developed valgus deformity due to collapse of medial condyle post operatively 6 weeks follow up. And there was significant articular step, subsequently fracture united with significant depression of medial condyle.

The mean age of patients in our study is 33 years with lowest 18 years and highest 70 years. Barei D.P. *et al.* [2] in their study observed mean age of 44 years with the range from 21

to 88 years. Likewise other study by Weil Y. A *et al.* [11] showed the mean age of 43 years and range from 18 to 65 years. Seppo also showed age incidence 20-60 years with an average of 39.8 years which correlates with the present study. In our study, incidence of tibial plateau fracture was more among age group of 31 to 40 years.

## Conclusion

In our study we found, we cautiously concluded that posteromedial plating through posteromedial approach is the gold standard for the management of posterior tibial plateau fractures. The posteromedial supine approach being the safe and provide direct visualization of the fracture, avoid dissection of neurovascular bundle. As a result, satisfactory reduction, stable internal fixation and good functional outcomes can be obtained by this technique. Anterior approach warrants excessive soft tissue dissection and the direct posterior approach needs dissection through neurovascular bundle. Posteromedial approach is not associated any such complications. Thorough anatomy of the posteromedial portion of the knee is important.

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