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## Functional and radiological outcome in tibial condylar fracture with posteromedial fragment fixed with buttress plate

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### Abstract

**Background:** The posteromedial fragment of tibial plateau fracture remains unrecognized for a long time, leading to inadequate fixation with conventional methods and resulting in early varus collapse. So our study is to observe any significant change in functional and radiological outcome in tibial condylar fracture with posteromedial fragment fixed with buttress plates.

**Materials and methods:** We studied 20 patients of tibial plateau fracture with posteromedial fragment fixed with buttress plate at Narayan Medical College and Hospital, Jamuhar, Sasaram, from first march 2017 to 28 February 2018. This study was a prospective observational study. Direct posterior approach in prone were employed in six patients and posteromedial approach in supine employed in 14 patients. Early knee mobilisation started on 1<sup>st</sup> day weight bearing restricted for 11-13 weeks postoperatively. Minimum 6 months follow up done. Rasmussen clinical and radiological scoring system was used.

**Results:** Age of the patients ranged from 18-70 years with most of patients belong to 31- 50yrs of age group who are more prone for road traffic accidents. The majority of the patients were male (M: F = 3:1). The majority of the fractures were found to be type 4(30%) type5 (30%) and type6 (40%) of Schatzker's classification. The functional and radiological outcome were comparable and no statistical difference was found with other study ( $p>0.05$ ).

**Conclusion:** Fixation of posteromedial fragment of tibial plateau fracture with buttress plate provides high union rates, acceptable complications rates as well as satisfactory clinical outcome and radiological outcome.

**Keywords:** Medial condyle, buttress plating, arthritis

### Introduction

The tibial plateau fractures constitute 1-2 % of all the fractures. Joseph Schatzker classified proximal tibia plateau fractures in to 6 types based on the anteroposterior x rays. Hence fractures of the posterior tibia plateau could not find a place in the classification <sup>[1, 2]</sup>. With the advent of the CT scan, the posteromedial and posterolateral fragment is frequently identified <sup>[3]</sup>. The posteromedial fragment is defined as any posteriorly based articular fracture of the medial plateau with the fracture line exiting the medial cortex. Higgins and Barei have observed a clinically significant posteromedial fragment in 30%-59% of bicondylar patterns <sup>[4]</sup>. Hohl first described a unicondylar coronal plane split fracture of the medial tibial plateau in 1967 and noted that this injury should be considered as a fracture-dislocation. It is a specific fracture pattern that is not well described by the A.O (41- b2.2/b3.2). The fracture line of the posteromedial fragment is more or less in the coronal plane, usually quite vertical and unstable, with a high shearing angle and usually encompasses a large proportion (greater than 25%) of the plateau area <sup>[5]</sup>.

Identification and fixation with absolute stability is necessary as mal reduction or misidentification can cause chronic posteroinferior subluxation, arthritis, and poor patient outcome. Conventional methods of lateral column plating do not secure posteromedial fragment as biomechanical studies have showed fracture plane is coronal and parallel to screws <sup>[6]</sup>.

We recommend direct identification of the fracture apex in the medial cortex, reduce the articular surface and buttress plating to neutralize the shear forces.

The purpose of this study is to assess functional and radiological outcome after buttressing posteromedial fragment either as an isolated unicondylar posteromedial fragment or in combination with a second conventional anterolateral approach for bicondylar fracture. Functional and radiological assessment was done by using Rasmussen clinical and radiological criteria.

**Aims and objectives**

To assess the functional and radiological outcome in the knee joint after congruent articular surface reduction and fixation of tibial plateau fracture with posteromedial fragment with buttress plate.

**Material and methods**

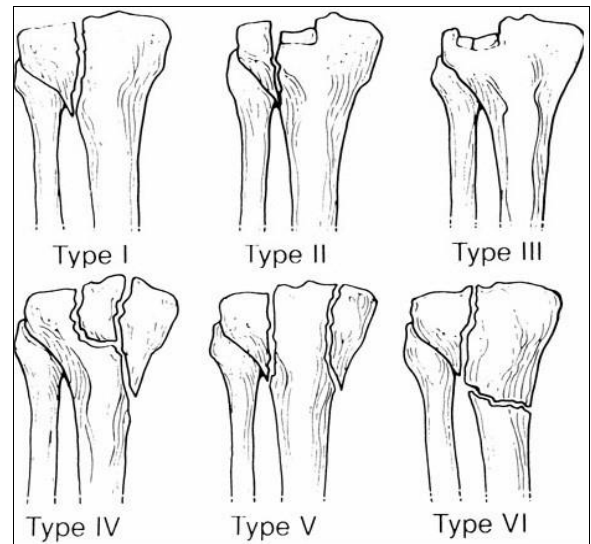
**Patients**

We conducted this study at Narayan Medical College and Hospital Jamuhar, Sasaram. Our hospital's institutional ethical committee review board approved this study. From first march 2017 to 28<sup>th</sup> February 2018 twenty eight cases of tibial plateau fractures were admitted in our trauma center. Two cases had vascular injury and were excluded. Two cases had grade 3b soft tissue injury and were excluded. Six cases having isolated lateral condyle fracture were excluded.

Twenty patients with tibial plateau fracture with posteromedial fragment were included in the study. They were associated with fractures of ulna distal radius, distal femur and knee ligament injuries.

**Fracture characteristics**

Tibial plateau fractures were classified using Schatzker's classification system. Computed tomography scan with 3-dimensional reconstruction of the knee of every cases obtained.



**Fig 1:** Schatzker's Classification of Tibial plateau fractures

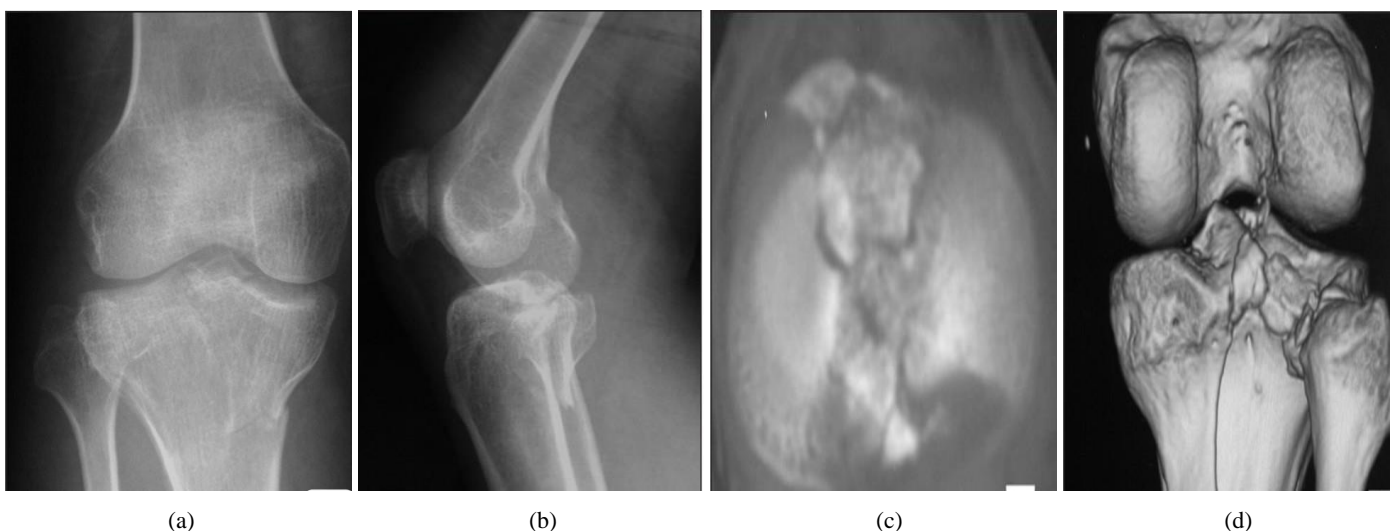
There were five cases of isolated medial condyle fracture, 7 cases of Schatzker type 5 and eight cases of Schatzker type 6 fracture.

**Pre operative planning**

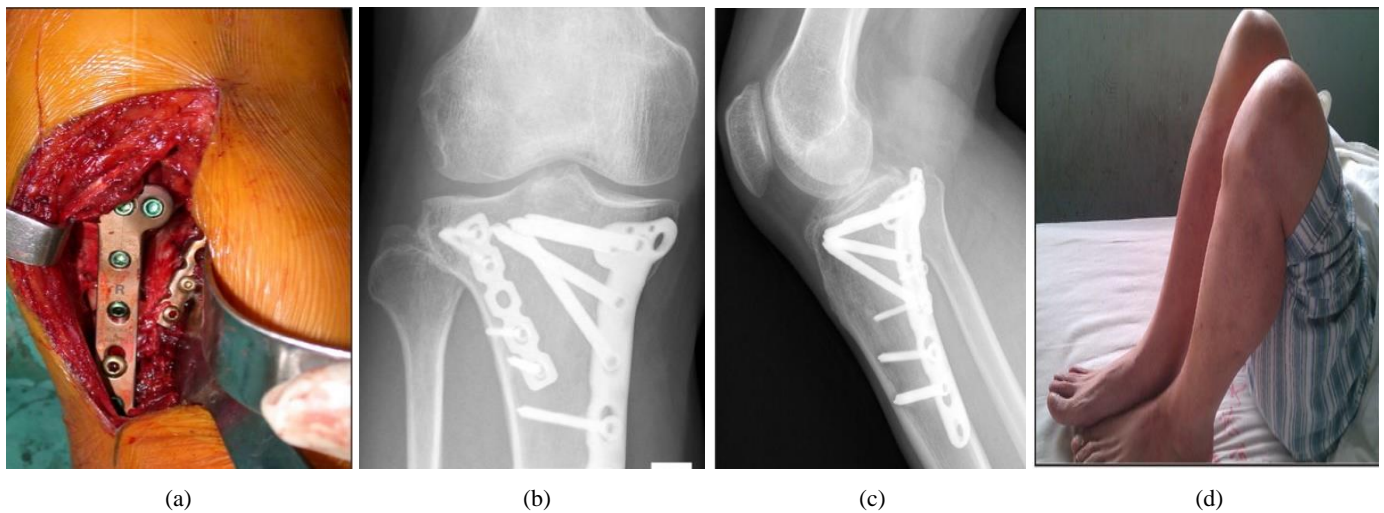
All patients were managed in a staged manner. All patients were applied external fixator with knee in 30 degrees of flexion and distraction till the soft tissue swelling subside. All patients were taken to surgery only after wrinkling sign appear. 3D CT scans were obtained and axial images were studied for surgical planning.

**Operative technique**

We applied direct posterior approach with patient in prone position and posteromedial approach to buttress the apex of the posteromedial fragment. In few patients additional anterolateral fixation was done from anterolateral approach.



**Fig 2:** Schatzker type 4 fracture (a) X ray AP (b) Lateral (c) Axial CT (d) 3D reconstruct



**Fig 3:** (a) intraoperative (b) postoperative x rays AP (c) Lateral view (d) knee movements

### Postoperative protocol

Early knee mobilization and toe touch weight bearing was started. Full weight bearing mobilization was started by 8 to 12 weeks depending on the fracture healing.

The discharged patients were followed up at 6 weeks, 3 months and 6 months. During the follow up visit, serial x-ray were done and the anatomic and functional evaluation was assessed using the Rasmussen clinical and radiological scoring system.

### Results

Two cases developed post op superficial wound dehiscence and one case developed sural nerve paraesthesia. Radiological union was achieved in all cases by 13 weeks (11-14) [9]. patients had an excellent outcome and seven patients had good clinical outcome based on rasmussen clinical scoring system at 6 months follow up. None of the patients had loss of fixation or non union. 12 patients had excellent radiological outcome and 6 patients good outcome at 6 months follow up.

### Discussion

Schatzker's classification does not identify posteromedial fragment of the plateau fracture as it is based on anteroposterior x rays. With the increasing use of the CT scan and 3D reconstruction, posteromedial fragment has been identified frequently. In a study of Barei *et al*, a posteromedial fragment was observed in nearly one third of the bicondylar plateau fractures evaluated. Higgins *et al*. studied 111 CT scans of bicondylar tibial plateau fractures, and they found that 65 cases involved posteromedial tibial plateau fragments, with an incidence of 59%.

Some authors believed that the posteromedial tibial plateau fragment resulted from the avulsion fracture of semimembranosus tendon insertion site [7]. It is a split fracture caused by the impact on the posterior plateau from the femoral condyle with the knee subjected to vertical or varus stress in flexed or semi-flexed position [8].

The posteromedial fragment has several uniqueness. Firstly it has a large surface area. Barei *et al* found that the surface area of fracture fragment was 58% (19-98%) of the medial plateau surface and 23% (8-47%) of the entire plateau articular surface [9]. Higgins *et al* revealed that the average area of bone fragment was 25% of entire tibial plateau articular surface. The sagittal angle of fracture fragment is large and the displacement of articular surface is usually more than 5 mm. The posteromedial tibial plateau fracture is a vertical split

fracture not a compression fracture, even in the osteoporotic patients. All these factors make it unstable and demand fixation in absolute stability.

Bendayan *et al* described posteromedial approach. It is a versatile approach which provides adequate exposure of the fracture apex, provide adequate space for fragment manipulation and placement of buttress plate [10].

Hsieh *et al* placed lag screws from anterior to posterior for fixation of posteromedial tibial plateau fracture in 8 cases and the results were satisfactory. Most authors believe that it was prone to loss of reduction with the only use of lag screws when the fracture fragment was big [11]. Gosling *et al* 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 and the screws were usually in parallel with the fracture line of posteromedial fragment [12]. Therefore, satisfactory fixation cannot be achieved. The fixation of fracture fragment by placement of the lateral locking screws was unreliable and the rate of failure was very high. Zeng *et al* compared anteroposterior lag-screws fixation, anteromedial limited contact dynamic compression plate fixation, lateral locking plate fixation and posterior t-buttress plate fixation for the posteromedial tibial plateau fracture. It was confirmed that the posterior t-buttress plate fixation was biomechanically the most stable *in-vitro* fixation method for posteromedial tibial plateau fracture. To date, many satisfactory results of posterior buttress plate fixation in clinical practice are reported. The results of our study are satisfactory. The overall outcomes were favourable, with no serious soft tissue complications, no deep infection and no case of non-union. Rasmussen clinical and radiological scores showed excellent and good outcome in most patients.

### Conclusion

In conclusion fixation of posteromedial fragment of tibial plateau fracture with buttress plate provides high union rates, acceptable complications rates as well as satisfactory clinical outcome and radiological outcome.

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