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## Functional outcome of surgical management in schatzker type V, VI tibial plateau fractures with locking compression plate

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#### Abstract

Tibial plateau fractures are one of the commonest intra articular fractures. Results from indirect coronal or direct axial compressive forces. Among Tibial plateau fractures, Schatzker type V and VI tibial fractures are complex injuries, usually treated with open reduction and internal fixation (ORIF) using LCP plates.

**AIM:** This study was done to determine functional outcome and the complications of Schatzker V and VI tibial plateau fractures treated with LCP plates with a regular follow-up of 18 months.

**Materials and Methods:** Total 30 cases of tibial plateau fracture type V and VI treated with dual plating were studied from FEBRUARY 2017 to NOVEMBER 2018 in Sanjay Gandhi Institute of trauma and orthopaedics, Bangalore. The follow up duration ranged from 6 months to 15 months. The patients were operated through an anterolateral approach for lateral plate and a medial column plate was put through a minimally invasive medial approach or an open posteromedial approach.

**Results:** Total 30 patients were evaluated postoperatively thoroughly for functional and radiological outcomes by Modified Rasmussen Assessment criteria which showed 17 patients (56.7%) had excellent, 8 patients (26.7%) had good, 3 patients (10%) had fair and 2 patients (6.7%) had poor outcome

**Conclusion:** We concluded open reduction and internal fixation of high-energy tibial plateau fractures with LCP excellent to good functional outcome with minimal soft tissue complications. Thus, a minimally invasive approach should be used which helps in preventing soft tissue problems and helps in early wound healing. Fixation done by Dual plating is important for early mobilization of knee joint. Early mobilization leads to better range of movements and thereby better functional outcome.

**Keywords:** Functional outcome, surgical management, compression plate

#### Introduction

Tibial condylar fractures are one of the commonest intra- articular fractures. They result from indirect coronal or direct axial compressive forces. This makes about 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 frequency of bicondylar lesions is found in 10 to 30% of the reported Series <sup>[1]</sup>. The aim of surgical treatment of proximal tibia fracture is to restore congruent articular surfaces of the tibial condyles maintaining the mechanical axis and restoring ligamentous stability eventually can achieve functional painless and good range of motion in the knee joint <sup>[2]</sup>. The aim of the study is to analyse the post-operative surgical outcomes of functional outcome of surgical management in schatzker type v, vi tibial plateau fractures with proximal locking compression plate.

#### Materials and Methods

The study was conducted in the Department of Orthopaedics, Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore. This study consisted of 30 patients visiting the outpatient department and emergency department of the hospital. Patients diagnosed with Schatzker type V and VI Tibial plateau fractures who were operated during the period from February 2017-November 2018 were included in the study. The follow up duration ranged from 6 months to 15 months. All the fractures in the study group were post-traumatic.

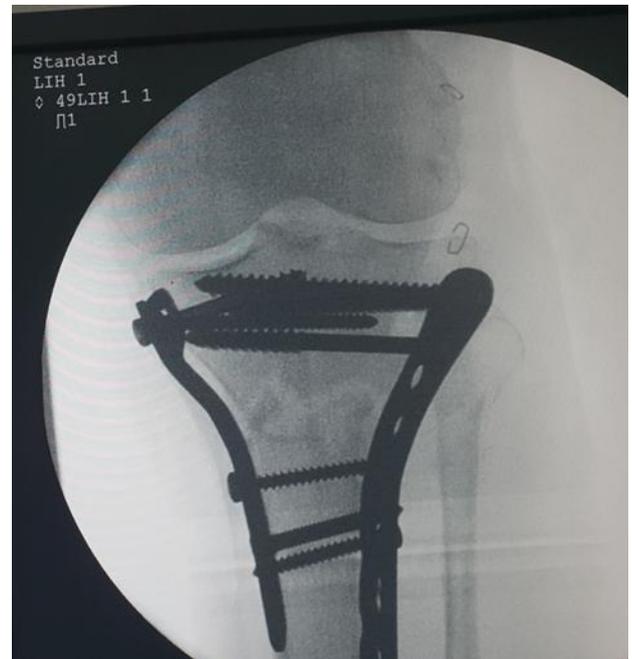
Pathological fractures and patients below 18 years of age were excluded from the study. The patients included are Patients above 18 years of either sex Closed tibial plateau fractures and also Open fractures up to type I, II as per Gustilo Anderson classification. The patients excluded are Patients below 18 years of age, Schatzker classification I, II, III and IV fractures, patients medically unfit for surgery, Concomitant associated fractures in the same limb and upper extremities and also patients with pathological proximal tibial fractures surgical technique

### Surgical Procedure

After anaesthesia, he or she is placed supine with a small sand bag under the gluteal region and a tourniquet is applied over the proximal thigh and is inflated. The limb is draped up to the level of iliac crest. Sterile bolster placed under the affected knee, provides the capability to flex the knee to 90 degrees. According to the preoperative plan, an anterolateral or Posteromedial incision was used. Deep dissection is carried out and full thickness flaps are raised consisting of subcutaneous fat down to the fascia. Meniscus was preserved in all the cases and submeniscal arthrotomy was carried out to visualize the articular surface. The fracture geometry was well understood and then reduction done accordingly, checked and fixed provisionally with K-wires under the guidance of C-arm. Thereafter locking compression plate/ buttress plate was placed and 6.5 mm cancellous screws applied and cortical screws applied in the diaphysis. Medial plating, posteromedial plating were applied on the medial side and posteromedial side, Lateral plating were applied on the lateral side to prevent collapse of the articular surface.



**Fracture reduction and plate application**



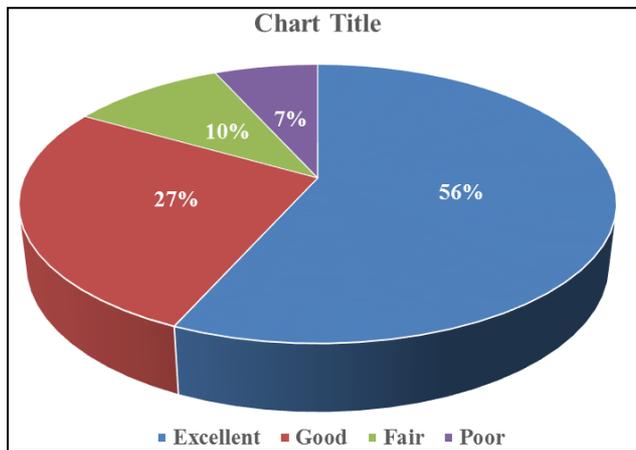
**Fig: 12 Intraoperative C-Arm Images**

### Postoperative protocol

Splints were removed and mobilization of the limb started on the 3rd or 4th postoperative day. Non weight bearing mobilization was started from the first post-operative week till 6-8 weeks depending on the fracture pattern, and then partial weight bearing after confirmation of the beginning of healing process till fracture union. Static quadriceps exercises were started on 1<sup>st</sup> postoperative day and active or active assisted bedside knee mobilization was started from second postoperative day. Suture removal was done on 11<sup>th</sup> postoperative day. The patients were then followed up for a minimum period of 6 months, during which time the anatomic and functional evaluation was done using the modified Rasmussen clinical and radiological criteria.

### Results

The mean age was 39.27 years. Majority of the patients in the study group were males 80% with a male to female ratio of 4:1. RTA was the most common mode of injury accounting for about 77% cases. Out of 30 fractures, 3(10%) were open fractures. All the 30 fractures analysed in this study were graded in accordance with Schatzker classification. It was observed that more of these fractures, i.e., 16(53.3%) out of 30 were type V, and 14 type VI (46.7%). In this study out of 30 fractures 17 had undergone dual plating and remaining 13 fractures had undergone single lateral locking compression plate. Additional procedure of cortico-cancellous bone grafting was performed in 6 patients in view of depressed fracture fragments. The average time to union was calculated to be 17 weeks. In almost 56.7% of cases fracture united in 17-20 weeks. 60% (17) of the patients in the study group had a knee flexion of greater than 120 degrees, only 13% (4) of the patients had knee flexion less than 90 degree. All the 30 patients were thoroughly evaluated postoperatively and functional outcomes were calculated using The modified Rasmussen Clinical and Radiological Assessment criteria, They showed 17 patients (56.7%) had excellent, 8 patients (26.7%) had good, 3 patients (10%) had fair and 2 patients (6.7%) had poor outcome.



**Clinical and radiological results assessed by MRC and MRR**

## Discussion

In this study it was observed that fractures of tibia plateau were more prevalent in younger and middle aged population with the mean age being 39.27 (range 18-65 years). Most cases about 60% were between 31-50 years i.e. in the fifth & sixth decade about 60%. Males were more commonly affected than females (24 males and 6 females). The mean age of the patients was 42 years (range 19-83) in the study by Standard *et al.* (2004) [3]. There were 25 males and 12 females in the same study. In another study by Schutz *et al.*, (2003) [4] the patients included 6 women and 16 men aged between 22 and 59 years (mean age of 42 years).

Therefore, proximal tibial fractures were seen more commonly in younger and middle aged population. They are more prone for injury especially due to vehicular accidents [5, 6], thus age group in our study was in accordance with above mentioned studies.

In our study that the majority of the patients suffered such fractures after high velocity road traffic accidents (77% of cases; 23 patients), and the remaining were after a domestic fall (23% of cases; 7 Patients). In our study, majority of the patients 27(90%) had closed fractures, 1(3.3%) had open fracture type I and 2(6.7%) patients had open type II fracture according to Gustilo and Anderson classification. majority of fractures in the study had severely comminuted intra-articular fractures. Higher grade of these fractures was attributed to high velocity. In our study, for highly comminuted fractures, i.e. Schatzker Type V & VI, Dual plating (Lateral L.C.P and Medial buttress plate) was applied in 57% of the cases, (17 cases), (8 Type V & 9 Type VI). Siddaram N. Patil *et al.* (2017), in their study on management of Schatzker's type V & VI tibial plateau fractures by different types of plate osteosynthesis, concluded that single plating and dual plating fixation of complex proximate all tibial plateau fracture Schatzker's type 5 and type 6 ensures stable fixation, immediate mobilization, satisfactory radiological outcome, very high union rates and excellent functional assessment outcome with a very low rate of complications [7]. Chang- Wug Oh *et al.* [14] reported the outcome of double plating in a series of 23 unstable proximal tibial fractures in 23 patients with a mean age of 54 years. All fractures healed at an average of 19 weeks. Twenty one patients had excellent or good clinical and radiographic results. There was one case of superficial infection which healed after hardware removal. The healing process was determined both clinically and radiographically. In our study the mean time to union was 17 weeks, with 57 % of fractures uniting in 17-20 weeks. In the

Study by Lee *et al.*, [10] the average time to healing of the 34 fractures were 4.2 months. In our study there were 3 cases (15%) of impending compartment syndrome. Two patients had undergone knee spanning external fixator and one patient were managed conservatively with strict immobilization, foot end elevation and anti-edema measures to reduce the intra compartmental pressure. The incidence of compartment syndrome after tibial plateau fracture has been reported to be as high as 31%, in a study by Zura *et al.* [9] with a positive correlation to fracture severity. In our study, complication in the form of infection was observed in 2 cases (7%). The infections were superficial, and were controlled with intravenous antibiotics given according to culture and sensitivity report.

We calculated the functional outcome using The Modified Rasmussen Clinical and Radiological Assessment criteria, they showed 17 patients (56.7%) had excellent, 8 patients (26.7%) had good, 3 patients (10%) had fair and 2 patients (6.7%) had poor outcome. Reduction of knee motion after tibial plateau fractures is common [11-21, 23]. This severe complication is thought to result from damage to the extensor retinaculum, to the joint surface or during surgical exposure for fixation. Extensor mechanism scarring with or without arthrofibrosis of the knee or patellofemoral joint can lead to restricted knee movement. These effects are greatly magnified by immobilization after fracture or internal fixation. Early stable fixation of the fracture, meticulous soft-tissue handling and immediate mobilization of the knee maximizes the chances of optimal outcomes after most tibial plateau fractures [16-24]. In the study by Lee *et al.* [10], the overall knee range of motion averaged 105 degree at the latest follow-up.

Thus, proximal tibial locking plate is a good device to stabilize the fractures of proximal tibia, especially when used in conjunction with meticulous intra operative handling of soft tissues and active participation of the patients in the rehabilitation.

Programme [3, 23]. In summary, locking compression plate is an efficient bone stabilization device, even in cases with soft tissue injuries.

## Conclusion

Proximal tibial locking plate is a good device to stabilize the fractures of tibial plateau (Intra Articular), especially when used in conjunction with meticulous intraoperative handling of soft tissues and active participation of the patients in the rehabilitation programme. MIPPO technique is expected to minimize the surgical incision, and by decrease the soft tissue stripping to avoid the post traumatic soft tissue injury. Since MIPPO technique provokes limited surgical insult to surrounding soft tissue and to the healing process biology, the complications have reduced.

The surgical treatment is aimed at precise reconstruction of the articular surface with elevation of the depressed bone fragment with bone grafting, stable internal fixation and allowing early range of movement to achieve good results. Prognosis of this complex fracture depends on the degree of articular reconstruction, the integrity of the soft tissue envelope, post-operative physiotherapy.

We found no statistical difference in assessing the Schatzker type V and VI fracture patterns. Comparable Results were achieved in radiological, clinical, subjective and functional outcomes based on The Modified Rasmussen Clinical and Radiological Assessment criteria.

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