# A PROSPECTIVE STUDY OF CLINICAL AND FUNCTIONAL OUTCOME OF PROXIMAL TIBIA FRACTURES TREATED WITH LOCKING COMPRESSION PLATES IN ADULTS AT A TERTIARY CARE HOSPITAL

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**ABSTRACT**

**BACKGROUND**

Most of the tibial fractures are closed fractures accounting to all most three quarters (76.5%) of all tibial fractures. Surgery is accepted more and more as primary treatment for proximal tibia fractures as studies have shown that operative treatment results in lower rate of fracture non-union, symptomatic malunion than conservative management. Incidence of high energy proximal tibia fracture is increasing and may contribute to these findings because, increased initial fracture displacement, shortening, comminution have been predictive of mal-union and poor patient outcome with non-operative care. Open reduction & locking compression plating thus may be better options for displaced proximal tibia fracture. The objective of the study is to evaluate the role of open reduction and internal fixation and to evaluate clinical and functional outcome of fracture of the proximal tibia treated with locking compression plates in adults with six months follow up.

**METHODS**

The study was carried out during the period of April 2015 to March 2018 in the Department of Orthopaedics, Inlaks and Budhrani Hospital, Pune, (MH). Study includes 30 cases of proximal tibia fracture in the population aged between 18 years to 60 years, irrespective of sex, with fracture proximal tibial plate (amenable to open reduction, internal fixation with LCP with minimum of three screw in proximal and distal fragment). The clinical and radiological outcome was evaluated using Rasmussen's score and plain radiograph. Union was evaluated clinically and radiographically. Complications were recorded.

**RESULTS**

Highest number of patients were seen mainly in the age group of 40-50 years (10 patients, 33.33%). Out of 30 patients, 28 were male patients (93.33%). Most patients had fracture union in 18 weeks and 16 weeks with 9 patients in each group (30%). The mean duration for fracture healing was 16.14 weeks.

**CONCLUSIONS**

This study showed clinically and radiologically satisfactory results. Overall operative treatment with locking compression plates can be used to obtain stable fixation and excellent outcome.

**KEYWORDS**

Tibia Plating, Tibia Fracture, Proximal Tibia

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## BACKGROUND

Knee is one of the major weight-bearing joints in the lower extremity. Proximal tibial fractures are one of the commonest intra articular fractures. Generally, these injuries fall into two broad categories, high energy fractures and low energy fractures. Fractures of the proximal tibia are the result of high-energy injuries, and because of the lack of soft tissue coverage in this region, it is vulnerable and open fractures are commonly encountered. In such cases, the treatment of damaged soft tissues is of primary concern.[1] The majority of tibial plateau fractures are secondary to high speed velocity accidents and fall from height.[2] Fractures result from direct axial compression, usually with a Valgus or varus moment and indirect shear forces.[3]

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.[4] The various clinical studies established that bone beneath a rigid conventional plate is thin and atrophic which are prone for secondary displacement due to insufficient buttressing and secondary fractures after removal of plates, fractures site

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take longer period to osteosynthesis due to interruption of vascular supply to bone due to soft tissue and periosteal stripping. So, there was the birth of a new concept of biological fixation using the plates, otherwise called minimally invasive percutaneous plate osteosynthesis (MIPPO). But this was difficult as conventional plates needed to be accurately contoured to achieve good fixation, osteoporosis also posed the same problem of poor fixation with conventional plates this led to the development of the internal fixators. Point contact-fix I later Point contact fix-II.[5] As more and more concepts about biological fixation become clearer the innovation of plates progressed and lead to the development of less invasive stabilization system. Research to combine these two methods has led to the development of the anatomically contoured locking compression plate. This new system is technically mature as it offers numerous fixation possibilities and has proven to worth in complex fracture situations and in osteoporotic bones.

The aim of the present study was to study the clinical and functional outcome in proximal tibia fracture treated with locking compression plate and to study the duration of union in proximal tibia fractures treated with locking compression plate.

**METHODS**

This study was a prospective study done on 30 consenting cases of proximal tibia fractures admitted in Inlaks and Budrani Hospital Koregaon park, Pune during April 2015 to March 2017 chosen based on inclusion and exclusion criteria. Patients were informed about the study in all respects and written informed consent was obtained. The follow up period was 6 weeks, 3 months and 6 months. Inclusion criteria was Schatzker classification type III to VI proximal tibia fractures in adults aged 18 years and above of either sex. Patients willing for treatment and informed and written consent. Exclusion criteria- Age less than 18 years. Patients not fit for surgery, managed conservatively for other medical reasons. All open fractures of proximal tibia. Patients with pathological proximal tibia fractures other than osteoporosis. Extraarticular fractures of proximal tibia. Patients with peri-prosthetic fractures. Sample size 30 cases of proximal tibia fractures were included in this study.

History was noted with name, age, sex, occupation with mechanism of injury like fall, direct injury to leg, road traffic accident. Clinical examination (both local and systemic) was done. On inspection the following points were noted, patients with fracture proximal tibia often support the knee of the injured side with the hand. Abnormal swellings, tenderness, present in the proximal third fracture of proximal tibia. The condition of the skin over the tibia was noted for any abrasion, laceration and contusion. On palpation the following points were noted palpation of the entire length of the affected Proximal tibia for tenderness in the medial middle third or in the distal third fracture. The tibia was also palpated for any abnormal mobility and crepitus. If movement of the affected side was restricted due to pain, distal neurovascular status of the affected lower limb was examined and also the associated injuries along with fractured tibia were noted. Routine investigation including complete blood count, Blood urea, Serum creatinine and ECG were done. HIV, HBsAg screening tests were done before surgery on all Subjects. Fracture anatomy was assessed with X-rays. Diagnosis was done after clinical and radiological assessment. Written informed consent was taken for surgical procedure. All patients were operated as early as possible once the patient was declared fit for the surgery by the physician. All cases were operated by experienced senior consultant orthopaedic surgeon.

Postoperatively the limb was kept elevated with pillows. Intravenous antibiotics were continued for first five days and then shifted to oral. Posterior splint was given if protection of fixation was desired. Sutured drain was removed after 48 hours depending on the amount of collection. Check X-Ray on 3rd post-operative day after drain removal. Quadriceps exercises and ankle mobilization was started within 48 hours. Knee bending and toe touch walking with walker on second or third postoperative day if the fixation allowed. Dressing was done on 2nd, 5th and 8th postoperative day. Sutures were removed on 14th postoperative day. Progressive weight bearing was allowed as tolerated by patient. Full weight bearing was permitted only after clinic-radiological evidence of union. Follow up was done at 6 weeks, 3 months and 24 weeks. X-ray was done in each post op visit and progression of union was noted, as well clinical examination was done on operated side for any sign of infection, tenderness or deformity. Follow up done up to 6 months. Physiotherapy of affected extremity was done during follow up as per stage of fracture union. Evaluation of outcome was done using RASMUSSEN's score.

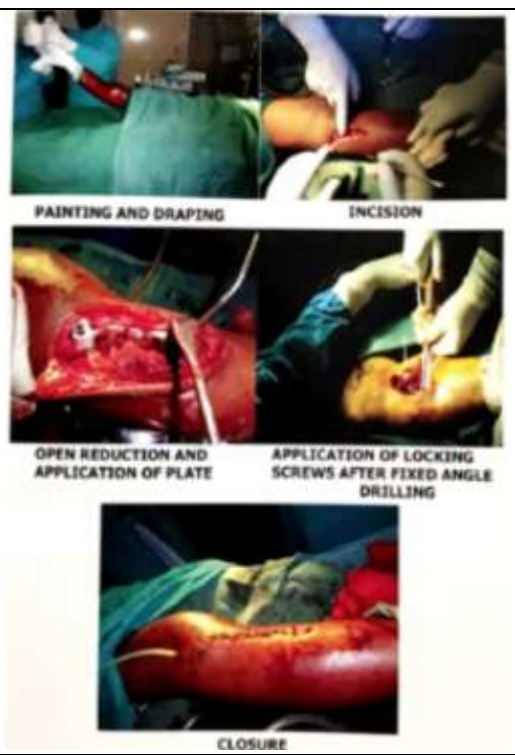


***Figure 1. ORIF Technique***

Statistical analysis was done using the SPSS (Statistical Package for the Social Science) Version 17 for window. The

demographic variability, mode of injury, side, approach, method of reduction and fixation, Schatzker type, ROM, fracture union, complication, outcome were calculated with number and percentage. The chi-square test was used to find significance between mode of injury, complication and outcome. The t test was used to find the significance difference of range of motion, fracture union according to outcome. A probability value of 0.05 was accepted as the level of statistical significance.


*Figure 2*


*Figure 3*


*Figure 4*

**RESULTS**

30 cases in the study most patients belonged to the category 41-50 years (10 patients, 33.33%). The mean age was 41.03 years. In the present study on evaluation of the gender distribution we found that of the 30 cases in the study most patients were males (28 patients, 98.33%) and on evaluation of the mode of injury we found that of the 30 cases in the study most patients were injured by vehicular accident (23 patients, 76.67). The side of injury we found that of the 30 cases in the study most patients had a right sided injury (18 patients, 60%). The type of Schatzker fracture we found that of the 30 cases in the study most patients had type III and type IV (9 patients in each group, 30%). The type of approach chosen for the treatment of fracture we found that of the 30 cases in study most patients had anterolateral approach (13 patients, 43.33%). On method of reduction and fixation we found that of the 26 cases in the study most patients were fixed by ORIF (28 patients, 93.33%). Most patients had good range of motion of 120* (8 patients, 26.67%) following surgery. The complications following surgery, 2 patients had superficial wound infection (6.67%) were tested by dressing and antibiotics, 1 patient had deep infection (3.33%) treated by debridement and antibiotics according to culture and sensitivity reports, 1 patient had non-union (3.33%) and was treated by replating with cancellous screw and bone grafting from iliac crest. 2 patients had knee stiffness (6.67%)

treated by physiotherapy and range of motion exercises. 24 patients had no complications. The duration taken for the fracture union most patients had fracture union in 18 weeks and 16 weeks (9 patients in each group, 30%), the mean duration for fracture healing was 16.14 weeks. In the present study on evaluation of the final outcome of the fracture most patients had excellent results (16 patients, 53.33%), the mean duration for fracture healing was 16.14 weeks. Final Outcome was not significantly related to Mode of Injury with P value being 0.30. In the present study on evaluation patients having Good and Excellent results had significantly better Range of Motion as compared to patients with Poor and Fair results with P value <0.0001.

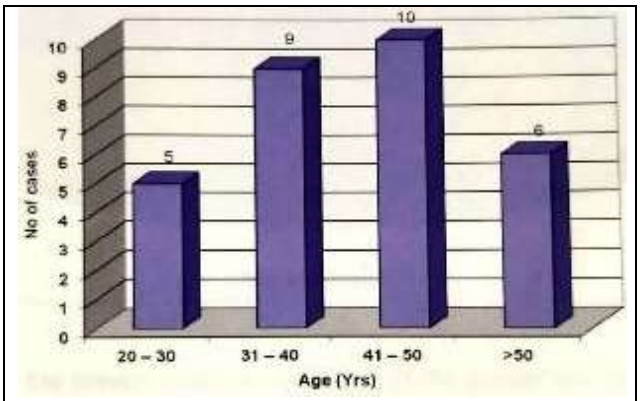


***Diagram 1. Bar Diagram Showing Age Distribution of Cases in Study Group***

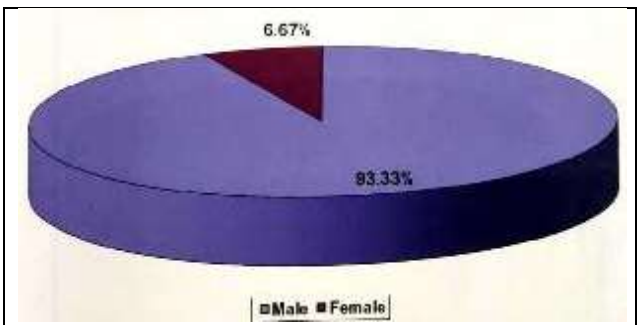


***Diagram 2. Pie Diagram Showing Sex Distribution of Cases in Study Group***

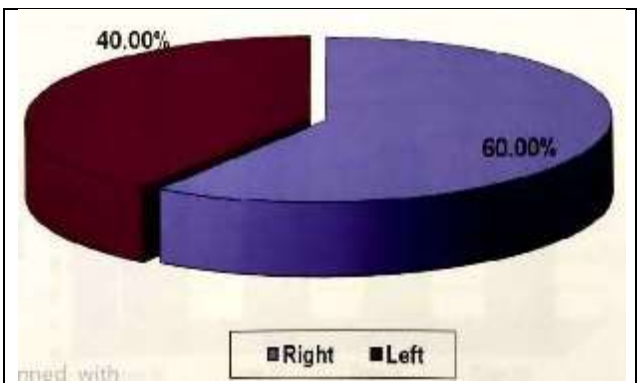


***Diagram 3. Pie Diagram Showing Side of Injury Wise Distribution of Cases in Study Group***

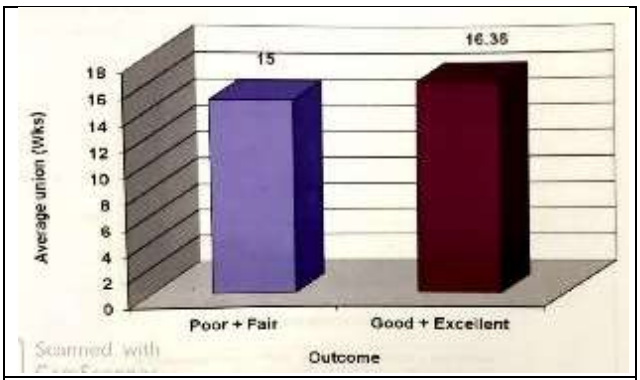


***Diagram 4. Bar Diagram Showing Comparison of Fracture Union According to Outcome in Study Group***

In the present study on evaluation patients with Poor and Fair outcome had more complications as compared to patients with Good and Excellent outcome. Proximal tibial fracture treated with LCP can be manipulated under anaesthesia in the event of plate bending due to re-injury. Because LCP provide angular stability and technique of MIPPO retains the fracture biology, manipulation under anaesthesia may be justified in these cases. The main purpose of the study is to evaluate outcome of the surgery. Hence all the patients included in the study are of the operative group. We have not included any conservatively managed group. Our study shows the effectiveness of the operative treatment as the articular surface was restored anatomically and fixed with suitable implant for early mobilization.

**DISCUSSION**

In a study by Tang Xin et al (2012)[6] study on evaluation of the age distribution, the mean age was 40 years which is similar to our study, and on evaluation of the gender distribution we found that of the 42 cases in the study most patients were males (30 patients) and females accounted for 12 cases of the total number, this gender distribution is similar to our study. In their study the mode of injury of most patients were injured due to RTA. Final outcome for most patients with surgical approach was excellent like our study In a study by Prasad et al[7] most patients had 120* and above knee flexion which is a finding similar to our study. All patients had union in 8-22 weeks (average 14 weeks). He had surgical outcome excellent like our study

Gosling et al[8] in a multicentre study, reported 23% postoperative malalignment and 14% loss of alignment when high- energy bicondylar proximal tibial fractures were treated with laterally placed LISS plate only. Phisitkul et al[9] reported immediate postoperative and delayed loss of alignment in 22% and 8% of cases, respectively, when lateral LISS plate was used in proximal tibia fractures. Marsh et al.[10] presented a series of 21 complex tibial plateau fractures treated with monolateral external fixation and limited internal fixation and reported a 14% rate of malalignment. Weigel and Marsh[11] presented a 5-years follow-up after treatment of 24 high-energy tibial plateau fractures with limited internal fixation and a monolateral external fixator. In a study by Shiva Naik et al.[12] they showed

that locking compression plate is an important armamentarium in treatment of fractures around knee especially when fracture is severely comminuted and in situation of osteoporosis. Jain et al.[13] showed that applied with proper understanding of biomechanics, LCP is one of the best available options for the management of challenging peri- and intra-articular fractures especially of proximal tibia. Patil et al[14] and co-workers in a study comparing the fixation of proximal tibial fractures by non-locking buttress verus locking compression plate by has almost same results in both groups and concluded that considering its high cost, LP should be used, where it is more advantageous than conventional plate. In a study by Peter A. Cole[15] Internal fixation using the LISS was performed at an average of 7.1 days (range: 0-29 days) after the injury. Twenty-two fractures were operated (within the first 24 hours. The implants used for the fractures in this series included 65-holes, 43 and 28 13-hole fixators. The mean number of locking screws used in the proximal articular segment was 4.9 (range: 3-7 screws), and the mean number of screws used in the distal segment was 4.8 (range: 2-6 screws).

**CONCLUSIONS**

Displayed tibial plateau fractures are best managed by surgery. Optimal knee function is achieved by accurate anatomical reduction and secure fixation followed by early mobilization to attain functional arc of motion. For minimally displaced fracture with minimal bone defects, percutaneous fixation suffices whereas for more comminuted fractures, open reduction and internal fixation is mandatory. Post-operative rehabilitation protocol in terms of non-weight bearing and achieving satisfactory range of motion needs to be strictly adhered to, in order to obtain optimal functional results. In our study, we found that proximal tibial locking plate provides complete union and early mobilisation to attain better functional outcome.

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