

# A Prospective Study of Functional Outcome of Tibial Condylar Fractures Treated with Locking Compression Plates

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**Abstract:** Background: There is a wide range in treatments for proximal tibial fractures. Functional outcome of tibial condylar fractures managed with locking plate and the importance of anatomical reduction and physiotherapy in obtaining good results needs to be evaluated.

Materials and Methods: Prospective descriptive study was carried out including all patients having proximal tibial metaphyseal fractures (both open and closed). Patients unfit for surgical management, and those less than 18 years old were excluded.

Results: In our series, the majority of the patients are found to be between the age group of 18-29 years (8) & 30-39 years (6). 90% of patients were male. Road traffic accident was the most common cause. Wound infections (superficial and deep) were the most common complications. According to Rassmussen's scoring system, 56.67% patients had excellent results, 30% had good results and 13.33% had fair results.

Conclusions: Locking plates gives excellent results in tibial condylar fractures with minimum complications. Achieving and maintaining anatomical reduction becomes easy with locking plates, which helps in early mobilization and hence obtaining good functional outcome in tibial condylar fractures and there is no substitute for early physiotherapy.

Keywords: Tibia condyle fracture, locking plate, anatomic reduction, physiotherapy.

**Thesis Question:** 1. What is the functional outcome of tibial condylar fractures managed with locking plate?

2. What is the importance of anatomical reduction and physiotherapy in obtaining good results?

3. What is the complication rate in tibial condylar fractures managed with locking plate?

**Thesis Answer:** 1. Tibial condylar fractures managed with locking plate gives good functional outcome.

2. Anatomical reduction combined with early physiotherapy is crucial in obtaining good results

3. Complication rates are minimal in tibial condylar fractures managed with locking plate

## THESIS SUMMARY

### Introduction

Low and high-energy tibial plateau fractures present a variety of soft tissue and bony injuries that can produce permanent disabilities and their treatment is often challenged by severe fracture comminution.

Potential complications vary with the degree of trauma energy and include soft tissue injuries requiring coverage procedures, compartment syndrome, peroneal nerve injury and vascular injury. Associated injuries include cruciate and collateral ligament injuries

and meniscal tears. Complex fractures include significant articular comminution and depression, condylar displacement, metaphyseal fracture extension and open or closed soft tissue injuries. New implants and surgical techniques have provided new options for the treatment of tibial plateau fractures. These include techniques of limited incision reduction for joint surface restoration, the ring and hybrid external fixators, percutaneous plates (LISS) and fixed angle plate and screw designs (LCP). High-energy tibial plateau fractures present a spectrum of soft tissue and bony injuries that can produce permanent disabilities. Their treatment is challenged by fracture comminution, instability, displacement and extensive soft tissue injuries. New implants and surgical techniques have provided new options for the management of these fractures. The goals of treatment are restoration of joint congruity, normal limb alignment, knee stability and a functional range of knee motion. There is a wide range in treatments for proximal tibial fractures. Surgical treatment of low-energy unicondylar tibial plateau fractures can usually be carried out at early stage. In most closed high-energy tibial plateau fractures temporary knee bridging external fixation is needed to allow soft tissue recovery. Delayed definitive surgical treatment can be carried out once optimal soft tissue conditions exist (7-21 days). Locking plates may decrease the need for dual plating in certain bicondylar fracture patterns. Locking plate in the lateral side in bicondylar tibial fractures might be a stable enough fixation when medial condyle is not comminuted and there is no separate posteromedial fragment. Dual plating is needed in bicondylar tibial plateau fractures with a separate posteromedial segment, complete separation of the entire medial plateau and medial articular comminution.

### Aims and Objectives

1. To study functional output of tibial condylar fractures managed with locking plate
2. To study importance of anatomical reduction and physiotherapy in obtaining good results and functional outcome
3. To study fracture patterns
4. To study complication rates

### Material and Method

A prospective study was conducted at Sir J J Group of Hospitals, Mumbai after obtaining the ethical clearance, to study functional output of tibial condylar fractures managed with locking plate and to study importance of anatomical reduction and physiotherapy in obtaining good results. We studied 30 cases of tibial condylar fractures during the period May 2010 – Nov 2012

Inclusion Criteria of our study was:

- All Proximal Metaphyseal Fractures of Tibia
- Both Closed and Open fractures
- Patient above Age of 18 years

Exclusion Criteria of our study was:

- All Diaphyseal Fractures
- Patient Less than 18 Yrs of Age
- Patients who are medically unfit for the surgery.

Patients were given plaster slab for temporary immobilization and surgery was planned after subsidence of swelling. As soon as the operation was planned, certain routine procedures were

regularly followed.

1. Use of antibiotics – 1 preoperative & 4 post-operative doses of first generation cephalosporin (cefuroxime)
2. Shaving & preparing the part for surgery always done
3. Selection of proper size of implants
4. Assessment of the joint instability under anaesthesia.
5. To verify if any other associated procedures might be required like bone grafting.

Rasmussen's Knee Score was used for evaluation of result.

### Results

Observation and analysis of results was done in relationship to age, sex, mode of injury, type of fracture, complications and the remarks of different age groups in details as follows

#### AGE DISTRIBUTION:

In our series, the majority of the patients are found to be between the age group of 18-29 years (8) & 30-39 years (6). The least number of cases are found in the age group between 70-79(0) and 80-89 years (1). The youngest being 19 years and the eldest being 81 years. average age being 40.47 yrs

#### SEX INCIDENCE:

There were 27 males (90%) and only 3 females (10%) in our series. This incidence of sex versus upper tibial fractures can be attributed to an overwhelming large proportion of male patients, because in our Indian setup, the female population largely working indoors or in the agricultural fields and do not indulge themselves in travelling or outdoor activities.

#### MODE OF VIOLENCE:

In this series, the majority of the patients treated are due to road traffic accidents

or automobile accidents [25 out of 30, 83.33 %]. There were 2 cases of domestic fall and 3 cases of fall from height

#### TYPE OF FRACTURE AND CORRELATION WITH MODE OF INJURY:

##### SCHATZKER'S CLASSIFICATION:

There was 1 case of Schatzker type I, 8 cases of Schatzker type II, no case of Schatzker type III, 3 cases of Schatzker type IV, 6 cases of Schatzker type V and 12 cases of Schatzker type VI.

##### Range of Motion

Range of motion of 120 to 140 degrees was achieved in all patients of which 7 achieved it at 3 months follow up, 14 achieved it at 4 months follow up and 16 achieved it at 6 months follow up

#### ASSOCIATED INJURIES:

Compound fractures were found in 2 patients which were managed by external fixator and plastic surgery intervention and final fixation with locked plates. One patient had distal end radius fracture which was managed by closed reduction and K wire fixation.

One patient had left humerus fracture who underwent plating for the same.

One patient had Patella fracture, managed by ORIF with TBW

Two patients had fracture of ipsilateral Lateral femoral condyle, fixed with two 4.5 mm CC screws

Three patients had fracture of tibia shaft treated with Interlock

nailing

Two patients had fracture shaft femur treated with Interlock nailing

One patient had compression fracture of D12 Vertebra, managed conservatively.

One patient had ipsilateral Popliteal artery thrombosis, managed with embolectomy by CVTS doctors

One patient had Head injury, managed by Neurosurgeons.

#### COMPLICATIONS:

Complications are divided into pre-operative & post operative; and post operative complications are further divided into septic and non septic types.

Pre operative –

Out of 30 patients 2 patients had compound fracture grade IIIB (Pt 27) and grade IIIC (Pt.19). Both patients were schatzker type VI. External fixator was applied to 2 patients. The aim of temporary spanning external fixation was, soft tissue healing. Local flaps used to cover the wound at a later date and final fixation with locked plates was done after complete wound healing (pt 21-154 days & pt 27 – 60 days)

Popliteal artery thrombosis was diagnosed in one patient (pt - 21). External fixator was applied in this patient. Time taken from the trauma to definitive fixation in this patient was 154 days

The decision to proceed with definitive fixation was based on the patient's medical fitness and recovery of the soft-tissue envelope. This staged treatment was individualized and based on the attending surgeon's experience and judgment in identifying satisfactory soft-tissue recovery. Specific clinical signs aiding in this decision included resolution of edema and fracture blisters and the return of skin wrinkling. Final results was excellent in one patient (pt.27) & fair in 1 patient (pt.21)

Post operative complications

Nonseptic Complications

Complications requiring surgical interventions due to implant failure/breakage was not seen in our study.

Septic Complications

Six patients developed superficial wound complications that responded to daily dressing and antibiotics. Deep wound infections occurred in 6 patients. Three patients (pt 10,20,26) responded to intravenous antibiotics as per culture and sensitivity report & plastic surgery intervention; and implant removal was required in other 3 patients (pt.13,24,28). Using the Fisher exact test, patient gender, age, use of temporary spanning external fixation, and compound fractures were not found to be statistically associated with the development of infection. The time delay to definitive surgery and patient age were similarly not found to be significantly associated with the development of deep infection.

CLINICAL RESULTS (According to Rasmussen's Knee Scoring System):

In our series Excellent results were achieved in 17 cases (56.67%), Good results in 9 cases (30%) and Fair in 4 cases (13.33%).

### Conclusion

Locked plate technology has evolved in an effort to overcome the limitations associated with conventional plating methods, primarily for improving fixation in osteopenic and metaphyseal bone. The development of screw torque and plate-bone interface

friction is unnecessary with locked plate designs, significantly decreasing the amount of soft tissue dissection required for implantation, preserving the periosteal blood supply, and facilitating the use of minimally invasive percutaneous bridging fixation techniques. The locked plate is a fixed-angle device because angular motion does not occur at the plate screw interface. The use of locked plate technology allows the orthopaedic surgeon to manage fractures with indirect reduction techniques while providing stable fracture fixation<sup>51</sup>.

High energy, complex bicondylar tibial plateau fractures, however, typically present with an associated severe soft-tissue injury. Extensive dissection through the tenuous soft-tissue envelope to achieve reduction and apply conventional stabilizing implants, particularly through a midline incision, may significantly increase postoperative infection rates and implant failure leading to loss of fracture reduction, hindering long-term successful outcome.

There are two major problems for the operative treatment of tibial head fractures: On the one hand there is a highly elevated infection rate for the treatment of bicondylar tibial head fractures, caused by the frequently necessary vast exposition of the fracture and its fragments for the placement of double-plate osteosynthesis. These double-plate osteosynthesis are affiliated with an overall infection rate of up to 50%. Therefore many authors point out that, if possible, only one plate should be used. Separate screws from the opposite side can help to provide sufficient stability. If double-plate osteosynthesis can not be avoided it is strictly recommended to use two separate skin incisions. The Y-shaped approach is not used and recommended anymore, due to the high rate of skin necrosis [6,8,9,10,15,16,17](#). On the other hand, during the last decades, older patients suffer from tibial head fractures due to a change of the age structure and activity level in our population. In contrast to younger patients the reason for tibial head fractures of older patients is usually a minor trauma, which leads to plateau-fractures of the tibial head. Reason is the usually pre-existing osteoporosis [2,3,18](#).

Our own collective consisted of 18 patients with a bicondylar Schatzker type – V(6) & VI (12) tibial head fracture. Out of 18 patients for the 13 patients suffering from a bicondylar fracture we used a unilateral osteosynthesis with a locked screw plate with or without supportive screw fixation from the opposite side. All these cases would have required a bilateral conventional double-plate osteosynthesis, if treated without locking plate & screws. No statistically significant wound infection and no secondary loss of reduction, especially of the contralateral tibial head, occurred.

Our results show, that a unilateral plate fixation of the bicondylar tibial fracture is sufficient. With the use of locked-screw plates also the contralateral tibial head fragment can be held in position. We did not observe severe complications like deep wound necrosis or osteitis, which are well known after bilateral incisions. Rasmussen-score of our group showed a result comparable to the results of other authors treating bicondylar tibial head fractures.

Main problem for the treatment of tibial head split depression fractures or gap-fractures, where the reason is usually a minor trauma, is not infection but secondary loss of reduction due to the missing stability of conventional implants especially in

osteoporotic bone<sup>2,3,7,12,13,22,23</sup>. The all 30 patients (9 patients with osteoporotic bone) suffering from tibial plateau fractures, which we treated with angular stable implants, showed no loosening or failure of the osteosynthesis.

Unilateral plate fixation for the treatment of bicondylar tibial head fractures, as well as the treatment of osteoporotic tibial plateau fractures with angular stable implants, seems to offer advantages in particular concerning infection rate and implant failure in the treatment of tibial head fractures.

The indications and uses for locking plate technology continue to be defined. One important problem to avoid is the creation of an overstiff construct by placing locked screws when not needed (or more than what is needed). The resultant relative lack of motion at the fracture site can, in some situations, be too stiff to allow fracture healing. This has led some to refer to locking plates as “nonunion generators.”

Thus, the indications and correct utilization of locking plates is important to understand so they are not used inappropriately and compromise fracture healing. In addition, newer techniques such as “hybrid” plating (use of both locking and nonlocking screws in a single construct) and far cortical locking (obtaining purchase in far cortex while bypassing proximal cortex) have evolved to combat these problems sometimes seen with locking plate<sup>52</sup>

### Conclusion

1. Tibial condylar fractures are common in males than in females.
2. Road traffic accidents were the commonest cause of mode of injury in tibial condylar fractures.
3. Locking plates gives excellent results in tibial condylar fractures with minimum complications.
4. Anatomical reduction is of utmost importance in obtaining good functional outcome in tibial condylar fractures.
5. Early and vigorous physiotherapy is required in obtaining good result in tibial condylar fractures.

### Clinical Message

Tibial condylar fractures are most difficult fractures to be managed even in experienced hands. Achieving and maintaining anatomical reduction becomes easy with locking plates, which helps in early mobilization and hence obtaining good functional outcome in tibial condylar fractures and there is no substitute for early physiotherapy.

### Keywords

Tibia condyle fracture, locking plate, anatomic reduction, physiotherapy

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