



MANAGEMENT OF PROXIMAL TIBIAL FRACTURE WITH LOCKING PLATE AT NMC, SASARAM, BIHAR

Orthopaedics

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ABSTRACT

BACKGROUND: Management of Proximal tibia fractures is complex due to its proximity to joint, associated soft tissue complications. Conventional methods of management of these fractures have their own shortcomings. Locking plates have been introduced which offer angle stable fixation with minimal soft tissue compromise.

OBJECTIVES: To evaluate the results of locking plate system for proximal tibial fractures in with emphasis on functional outcome, soft tissue complications, rate of infection and time to union.

METHODS: It's a retrospective study carried out at Orthopaedics Department of NMC, Sasaram, Bihar. Thirty patients with proximal tibia fractures treated with locking plates were reviewed with a minimum one year follow up. The final outcome was assessed using the Rasmussen's score.

RESULTS: Median age of the patients was 36 years. The average time to union was 20 weeks. Rasmussen's score was good to excellent in 80% of cases. Infection was seen in two cases and malunion in one case.

CONCLUSION: Surgical management of proximal tibial fractures with Locking plate give excellent anatomical reduction and rigid fixation to restore articular congruity, help to facilitate early mobilization and reducing post-traumatic osteoarthritis and hence to achieve optimal knee function.

KEYWORDS

INTRODUCTION

Proximal tibia being involved in body weight transmission through knee joint and leg, it plays a vital role in knee 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. Fractures of proximal tibia are common yet serious injuries involving major weight bearing joint surface of the knee. If not treated well, it results in significant functional impairment. With increasing high velocity trauma, the surgeon has to deal with complex injuries with severe soft tissue compromise. High energy fractures are associated with complex fracture patterns, intra-articular involvement, severe comminution and displacement where a wedge depression and pure depression type are seen in the low energy group. These fractures are also predisposed to complications like compartment syndrome and injury to the neurovascular structures and soft tissue envelope. The objective of treatment is to attain fracture union with a stable knee joint with a functional painless range of motion. Conventional treatment modalities to achieve the desired result have included non-operative modalities like cast, braces and traction; percutaneous wires with external/hybrid fixators and single or dual plating methods. Each of these methods has its limitations prompting the search for better techniques and implants. The introduction of locking plates has added a new dimension in the treatment of these injuries.

Locked-plate fracture-fixation techniques and designs continue to evolve, from LISS (Less Invasive Stabilization System) to the Locking Compression Plate (LCP) system. Data regarding the use of these plates and their functional outcome in Indian population is scarce which necessitates this study.

METHODS:

From April 2018 to March 2019, patients with proximal tibia fractures managed with locking plate system at Narayan Medical College, Sasaram, Bihar were included in the study. They were followed up for a minimum of one year. Patients with active or recent infection involving leg, extensive comminution, Gustilo and Anderson.

Type IIIC fractures and open fractures with extensive soft tissue damage and/or contamination were excluded. Anteroposterior and lateral radiographs of the thigh and leg including the knee joint were taken to determine the fracture pattern, classifying the fractures according to the Schatzker classification and for preoperative planning. Computed tomography (CT) scan was done in cases where

more detailed fracture configuration was required.

The patients were stabilized and local soft tissue condition assessed pre-operatively, else the surgery was deferred till the wrinkle sign appeared.

Minimally invasive plate osteosynthesis (MIPO) was used wherever the fracture configuration and soft tissue condition permitted. Precontouring of plates was done wherever necessary to achieve optimal seating of the plate. Primary bone grafting was performed to fill bone defects only in case of depressed fractures. Post operatively, limb elevation was done and quadriceps exercises and ankle mobilization were started within 24 hours of surgery. The patients were given posterior splintage if protection of fixation was desired in comminuted fractures. Knee bending and toe touch walking with a walker was commenced on second or third postoperative day if the fixation allowed otherwise the patient was kept non weightbearing ambulation and a posterior splint. In open fractures, intravenous antibiotics were continued till the wound condition necessitated the same. Patients were followed up clinically and radiologically in the outpatient clinic at monthly intervals till one year. Progressive weight bearing was allowed according to the callus formation as assessed in follow up radiographs. Full weightbearing was permitted only after clinico-radiological evidence of union. Union was defined as bridging of three of the four cortices and disappearance of the fracture line on the plain radiographs for a patient who was able to bear full weight. Fracture in the process of union but not united at six months was considered as delayed union. Nonunion was defined as a fracture that did not heal within a year. At the end of one year, functional outcome score was analysed using the Rasmussen's knee score.



Figure 1a. Preoperative Schatzker Type VI fracture

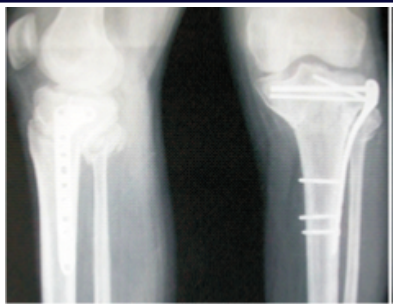


Figure 1b. Immediate post p radiograph showing unresorbed medial fragment

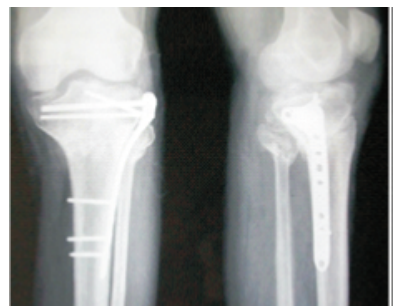


Figure 1c. Radiograph at twelve weeks showing malunion

RESULTS

There were thirty patients with proximal tibia fractures treated with locking plate system. The mean follow up was 18 months (range 12 to 24 months). Twenty two fractures were due to road traffic accidents and eight due to different other causes. There were five open fractures all of which were Gustilo and Anderson Grade IIIA injuries. The fractures were classified according to the Schatzker classification. Twenty four out of 30 fractures were Type V or Type VI injuries signifying that majority of fractures

in this study were comminuted intra-articular fractures. In our series, 12 patients had concomitant injuries to other systems. In eight cases, other long bone fractures were also present out of which ipsilateral femur fracture was present in two cases. The operative intervention was performed within 24 hours of presentation in all except four cases who had closed fractures with extensive soft tissue edema and impending compartment syndrome. The average time for operative intervention in these patients was seven days (range five to ten days). MIPO technique was used in eight cases – six cases where fracture reduction was easily achieved with indirect reduction and two cases where long plates were used for fractures extending into tibial diaphysis using the bridge mode. Primary bone grafting was done in two cases with depressed fractures – with autologous bone graft taken from iliac crest. Wound Infection was observed in two cases. One was superficial infection in a patient with impending compartment syndrome which was controlled with an extended course of intravenous antibiotics, continuous limb elevation. The other patient with deep infection and positive culture had a Grade IIIA open fracture with extensive comminution and bone loss. This patient required two debridements – one in the same hospital admission and another after three weeks before the wound healed by secondary intention.

In our study, fracture nonunion was observed in one patient who had Schatzker Type VI fracture. Plate fixation was done in bridge mode and the patient showed nonunion at the diaphyseal site which was managed with bone grafting at one year resulting in healing of fracture. There was one case of malunion in Schatzker Type VI fracture where reduction of the medial condyle was not achieved intra-operatively (Figure 1a-c). The average time to union was calculated to be 18 weeks (range 14-24 weeks). In 50% of cases, fracture united in 14-16 weeks. Fracture union was found to be slower in open fractures with a mean of 22 weeks as compared to closed fractures.

In this study, Rasmussen's score was applied to analyse the functional outcome. After evaluation, it was observed that 24 (80%) of patients had good to excellent results while six patients (20%) had fair results (Table 1). The average range of motion in our study was from two degrees (range 0° – 15°) to 120° (range 60° – 140°).

TABLE 1 Rasmussen's score showing functional outcome at one year follow up

SCORE	RESULT	NO. OF PATIENTS	PERCENTAGE
27-30	Excellent	12	40
19-26	Good	12	40
10-19	Fair	6	20
<10	Poor	Nil	NIL

DISCUSSION

Proximal tibia 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. The goals of treatment are restoration of joint congruity, normal limb alignment, knee stability and a functional range of knee motion. With the introduction of locking plates, many limitations of conventional plating have been overcome. The angle stable locking screws allow secure fixation of the opposite condyle with a single plate thus avoiding extensive soft tissue dissection. Contact area between the plate and the bone is minimal thus preserving periosteal blood supply. Our patient cohort represents the subset of population presenting with complex fracture patterns (Schatzker Type V and VI) accounting for 80% of cases which is due to high velocity trauma. A five to 27 year review from Netherlands by Rademakers et al., had only 14% fractures from the Schatzker V and VI types. This was attributed to excellent road safety measures which lowers the incidence of high velocity trauma. The mean time to union in our study was 17.6 weeks, with 50% of fractures uniting in 14-16 weeks. This is comparable to contemporary studies with locked plating. In our study infection was observed in 6% cases (n=2). These are similar to rates of infection reported by Lee et al (8%), Gosling et al (6%) and Stannard et al (5.9%).

An analysis of functional outcome using Rasmussen's score showed that 80% of patients had good to excellent results with average range of motion at the knee being two degrees (range 0°–15°) to 120° (range 60°–140°). In another study using LISS, the mean knee extension was 1° (0°–15°) and the mean knee flexion was 109.3° (60°–135°).

A study of 27 closed tibial plateau fractures by Mathur et al treated with conventional plates showed excellent Rasmussen score in 40% (n=12) and good in 40% (n=12) of cases. However, their patient cohort had mainly low energy fractures with Schatzker Type V and VI fractures accounting for 20% of injuries (n=6) as compared to 80% in our series. A subset of six patients in our series with fair Rasmussen score had lesser range of motion due to severe intra-articular comminution resulting in bone loss and hence prolonged immobilization. This study further establishes the role of periarticular locked plates to treat the difficult problem of proximal tibia fractures. It offers clear advantages in complex comminuted fractures with decrease in soft tissue complications and improved union rates. Our study was a retrospective non-blinded study with no control group. A study with better design and level of evidence will further clarify the role of these plates.

CONCLUSION

Surgical management of proximal tibial fractures with Locking plate give excellent anatomical reduction and rigid fixation to restore articular congruity, help to facilitate early mobilization and reducing post-traumatic osteoarthritis and hence to achieve optimal knee function. LCP remains a good choice in comminuted or more severe patterns of fractures. Management of proximal tibia fractures needs both mechanical and biological fixation. Locking plates combined with biological techniques have improved patient outcomes with respect to union rates, soft tissue complications and functional outcomes.

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