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FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF EXTRA-ARTICULAR PROXIMAL TIBIAL FRACTURES TREATED WITH LOCKING COMPRESSION PLATE: A PROSPECTIVE OBSERVATIONAL STUDY

Orthopaedics

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ABSTRACT

Background: Extra-articular proximal tibial fractures are difficult injuries because of metaphyseal widening, poor soft tissue coverage, and a high tendency for malalignment. Locking compression plate fixation using minimally invasive plate osteosynthesis (MIPO) has emerged as an important modality for achieving biological fixation.**Aim:** To evaluate the functional and radiological outcomes of extra-articular proximal tibial fractures treated with proximal tibial locking compression plating.**Materials and Methods:** This prospective observational study included 25 patients with extra-articular proximal tibial fractures treated with locking compression plates between April 2023 and January 2025. Functional outcome was evaluated using the Knee Society Score (KSS), while radiological assessment included fracture union, alignment, and callus formation.**Results:** Mean operative time was 92.12 ± 13.32 minutes and mean intraoperative blood loss was 140.96 ± 5.57 mL. Functional KSS improved progressively from 64.44 at one month to 81.76 at nine months. Radiological union was achieved in the majority of patients. Excellent functional outcomes were achieved in 64% of cases. **Conclusion**: Locking compression plating using MIPO principles provides stable fixation with satisfactory functional and radiological outcomes in extra-articular proximal tibial fractures.

KEYWORDS

Proximal Tibia Fracture, Locking Compression Plate, Mipo, Lcp, Functional Outcome

INTRODUCTION

Proximal extra-articular tibial fractures constitute approximately 5–11% of all tibial fractures. These fractures commonly occur following high-energy trauma such as road traffic accidents and falls from height. Management of these fractures is challenging because of the broad metaphyseal canal, poor soft tissue envelope, and tendency toward varus, valgus, and procurvatum deformities.

Historically, conservative management resulted in prolonged immobilization, malunion, knee stiffness, and delayed rehabilitation. The development of locking compression plate systems and minimally invasive plate osteosynthesis techniques has significantly improved outcomes by preserving fracture biology and minimizing periosteal stripping.Locking compression plating provides angular stability and allows indirect reduction while preserving soft tissue integrity. The present study was conducted to evaluate the functional and radiological outcomes of extra-articular proximal tibial fractures treated with locking compression plating.

Aim and Objectives

To study functional outcomes using Knee Society Score.
To assess radiological union and alignment.
To evaluate operative parameters such as surgical time and blood loss.
To analyze complications associated with proximal tibial locking compression plating.

Materials and Methods

This prospective observational study was conducted in the Department of Orthopaedics and Trauma Centre, J.A. Group of Hospitals, Gwalior, from April 2023 to January 2025. Twenty-five patients with extra-articular proximal tibial fractures treated with proximal tibial locking compression plates were included.

Inclusion Criteria	Exclusion Criteria
Age 20–50 years	Polytrauma
Closed fractures	Multiple fractures
GA Grade I open fractures	Arthritic knees
Extra-articular fractures	Age >50 years
Consent for surgery	Patients unwilling for surgery

Patients were evaluated clinically and radiologically. Functional assessment was done using the Functional Knee Society Score (KSS). Radiological assessment included evaluation of visible callus, coronal alignment, sagittal alignment, malunion, and nonunion.

Surgical Technique

Patients were positioned supine on a radiolucent table. Through a lateral proximal tibial incision near Gerdy's tubercle, a proximal tibial locking compression plate was inserted using minimally invasive plate osteosynthesis principles. Indirect reduction was achieved under fluoroscopic guidance. Locking screws were inserted proximally and distally to obtain stable fixation. Postoperatively, early knee mobilization and physiotherapy were initiated.

RESULTS

Table 1: Demographic Distribution

Variable	Number	Percentage
Male	20	80%
Female	5	20%
Road Traffic Accident	17	68%
Fall from Height	8	32%
AO Type 41A3	12	48%
Associated Fibula Fracture	20	80%

Table 2: Operative Parameters

Parameter	Mean ± SD
Time from injury to surgery	7.28 ± 3.64 days
Surgical duration	92.12 ± 13.32 minutes
Fluoroscopy time	98 ± 24.40 seconds
Intraoperative blood loss	140.96 ± 5.57 mL
Incision size	6.16 cm
Knee ROM at 9 months	115.40°

Table 3: Functional Knee Society Score

Follow-up	Mean KSS
1 month	64.44
3 months	70.44
6 months	79.20
9 months	81.76

Table 4: Final Functional Outcome

Outcome	Number	Percentage
Excellent	16	64%
Good	5	20%
Fair	1	4%
Poor	3	12%

Table 5: Complications

Complication	Number	Percentage
Superficial infection	3	12%
Deep infection	2	8%
Malunion	3	12%
Nonunion	2	8%

DISCUSSION

The management of extra-articular proximal tibial fractures remains challenging because of difficulties in maintaining alignment and preserving soft tissues.

Locking compression plating using minimally invasive techniques has become increasingly popular because it combines stable fixation with biological preservation.

In the present study, most patients were males in the 31–50 years age group, similar to the observations of Court-Brown and Caesar, who reported a predominance of high-energy trauma among economically active males. Road traffic accidents constituted the most common mechanism of injury, which correlates with previous studies.

The mean operative duration in the present study was 92.12 minutes, comparable to studies by Naik et al. and Cole et al., who demonstrated satisfactory fixation with MIPO techniques.

The use of indirect reduction and fluoroscopic guidance may increase operative duration slightly but improves biological fixation and decreases soft tissue damage.

Functional outcomes improved progressively during follow-up. The mean KSS improved from 64.44 at one month to 81.76 at nine months. Excellent or good outcomes were achieved in the majority of patients. These findings are consistent with studies by Bhandari et al. and Lindvall et al., who reported satisfactory outcomes following proximal tibial locking compression plating.

Radiological union was achieved in most patients. MIPO techniques preserve periosteal blood supply and promote secondary fracture healing with abundant callus formation.

Malunion occurred in a small number of patients and was primarily related to severe metaphyseal comminution and technical difficulties in reduction.

The superficial infection rate in the present study was acceptable and comparable to previously published literature. Careful soft tissue handling, indirect reduction techniques, and limited periosteal stripping likely contributed to lower wound complications.

Although intramedullary nailing offers advantages such as early weight bearing and smaller incisions, locking compression plating continues to provide excellent control of metaphyseal alignment, especially in fractures with severe comminution or coronal instability.

CONCLUSION

Locking compression plating using minimally invasive plate osteosynthesis provides stable fixation and satisfactory functional as well as radiological outcomes in extra-articular proximal tibial fractures. The technique preserves fracture biology, facilitates union, maintains alignment, and allows early rehabilitation. Meticulous surgical technique and careful soft tissue handling are essential for achieving optimal results.

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