



FUNCTIONAL AND RADIOLOGICAL OUTCOME OF LOWER THIRD TIBIAL FRACTURES IN ADULTS TREATED BY MIPPO WITH LOCKING COMPRESSION PLATE - A PROSPECTIVE STUDY

Orthopaedics

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ABSTRACT

Background: Treating distal tibia fractures can be challenging because of the limited soft tissue available at this region, the subcutaneous location of the bone, precarious blood supply and its close proximity to ankle joint. Treatment for fractures of distal tibia remains a controversial subject despite an ample amount of advances in both non-surgical (conservative) and operative care. **Material And Methods:** This is a prospective study to analyse the functional and radiological outcome of fixing the distal third of tibia treated with Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO). **Results:** 30 patients were treated for extra articular distal third tibia fracture with MIPPO. In our study all 30 patients achieved radiological union at a mean time of 15.6 weeks. 94% had excellent to good objective results based on AOFAS criteria and 97% had excellent subjective criteria. We observed ankle joint stiffness in 2 patients and 3 had superficial infection. **Conclusion:** Treating the closed distal third tibial fractures with LCP with MIPPO technique provides an early union and excellent to good functional outcome.

KEYWORDS

Distal tibia, MIPPO, LCP, Prospective study

INTRODUCTION

Considering the fractures of the distal third of the tibia, treating the fractures can be challenging because of the limited soft tissue available at that region, the subcutaneous location of the bone, precarious blood supply and its close proximity to ankle joint¹. Treatment for fractures of distal tibia remains a controversial subject despite ample amount of advances in both non-surgical (conservative) and operative care².

The aim while fixing the distal third tibia fracture is to precisely realign the fracture fragments, regain the limb length and rotation compared to sound side for early functional recovery. Because of higher incidences Road Traffic Accidents (RTA) the incidences of fractures increased. It accounts for nearly close to 1% of all the lower limb fractures³. Most common mechanism of injury is loading force along the axis of tibia⁴. The location and the pattern of the fracture is primarily determined by the position of the foot and the direction of force at the time of the injury⁴.

Surgical fixation of distal third tibia fractures, require sound preoperative planning based on the fracture pattern, soft tissue condition, quality of the bone and intra-articular involvement as it critically affects the choice of technique of fixation⁵. Several techniques of treatment have emerged – conservative by plaster application, use of hybrid external fixation, intramedullary nailing technique, plate osteosynthesis and Minimally invasive percutaneous plate osteosynthesis (MIPPO)⁶.

Non-surgical treatment of fracture is opted for closed undisplaced stable fractures and patients who are unfit for surgery⁷. The complications of conservative management such as malunion, shortening, restricted range of movement and early osteo-arthritis of the ankle joint can occur⁸. The classic way of doing open reduction and plate osteosynthesis required abundant amount of soft tissue exposure by dissecting and stripping the periosteum which resulted in more cases of infection, nonunions and malunion⁹.

MATERIALS AND METHODS

This is a prospective study to analyse the functional and radiological outcome of fixing extra articular distal third of tibia fracture by Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) using locking compression plate (LCP). This study was conducted in Aarupadi Veedu Medical College and Hospitals, Pondicherry from September 2017 to January 2021. The study includes 30 patients who sustained closed distal tibia fractures.

In this study, the patients age ranged from 20-70 years where majority

of patients were aged between 30-50 years (50%). Out of 30 patients, 19 were affected on the left side and 11 were affected on the right side. The maximum numbers of patients were Male (80.0%) and 20% of patients were Female. The result shows that majority of patients had injury due to RTA (66.7%) whereas 33.3% of patients had injury due to fall from height. In our study, most of the patients were classified into 43A1 group (43.3%). 33.3% of patients were classified into 43A3 group and 23.3% of patients were classified into 43A2 group.

Surgical Technique

After pre-operative evaluation all surgeries were done under spinal anaesthesia. Patient in supine position on a radiolucent table with a bump in ipsilateral gluteal region to stabilise the limb from rotation. Pneumatic tourniquet applied and time noted. Various length of Locking Compression Plates (LCP) with different number of holes are available. Plates are selected based on the required number of holes proximal and distal to the fracture site. The plate length should be 8-10 times the width of the fracture in a simple fracture and 3-4 times in a multi-fragmentary fracture. The LCP comes pre-bent according to the anatomy of distal tibia. Under image intensifier fracture reduced by closed method using a distractor. The proximal pin of the distractor is applied well away leaving adequate space for plate fixation and distal pin is applied in the distal tibia or in the talus. A 3-4 cm longitudinal incision is made over the medial malleolus and with the help of cobb's elevator a tunnel is created from distal tibia to towards the shaft. This tunnel lies subcutaneously. Then the plate is introduced through it. It should be placed at the centre of the distal tibia and holes be sitting on the medial aspect. Then the plate is held distally by application of an appropriate screw in the distal most hole which is not tightened fully. Then proximally stab incision is made over the proximal hole and then appropriate self tapping screws inserted. Then fracture reduction, alignment, length, rotation and inclination of the articular surface confirmed under image intensifier and the remaining holes are fixed with screws of appropriate length. After a thorough wash, wound closed in layers.

Postoperative Protocol

- One dose of pre-op Antibiotic at the time of spinal anaesthesia and then until 24 hours of post-op it was continued.
- Patient was started with ankle and toe movement exercises on post operative day 1 and was allowed to start non weight bearing ambulation from second post operative day and sutures was removed on 14th post operative day.
- The patients was followed up on 6th week, 12th week and 6th month of post operative period
- During follow-up, the skin condition, range of ankle movements,

radiological fracture healing, length and alignment were assessed.

- Partial and full weight bearing ambulation were allowed based on the radiological union and consolidation of the fractures.

RESULTS

30 patients were treated with MIPPO for distal third tibia fracture with patients age ranging from 20 to 70 with mean age of 36.9 years. In this study 24 patients were male and 6 were female. We observed that Road traffic accidents were the most common cause of the injury (66.7%) followed by self fall (33.3%). 19 patients were affected on the left side whereas the remaining 11 were affected on the right side. Based on AO classification most of the patients were classified into 43A1 group (43.3%), 33.3% were in 43A3 group and 23.3% were in 43A2 group. The mean duration between the trauma and the surgery was 10.4 days as it is ideal to wait for the 'wrinkle sign' to appear. The mean time for the duration of surgery was 53.66 minutes. All the cases were followed up for a minimum of 6 months. The mean duration of radiological union was 15.6 weeks with ranging from 14 to 20 weeks. 3 patients had complaints of post operative ankle stiffness and 2 patients had superficial skin infection which was treated with intra-venous antibiotics. The mean and standard deviation of AOFAS Score is 91.067 ± 5.626 . The median AOFAS Score is 94 and the range is 20 (76-96). The inter-quartile range is 8 which we get from Q1 (88) and Q3 (96). The objective result shows that 17 patients (56.7%) had Excellent results. 11 patients (36.7%) had Good result and 2 patients (6.7%) had Fair result. The subjective result shows that 20 patients had Excellent results (66.7%), 9 patients (30) had Good results and 1 patient (3.3%) had Fair result.

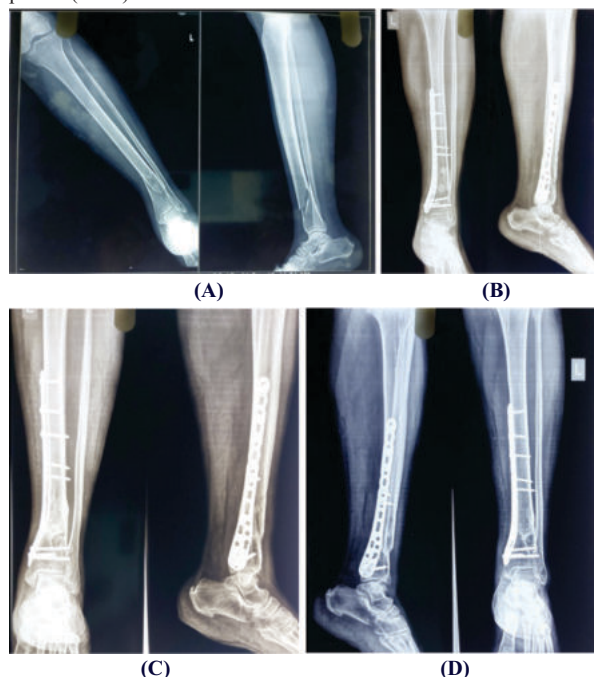


Fig 1: (A) Pre Op X-Ray , (B) Immediate Post Op X-Ray, (C) 6 Week Post Op X-Ray (D) 6 Months Post Op X-ray

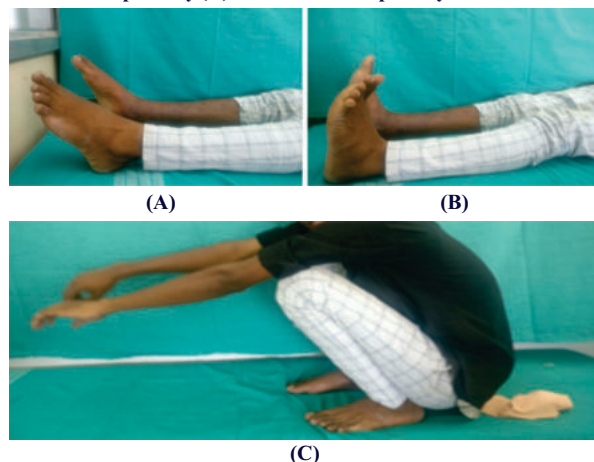


Fig 2: Patient's Clinical condition at the end of 6 months (A) Plantar flexion, (B) Dorsi flexion, (C) Squatting position

DISCUSSION

Distal third tibia fractures are among the most challenging fractures to manage effectively. The degree of soft tissue involvement, the amount of comminution sustained at the moment of injury affects the long term clinical outcomes. Operative treatment aims to reestablish the anatomic realignment of the fracture while ensuring sufficient stability to enable early motion. This can be ensured by using techniques that minimises bone and soft tissue devascularization, thus limiting the complications resulting from the surgery. The study was undertaken to ascertain the efficacy of the locking compression plates (LCPs) in surgery of the fractures of the area of distal tibial metaphysis. This study had 66.3% of High energy trauma and 33.3% of low energy trauma which correlates with the study conducted by Cory Collinge et al¹¹, Andrew Grose et al¹³, and along with that Heather A. Vallier et al¹⁴, who contributed only 51% of high energy fractures.. The operative time reflects a significant learning curve. The initial few procedures took longer duration, 70-80 minutes in this study which was similar to J.J. Guo et al¹⁰, whereas the most recent ones took less time, 30-40 minutes. The average duration for fracture healing in various studies conducted using various methods was 16-28 weeks. In this study had an average fracture union of 16 weeks which were comparable with studies conducted using the locking compression plates. Cory Collinge et al¹¹ had an average fracture union of 21 weeks and Abid Mushtaq et al¹² had an average of 22 weeks.

CONCLUSION

MIPPO with LCP provides effective and adequate stabilisation of fractures and allows early motion of the ankle joint. It shows rapid union rate as it facilitates preservation of blood supply to the fragments and also it preserves fracture haematoma. It is effective over intramedullary nails as it doesn't provide effective stability for fractures occurring 5cm within the ankle joint line. As there is a minimal soft tissue dissection, the chances of infection rate is comparatively low to the regular plate osteosynthesis. In our study the objective result shows that majority of patients had Excellent results (56.7%), 36.7% of patients had good result and 6.7% of patients had fair result. The subjective result shows that majority of patients had Excellent result (66.7%). 30% of patients had Good result and 3.3% of patients had Fair result. Minimal complications like superficial skin infections in 3 patients and ankle joint stiffness 2 patients were only observed. With the above mentioned advantages and with the results of our study, we are concluding MIPPO with LCP as a treatment of choice for distal tibia fractures.

Author Contributions

The authors contributed equally for its content, writing, and reviewing and/or editing of the manuscript before submission.

Conflicts Of Interest

The authors declare no conflict of interest.

Acknowledgement

The authors are grateful to the authorities of Aarupadai Veedu Medical College and Hospital, Vinayaka Missions Research Foundation (Deemed to be University) and to all the patients who participated in the study.

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