



EVALUATION OF RESULTS OF MINIMALLY INVASIVE PLATING OSTEOSYNTHESIS (MIPPO) TECHNIQUE IN THE TREATMENT OF FRACTURE OF DISTAL TIBIA

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ABSTRACT

The present study was conducted to evaluate the result of minimally invasive plating osteosynthesis (MIPPO) technique in the treatment of fracture of distal tibia. The study design was a prospective nonrandomized type and 15 patients presenting to our outpatient or emergency department with high energy distal tibial fractures with or without intra-articular extension were included in the study. Compound grade III fractures were excluded from the study. The data was collected after detailed history taking, x rays and CT scan. Fractures were classified according to the AO comprehensive classification system and I Ruedi-allgower classification. Closed injuries were managed initial with below knee plaster slab and elevation of the fractured extremity. The definitive fixation with locking compression plates using MIPPO technique was undertaken after subsidence of soft tissue trauma. Full weight bearing ambulation was allowed after clinic radiological union. At each visit patient were evaluated with clinical and radiological examination. The mean age of the patients was 39.50 year. The distal tibia fracture was caused by a low-energy injury (fall) in 5 patients (33.37%) and by a -high-energy injury in 10 patients (66.67%). Right side (60%) is more common than left (40%). The mean time interval between injury and surgery was 10.73 days. The mean rate of union was 19.4 weeks which is comparable to other study. The mean American Orthopaedic Foot and Ankle Score (AOFAS) improved significantly from 57.3 at the end of 3 months to 81.4 at the end of 6 months. In conclusion, the correct surgical technique and correct timing of surgery, MIPPO for internal fixation of distal tibia fractures favour a better functional outcome and faster fracture healing. The complications like infections, malreduction, angular deformity are less frequent compared to other techniques like conventional plates, intra medullary nails, external fixation, and conservative methods.

KEYWORDS : MIPPO, distal third tibia fractures

INTRODUCTION

Distal tibia fractures composes of a spectrum of skeletal injury ranging from fractures caused by low energy rotational forces to those caused by high energy axial -compression forces from motor vehicle accidents or fall from height

Fractures of the distal tibia metaphysis with or without intra articular extension can present as a challenge because of their characteristics of inherent instability, scarcity of soft tissues, subcutaneous nature and poor vascularity of bone. Treatment modality is dictated by the fracture displacement, comminution, intra- articular extension and injury of soft tissue envelop [1]

Various treatment options are available for treatment of distal tibial fractures ranging from cast, open reduction and internal fixation with plate and screws, intramedullary nailing, external fixators, ring fixators, undreamed intra medullary nailing. Non -surgical treatment is possible for stable fractures.

Intramedullary nailing allows atraumatic, closed stabilization while preserving the vascularity of the fracture and integrity of soft tissue envelop. Intramedullary canal anatomy at this level prevents intimate contact between the nail and endosteum, however, [2-3]

Plate fixation is effective in stabilizing distal tibia fractures. Conventional techniques involve extensive dissection and periosteal stripping, which increase the risk of soft-tissue complications. [4-5]

External fixators are very effective in managing compound fractures and fractures associated with extensive soft-tissue injury, but they are associated with a high incidence of pin tract infection, loosening and Malunion[6]

A mechanically stable fracture bridging osteosynthesis can be obtained without significant dissection and surgical trauma to the bone and surrounding soft tissues by minimally invasive percutaneous plate osteosynthesis (MIPPO) [7] This technique utilizes indirect reduction and internal fixation with locking compression plates. The plate is tunnelled subcutaneously, but extra periosteally, through limited skin incisions placed at the proximal and distal ends of the plate, by passing the fracture site and then making a stable construct by judicious use of compression and locking screws. This technique aims to preserve bone biology and minimizes surgical trauma to already traumatized soft tissues. [8-9].

Our aim is to observe the results of the distal tibial fracture fixation with locking compression plate using MIPPO technique in terms of clinical and functional outcome.

MATERIALS AND METHODS

We prospectively followed the patients who underwent minimally invasive percutaneous plate osteosynthesis using LCP for distal tibial fractures from January 2019 to October 2020. At start of study, permission were taken from hospital ethical committee and informed consent obtained from all patients.

INCLUSION CRITERIA:

1. Distal tibia fractures involving the lower one third of tibial Metaphysis and metaphyseal-diaphyseal junction AO/OTA classification type A,B,C distal tibia fractures presenting to us in emergency and OPD
2. Ruedi allgower type II&III pilon fractures.
3. simple fractures.
4. Age: 20-80 years

EXCLUSION CRITERIA :

1. Type I Ruedi-allgower pilon fracture.
2. Compound fractures.(Gustilo and Anderson grade III)
3. Delayed presentation of more than three weeks.
4. Non-union distal tibia fractures

After stabilizing the traumatized patient, routine pre-operative evaluation was done including x rays of the involved leg. CT scan was ordered for intra articular fractures.

Fractures were classified according to the AO comprehensive classification system and Ruedi Allgower classification [10]. Open fractures were classified according to the Gustilo and Anderson classification system [11]. On presentation all open fractures will be managed with debridement and primary fixation, while closed injuries will be managed initial with below knee plaster slab and elevation of the fractured extremity. The definitive fixation with locking compression plates using MIPPO technique will be undertaken after subsidence of soft tissue trauma

Choice of implant is 1. Medial Distal Tibia Anatomical Locking Plate For Tibial Fracture 2. One Third Tubular Plate System for Fibula Fracture

Fibula is fixed first with one third tubular plate by open technique to achieve stable lateral fixation which helps indirectly to restore the length of tibia and avoid over distraction (fig.1). After fixing the fibula fracture, reduction of tibia is checked under C-ARM (fig.2), then it is fixed with minimally invasive percutaneous plate osteosynthesis. A transverse incision of about 1cm is made over the medial malleolus to access the medial malleolus, a subcutaneous tunnel is created using a periosteal elevator(fig.3). After fracture reduction, a medial distal tibia anatomical locking plate is slid under the soft tissue into the tunnel to bridge the fracture site, temporarily fix the plate with pins, check the position under C-ARM and finally fixed with locking screws(fig.4, 5,6).

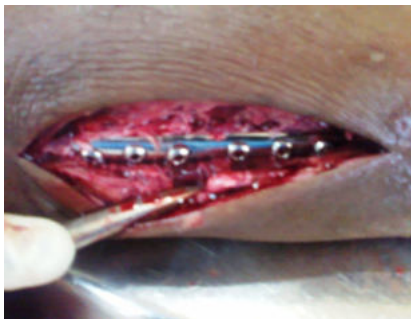


Fig 1

A) Open Reduction Internal Fixation of fibula with 1/3 tubular plate to restore the limb length and indirect reduction of tibia in comminuted distal tibia fractures



Fig 2

B) After fibula fixation, the fracture reduction checked under C-ARM



Fig 3

C) 1cm stab incision made just above the medial malleolus and proximal end of the plate, to slide the plate through the tunnel.



Fig 4

d) Plate was positioned and fixed with temporary pins



Fig 5

e) Final C-ARM should be done to assess the fixation



Fig 6



f) Final fixation with locking screws

Postoperative regimen consisted of knee and ankle bending exercises starting on 8th post-operative day. Non weight bearing ambulation Started on 2 weeks post-operative day, progressing to partial weight bearing at 6 to 8 weeks. Full weight bearing ambulation was allowed after clinico radiological union.

The patient is evaluated for clinical , radiological , soft tissue and functional outcome aspects at 6th week , 3rd month , 6th month and one year interval .

RESULTS :

In this study, fifteen cases with fractures of lower one third fractures of tibia in adults were surgically managed by closed reduction and internal fixation using minimally invasive percutaneous plate osteosynthesis (Mipo) with LCP from January 2019 to October 2020 at Nalanda Medical College and hospital , Patna , Bihar . Following results were seen :

- All patients were evaluated clinically and radiologically before and following surgery, for an average period of follow up was 6 months.
- The age of the patient in this study, ranged from 20 years to 60 years average being 39.5 years.
- There were 9 (60%) male patients as compared to 6 (40%) female patients in this study.
- 6(40%) patients had fracture of left lower one third of tibia and 9(60%) patients had fracture of right tibia.
- All 15 fractures were closed fractures
- 10(66.67%) cases sustained fracture following road traffic accident (high energy trauma) and 5(33.33%) cases sustained fractures following self-fall (low energy trauma)
- The 15 fracture were A1-2, A2-4, A3-5, B1-2, B2-1, B3-1
- The mean duration to surgery from the day of presentation and

injury was 10.73 days for soft tissue swelling around the fracture to subside as evidenced by appearance of wrinkles on the skin

- The mean operative time was 89.3 min.
- In six patients, fibula fractures were stabilized with one third tubular plate with separate incision(54%)
- The mean rate of union was 19.4 weeks which is comparable to other studies. 72% of fractures united between 16 to 20 weeks. one patient had delayed union.(7%).
- The mean American Orthopaedic Foot and Ankle Score improved significantly from 57.3 at the end of 3 months to 81.4 at the end of 6 months.
- Superficial wound infection(13%) occurred in 2 patients. It resolved after regular wound care and antibiotics.
- Deep wound infection occurred in 3 patients(20%), among them, implant removal and thorough wound debridement was done in two patients after fracture union, fracture was not united in one patient, he was put on temporary external fixation, two patients required local flap cover(13%).
- Implant removal was done in five patients(4 due to infection, one after fracture healing)(33%)
- Two patients had malunion(13%). Three patients had angular deformity. One patient had limb length discrepancy.
- No patient had a postoperative neuro vascular complications



X ray showing fracture union at 24 weeks

DISCUSSION

For distal tibia fractures, the combined external and delayed internal fixation, immediate ORIF with plate osteosynthesis, intramedullary nails are the common modality of treatment. It is found that there is successful outcome after plate osteosynthesis, where as open reduction and internal fixation with nonlocking plates have high rate of complication-related to unstable fixation, wound complications which later lead on to non-union. The new technique of Minimally Invasive Percutaneous Plate Osteosynthesis are giving good results with less complication, due to minimal soft tissue dissection and periosteal stripping. The new anatomically precontoured Locking Plate system have the advantage to overcome the complications occurring in conventional plating.

Wang Cheng et al compared MIPPO technique with conventional ORIF with non-locking plate osteosynthesis. They concluded that it is advantageous over the conventional non locking plate osteosynthesis in terms of low infection rate and faster healing, though with minimal disadvantageous such as skin irritation and malreduction Pierre Joveniau et al they compared the MIPPO with Intramedullary nailing and Conventional ORIF plate osteosynthesis. They concluded that MIPPO have minimal surgical trauma, less soft tissue infection rate and better functional recovery of tibia with faster healing rate with minimal disadvantage such as malreduction.

Eric J. Strauss et al studied the concurrent fibula fractures in distal tibia fracture fixation with locking plate systems. They concluded that locking plate provides better fixation for fracture pattern in which the fibula can not be effectively stabilized.

Minimally Invasive Percutaneous Plate Osteosynthesis with anatomically precontoured medial distal tibia locking plate fixation of

distal tibia fractures is safe and effective method. On reviewing the literature only few studies has been conducted on this. Most authors have concluded that the MIPPO technique with locking plate provides secure fixation and a better outcome.

CONCLUSION

In conclusion, the correct surgical technique (such as positioning the plate at correct offset after appropriate fracture reduction, which is confirmed by a final C-ARM check), and correct timing of surgery (which is evidenced by wrinkle sign), the anatomically precontoured medial distal tibia locking plate is suitable option for internal fixation of distal tibia fractures which may favour a better functional outcome and faster fracture healing. The complications like infections, malreduction, angular deformity are less frequent when the distal tibia fracture are treated with locking compression plates, compared to other techniques like conventional plates, intra medullary nails, external fixation, and conservative methods.

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