

Outcome of Distal Tibial Fractures fixed with Precontoured Periarticular Locking Plates using MIPO Technique: a case series of 60 patients

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ABSTRACT

Background: Fractures distal tibia including pilon present a challenge, because larger portion of tibia is in subcutaneous location, has minimal soft tissue coverage and minimal blood supply. Now a newer technique MIPO (Minimal invasive plating osteosynthesis) has introduced as a new concept to treat distal tibia fractures with minimal articular comminution and minimal soft tissue damage.

Aim: To treat fracture of distal tibia who meet the criteria to manage with precontoured peri articular locking compression plate (LCP) through MIPO technique.

Method: In this study we planned a prospective study for We included total 60 patients from January to December 2017. We used AO system for fracture classification and post operatively patients were assessed and scored using Ovadia-Beals scoring system.

Result: Among 60 patients operated, there were 44 males and 16 females. Age ranges from 18 to 70 with the mean age of 42.7 years. 51 patients had Type A (Extra-articular fractures), 06 patients had Type B (Partial articular and 03 had Type C (Total articular). Road traffic accidents was the predominant cause. The mean operative time was 72.6 minutes (55-90 minutes).

Conclusion: Locking compression plate using MIPO technique is an effective method for treatment for distal tibia fracture. It preserves soft tissue disruptions and bone biology.

Keywords: Tibial fracture, locking plates, MIPO technique

INTRODUCTION

Distal tibial fractures are challenge since beginning. They are difficult to treat with conventional method of open reduction and internal fixation. In literature review in 1905, Albin Lambotte was perhaps the first to perform open reduction and internal for these fractures. French radiologist Destot in 1911 introduced term tibial pilon to explain the distal tibial metaphysis, which looks like pharmacist, pestle (pilon)^{4,6}. The word Plafond used by Bonin(ceiling), who used the word *plafond* (ceiling) for these fracture to refer to the horizontal distal tibia articular surface^{7,9,12}. These fracture are usually caused by high energy trauma and are associated with severe soft tissue disruption Conventional plating with DCP often results in skin and soft tissue complications like necrosis, wound dehiscence and infection^{1,2,10}. Another important factor is thickness of DCP in contrary to precontoured LCP with low profile distally. To avoid these complications, we can use ilizarov external fixation, but it associated with poor compliance by the patient. To avoid all these complications MIPO (Minimal Invasive Plate Osteosynthesis) technique was evolved. MIPO technique results in biological fracture healing as there is no or less periosteal stripping and fewer skin complications^{5,8,13}.

MATERIAL AND METHODS

Our study was conducted in the Department of Trauma and Orthopaedics Shalamar Medical and Dental College

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Lahore, Pakistan from January – December 2017. Permission was granted by the Institutional Ethical Committee. We enrolled 60 patients of distal tibial fractures who were fixed with precontoured, periarticular locking plates using MIPO technique in our study period. The theme of our study was to access and measure clinical and functional outcome of MIPO technique using precontoured, periarticular locking plates in distal tibial fractures. Inclusion criteria in our study were all the patients aged 18 years and above having close distal tibia fracture. Patients with active or recent infection in the involved leg, extensive comminution (Type C2, and C3), and Gustilo Anderson type IIIC fractures were excluded. To determine the fracture patten radiographs of tibia including ankle joint were taken in both planes (AP and Lateral views (Figure 1). Computed tomography (CT) scan was only done in fractures where geometry was not clear. Universal AO classification system was used to classify the fractures. We stabilized the patient and also assessed the local soft tissue condition pre-operatively. Surgery was deferred till the wrinkle sign appeared. Minimally invasive plate osteosynthesis (MIPO) was used wherever the fracture configuration and soft tissue condition permitted. In case of depressed fractures primary bone grafting was performed to fill bone defects.

Informed consent was taken from all the patients. We applied tourniquet in the proximal thigh. We use supine position supine under fluoroscopic table. Small incisions were given proximal and distal to the fracture. Indirect reduction (Figure 2) was achieved with pointed reduction forceps. A tunnel was made subcutaneously (Figure 2).

The plate was slide through this tunnel and secured on either side with screws under C-arm. Position of plate confirmed both in AP and Lateral view to avoid malpositioning. Post operatively, limb was elevated and ankle pumping started within 24 hours of surgery. In comminuted fractures back splint was applied. Range of motion at Knee and ankle and toe touch walking with a help of walker was started on second or third postoperative day. Only three doses of I. V antibiotics were given. The follow up of the patients was done in outpatient's departments for two weeks. Full weight bearing as was started only after evidence of union.

Fig. 1: Anteroposterior and lateral radiograph of distal tibia fracture



Fig. 2(A-D): Steps of MIPO technique

A) Indirect Reduction & plate measurement



B)



C) Plate sliding



D) Reduction checked under fluoroscope



Fig. 3: Three month follow-up Anteroposterior and lateral X rays showing callus formation



RESULTS

We included, 60 patients of who were managed with CRIF (closed reduction and internal fixation) by using precontoured, peri articular locking plate with MIPO. We had 44 males and 16 females. Age range was 18 to 70 years with the mean of 42.7 years. We have 45 cases who had road traffic accident; fifteen cases were due to of domestic fall., Fifty-one patients sustained AO type A, 6patients sustained AO type B and 3 patients had AO type C fractures. 60 % of the patients were operated with in the first week Mean time from trauma to surgery was seven days. Mean operative time in our study was 72.6 minutes (55-90 minutes). Mean time for radiological union was 17 weeks (14-22 weeks). Postoperatively one year follow up was done. Only one patient developed superficial skin infection which was resolved by conservative measures and another patient had nonunion which was dealt with bone grafting from ipsilateral iliac crest and union was achieved. Functional evaluation of the ankle was done according to Ovadia-Beals scoring system (Table 1) [17]. According to these criteria 40 patients (67%) had excellent outcome, 16 patients (27%) had good outcome, 3 patients (5%) had fair outcome and 1 (1.6%) had poor outcome.

Table 1: Ovadia-Beals clinical scoring system Objective Evaluation

Result	Criteria	Score
Excellent	Ankle and subtalar joint ROM >75% of the normal side No tibial shortening No equines or calcaneus deformity	4
Good	Ankle and subtalar ROM 50 -75 % No tibial shortening No equines or calcaneus deformity	3
Fair	Ankle and subtalar ROM 25-50% Tibial shortening < 1cm No equines and calcaneus deformity	2
Poor	Ankle and subtalar ROM 0-25% > 5 degrees (Varus /valgus/recurvatum Tibial shortening >1 cm Equines and calcaneal deformity	1

Subjective Evaluation: This depends on the patient's subjective report of pain and performance

Results	Criteria	Score
Excellent	No pain, No Limp., returned to previous level of activity.	4
Good	Strenuous activity related pain Returned to previous level of activity Required occasional analgesia	3
Fair	Moderate Pain, Patient could not go to previous level of activity required daily analgesia limp present	2
Poor	Pain on each step, unable to work Extreme limitation of walking Limp present	1

Table 2: Results in different types of Fracture

Results	Type A	Type B	Type C	Total
Excellent	39	1	0	40
Good	12	3	1	16
Fair	0	2	1	3
Poor	0	0	1	1

DISCUSSION

In the treatment of long bone fracture, with and without intra-articular involvement, there are various options. These include plating, intramedullary nailing and external fixator^{11,14,15}. The final decision about which treatment modality is to be used depends upon the fracture configuration, soft tissue component and quality of bone as well as patient-related factor^{14,16}. For diaphyseal fracture, intramedullary nailing is commonly used. For metaphyseal fracture with or without articular involvement, plating is commonly used. If soft tissue over the fracture site is intact, plating is commonly used& if soft tissue element is compromised, external fixator is used. Intramedullary nailing of diaphyseal fracture is perhaps the most elegant and minimally invasive method commonly used. Now with the development of proximal and distal locking there is no fear of rotational alignment. Intramedullary nailing has its limitations in peri-articular and articular fractures^{2,3,17}. There is a significant incidence of malalignment after nailing of metaphyseal fractures. Plate fixation of fractures provides good mechanical stability but the traditional techniques entail an extensive soft tissue exposure. Extensive soft tissue disrupts the blood supply of the fracture site resulting in delayed and nonunion. There is change of emphasis from mechanical to biological priorities in the internal fixation of fractures in recent decade^{1,2,13}. Thus, with aim to minimize stripping of the soft tissue around the fracture,

minimally invasive plate osteosynthesis (MIPO) has been developed whereby the plate is placed through a small incision with little soft tissue dissection⁷.

CONCLUSION

The treatment of distal tibial fractures is still in evolving phase. Periarticular precontoured locking plates have improved patient outcome when using MIPO technique with respect to union, soft tissue complications and functional outcomes. However, the basic principles to treat these injuries should be followed in order to avoid pitfalls. These include healing for soft tissue envelope prior to surgery, meticulous use of surgical technique according to personality of fracture and restoration of articular congruity and metaphyseal – diaphyseal dissociation.

Conflict of interest: None .

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