Quest Journals
Journal of Medical and Dental Science Research
Volume 3 ~ Issue 1 (2016) pp:33-38
ISSN(Online) : 2394-076X ISSN (Print):2394-0751
www.questjournals.org

Research Paper

Outcome of Distal Tibia Fractures Treated Using MIPP0 with A Locking Compression Plate

[1]Dr. Santosh S Nandi, [2]Dr. Ramanagouda Biradar, [3]Dr. Arravind Pillai
[1]*Associate Professor, Dept of Orthopaedics Shri B.M Patil Medical college and research centre, Vijayapur*
[2]*Asst. Professor, Dept of Orthopaedics Shri B.M Patil Medical college and research centre, Vijayapur Phone: 9663130156*
[3]*Post graduate student, Dept of Orthopaedics Shri B.M Patil Medical college and research centre, Vijayapur Phone: 8105890044*

Received 04 January, 2016; **A**ccepted 23 January, 2016 © The author(s) 2015. Published with open access at **www.questjournals.org**

ABSTRACT:-
Introduction: *Distal tibia fractures are difficult to treat. Two of most used techniques are locked intramedullary nail and minimally-invasive percutaneous plate. Minimally invasive percutaneous plate osteosynthesis (MIPPO) offers biological advantages and require reduced soft tissue dissection and thus results in low surgical trauma and preservation of blood supply. Aim of this study was to evaluate results of MIPPO in treatment of distal tibial fractures and to compare with other similar studies.*
Materials and Methods: *This study was performed with 20 closed distal tibia fractures at Shri B.M Patil Medical College. All fractures were classified using AO/OTA classification and were fixed using a Locking compression plate (LCP) with MIPPO technique. Open and intra articular fractures were excluded. Duration of follow-up ranged from 18 months to 40 months. Data were analysed for patient's demographic parameters, injury surgery interval, operative time, time of radiological union and time of full weight bearing capacity.*
Results: *A total of 20 cases of fracture of distal tibia were treated using MIPPO technique with a LCP. In our study the average time of union was 22 weeks and average time for full weight bearing was 22.8 weeks. Complications encountered included 1 non union which was treated with bone grafting, 2 cases (10%) of delayed union which was treated with bone marrow injection from the contra lateral tibia, 1 case (5%) of skin necrosis which was treated with serial dressings and valgus angulation in 2 cases (10%). We had excellent results in 16 cases (80%), good outcome in 3 cases (15%) and poor outcome in 1 case (5%).*
Conclusion: *MIPPO facilitates in early mobilization of the patient which helps in healing of the fracture and prevents joint stiffness. It promotes early union as it does not disturb anatomy and physiology of vascularity at the fracture site. MIPPO with a LCP is an excellent treatment option for extraarticular distal tibial fractures.*
Keywords: *MIPPO, Distal tibia fractures, LCP*

I. INTRODUCTION

Tibial fractures are usually the result of high energy axial compression and rotation forces. Additional soft tissue injury and poor vascularity associated with these fractures make it more challenging to manage.[1, 2]. Most of these fractures are managed surgically using closed reduction with intramedullary interlocking nails(IMIL), open reduction and internal fixation with plating, closed reduction and per cutaneous plating or external fixators. Each of these techniques is associated with certain merits and demerits. Non-surgical treatment is usually reserved for stable fractures and requires prolonged immobilisation and are associated with complications such as malunion, shortening of affected limb, limitation of range of motion and early osteoarthritis.[3,4]. Conventional open osteosynthesis is associated with wound infection, skin breakdown and delayed union or non union requiring secondary procedures like bone grafting. Principles of biological fixation advocate realignment by manipulation at a distance from the fracture site, leaving comminuted fragments out of the mechanical construct and this preserving soft tissues with limited operative exposure.[5] MIPPO with a Locking compression plate (LCP) has emerged as a popular treatment option for distal tibial fractures as it is applied subcutaneously and thus does not disturb periosteal blood supply and fracture hematoma.[6,7,8] .We

*Corresponding Author: [3]Dr. Arravind Pillai

[3]*Post Graduate Student, Dept of Orthopaedics, Shri B.M Patil Medical college and research centre, Vijayapur*

prospectively studied the outcome of closed distal tibial fractures with or without intra articular extension treated by MIPPO with a LCP and compared with other studies.

II. MATERIAL AND METHODS

Twenty cases of fractures of the distal tibia with or without intra articular extension were prospectively studied from June 2010 to January 2014. Ethical clearance was obtained from the institution and Informed consent was taken from all patients. Fractures were classified according to AO/ OTA classification system. Only closed fractures were included in the study. Patients with multiple fractures and poly-trauma were excluded from the study. Duration of follow-up ranged from 18 months to 40 months.

At the time of presentation, anteroposterior and lateral radiographs were obtained and all the patients were splinted with a below knee slab. For those patients with gross swelling, surgery was delayed until swelling subsided and wrinkles appeared over the skin.

Surgery was performed under spinal or general anaesthesia. Patient was taken in supine position and a tourniquet was used in all cases. A small transverse incision was made over the medial malleoli and a subcutaneous plane was made with a Bristows periosteum elevator. Fracture was reduced and temporarily fixed with k wires under flouroscope guidance. Varus - Valgus angulation less than 5° and anterior-posterior angulation less than 10° and shortening of less than 15 mm were considered acceptable criteria for reduction. Plate was positioned and held in place with temporary k- wires and screws were applied once the position of the plate and reduction was confirmed. In long spiral oblique fractures, the fracture was fixed with lag screws before putting the plate. In cases were compression was required, compression osteosynthesis was achieved by using a cortical screw to before using the locking screws. The alignment was checked all the time. Soft tissue handling was done gently throughout the surgery.

Post operatively intra-venous antibiotics and analgesics were given for 3 days followed by oral antibiotics. Limb elevation was given in all cases. At one week, patient was mobilised with nil weight bearing and full weight bearing was allowed once clinical and radiological evidence of fracture healing appeared. Radiographs were assessed for evidence of union. Fracture union was defined as radiological evidence of bridging mature callus combined with clinical union as evidenced by pain free full weight bearing. Data were analysed for patient's demographic parameters, injury surgery interval, operative time, time of radiological union and time of full weight bearing capacity.

III. RESULTS

A total number of 20 patients were operated (13 were males; 7 females). Age of the patients ranged from 25–50 years (mean being 37.2).

16 (80%) fractures were due to road traffic accident, 3(15%) due to fall and 1(5%) due to assault. Most of the cases involved in high velocity accident were in the 31–50 years age group. Seven cases had associated injury resulting from the same trauma.

The average time between injury and surgery was 8.6 days with most cases operated in the period of 4–12 days. The average operative time was 75 minutes. Average period of union was 22weeks. Average time taken for full weight bearing was 22.8 weeks. We encountered 6 complications in our study. Complications encountered were skin necrosis in 1 patient which was healed by serial dressing; valgus angulation of less than 5 degrees in two patients, delayed union in 2 patients which were treated successfully with bone marrow injection taken from the contra lateral tibial condyle and 1 patient went for non union. Sixteen (80%) cases had excellent outcome while 3(15%) had good outcome and 1 had poor outcome in terms of radiological appearance.

IV. DISCUSSION

Biological plating was done for first time by Boitzy and Weber. Minimally invasive plating technique reduces iatrogenic soft tissue injury and preserves the fracture haematoma which reduces complication and augments fracture healing[9]. In our study most of the casses sustained the fracture after high speed road traffic accident, which is the established cause of the tibial fractures worldwide[1]

Treatment of distal tibia fractures using MIPPO with a LCP has shown good results. Other plates have been used instead of LCP, but studies found no significant benefit of any of these plates. In a study by Kao et al, they found no statistically significant advantages of LCP over conventional plates[10]. Unlike conventional plates, LCP is a friction independent self stable construct which provides both angular and axial stability and minimizes risk of secondary loss of reduction through a threaded interface between the screw heads and the plate body[11].

Other options for distal tibial fractures are intramedullary nails. Comparative studies of tibia IMIL with plating has found conflicting results. In a study by Vallier et al, they found more angular malalignment in cases treated with IMIL in comparison to those treated with plating (22 patients vs 2 patients, p=0.003) where as Guo et al. found better functional outcome in patients treated with plating over IMIL[8,12].

Although controversial, some authors advise delayed surgery for patients with swelling after distal tibial fractures [13, 14.]

We found the average time from injury to surgery was 8.6 days. In 4 of the cases surgery was delayed due to swelling and blister formation. Our injury surgery interval was higher than most of other studies. In a study by Shrestha et al, surgery was performed within a mean duration of 4.45 days [15].

Average time of union in our study was 22 weeks (range18-26 weeks) which is comparable to other studies. Ksekili et al reported a mean duration of radiological union to be 20.7weeks (range: 16–28weeks) in open and 17.96 weeks (range: 10–36 weeks) in closed fractures [16]. Shrestha et al reported an average duration of 18.5 weeks (range: 14–28 weeks) for the fracture segment union [15].

In our study full weight bearing was achieved in 16-24 weeks in 80% of the cases and in 20- 28 weeks in the rest 15% of cases. This observation is also comparable to the other studies [15]. Many studies have shown delayed union as a complication of MIPPO which is treated with a bone graft. In our study we came across one case of delayed union which was successfully treated with bone marrow injection and one case of non union which was successfully treated with bone grafting.

V. FIGURES AND TABLES

AO/OTA Classification	Number of cases
A1	9
A2	5
A3	4
B1	2

TABLE 1: no: of fractures according to AO/OTA classification

Study	Number of cases	Mean time of union	Complication
Hazarika S et al [17]	20	18 weeks	Non union :2 Wound break down:2 Wound infection: 1 Implant failure: 1 Secondary procedure: 2
Hasenbohehler E et al	32	29 weeks	Nonunion: 2 Plate bending (18°): 1 Pseudoarthrosis: 2
Ronga M et al.	19	22.3 weeks	Nonunion:1 Deep infection:3
Gupta RK et al	80 MIPO-71 Open -9	19 weeks	Delayed union :7 Non union: 3 Malunion (≥ 5° deformity or ≥ 1 cm LLD): 2 Wound infection:1 Wound breakdown: 2 Secondary procedure: 2
Ahmad MA et al.	18	21.2 weeks	Delayed union: 3 Superficial wound infection: 1 Chronic wound infection: 1 Implant failure: 1
Present study	20	22 weeks	Delayed union: 2 Valgus malunion <5 degrees: 2 Skin necrosis: 1

TABLE 2: Comparison of present study with other studies

*Corresponding Author: [3]Dr. Arravind Pillai

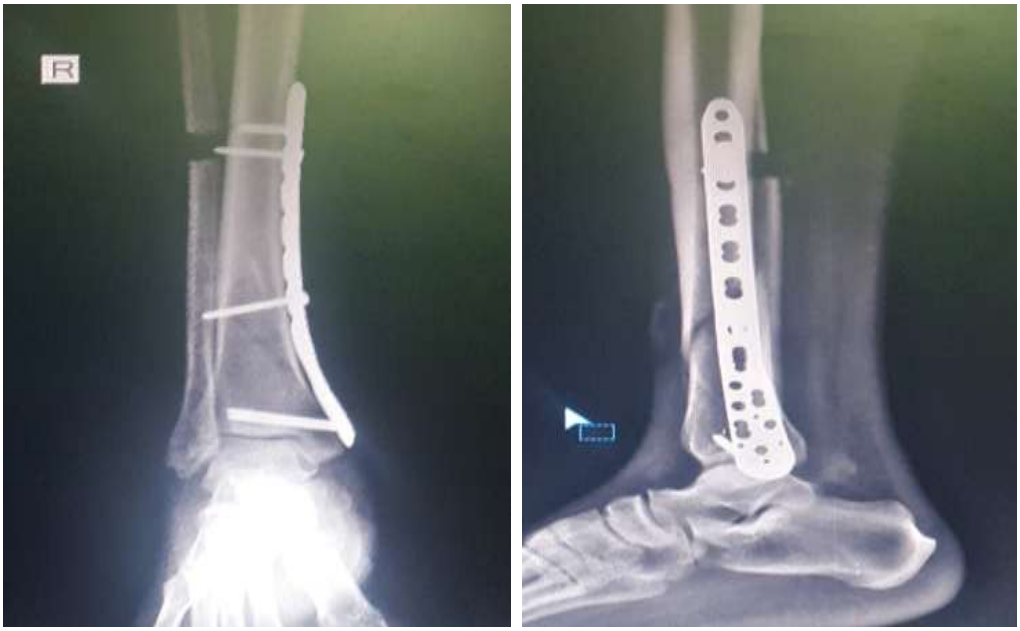
Complication	Patients	Percentage
Non union	1	5%
Delayed union	2	10%
Valgus malunion <5 degrees	2	10%
Skin necrosis	1	5%

TABLE 3: Complication encountered in our study

PHOTOGRAPHS

Case 1

Pre op AP and Lateral radiographs

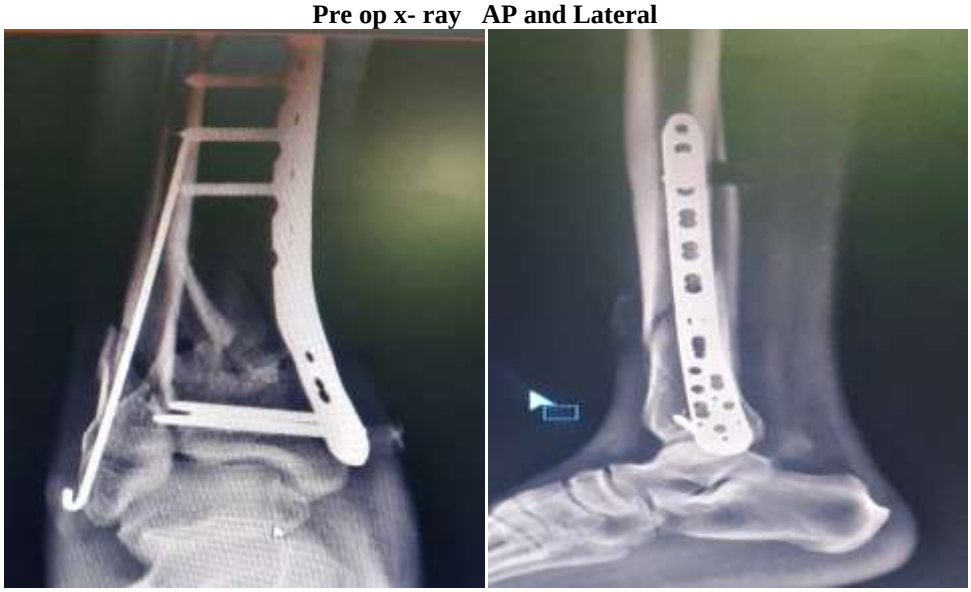


A 3 months follow up

At 6 months follow up

Case 2

Pre op x- ray AP and Lateral



Post op radiograph

VI. CONCLUSION

MIPPO is an excellent technique for the management of distal tibial fractures. Although technically demanding, with proper technique and reduction, good union can be achieved by preserving the soft tissue and gives excellent outcome in terms of radiological and clinical union.

REFERENCES

[1]. McFerran MA, Smith SW, Boulas HJ, Schwarz HS. Complications encountered in the tr eatment of pilon fractures. *J Orthop Traum 1992;6(2)*:195–200.

[2]. Teeny SM, Wiss DA. Open reduction and internal fixation of tibial plafond fractures; variables contributing to poor results and complications. *Clin Orthop 1993*;292:108–17.

[3]. Othman M, Strzelczyk P. Results of conservative treatment of "pilon" fractures.Ortop TraumatolRehabil2003;5:787–94

[4]. Digby JM, Holloway GM, Webb JK. A study of function after tibial castbracing. *Injury 1983*;14:432–9

[5]. Chandler Robert W. Principles of internal fixation. Rockwood and Greene's fractures in adults, 4thedition. 1996;1:159–217

[6]. Redfern DJ, Syed SU, Davies SJM. Fractures of the distal tibia: minimally invasive plate osteosynthesis. *Injury2004, 35*:615–620.

[7]. Apivatthakakul T, Phornphutkul C, Patumasutra S. Idea and innovation: Simple minimally invasive plate osteosynthesis (MIPO) instruments. *Injury Extra2009*,40:39–44.

[8]. Vallier HA, Le TT, Bedi A. Radiographic and clinical comparisons of distal tibia shaffractures (4 to 11 cm proximal to the plafond): plating versus intramedullary nailing. *J Orthop Trauma* 2008, 22:307-11

[9]. Probe RA. Minimally invasive fixation of tibial pilon fractures. Operative Techniques in Orthopaedics 2001;11(3):205–17.

[10]. Kao FC, Tu YK, Hsu KY, Wu CH, Yen Cy, Chou MC. Treatment of distal tibial fractures by minimally invasive percutaneous plate osteosynthesis of three different plates: Results and cost-effectiveness analysis. *Formosan Journal of Musculoskeletal Disorders 2010*, 1:35–40

[11]. Wagner M, Frigg FR. Locked plating: Biomechanics and biology and locked plating: Clinical indications. Techniques in Orthopaedics2007, 22(4) :209–218.

[12]. Guo JJ, Tang N, Yang HL, Tang TS. A prospective, randomised trial comparing closed intramedullary nailing with percutaneous plating in the treatment of distal metaphyseal fractures of the tibia. *J Bone Joint Surg Br2010*, 92-B:984-8.

[13]. Leone VJ, Ruland RT, Meinhard BP. The management of the soft tissues in pilon fractures.*ClinOrthopRelatRes1993*;292:315–20.

[14]. Leonard M, Magill P, Khayyat G. Minimally-invasive treatment of high velocity intra-articular fractures of the distal tibia. *Int Orthop 2009 Aug;33(4):*1149–53

[15]. Shrestha D, Acharya BM, Shrestha PM. Minimally invasive plate osteosynthesis with locking compression plate for distal diametaphyseal tibia fracture. *Kathmandu Univ Med J (KUMJ). 2011;9(34)*:60–6

[16]. Aksekili MA, Celik I, Arslan AK, Kalkan T, Uğurlu M. The results of minimally invasive percutaneous plate osteosynthesis (MIPPO) in distal and diaphyseal tibial fractures. *Acta Orthop Traumatol Turc 2012;46(3):*161–7.

[17]. Hazarika S, Chakravarthy J, Cooper J. Minimally invasive locking plate osteosynthesis for fractures of the distal tibia-results in 20 patients. *Injury 2006, 37*:877– 887.