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Distal tibial extra-articular fractures fixed with locking compression plate using MIPO technique: A clinical study

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Abstract

Background: Distal tibial fractures are one of the most complex injuries around the ankle joint, accounting for approximately 7% of all tibial fractures. The present study was conducted to assess distal tibial extra-articular fractures fixed with locking compression plate using MIPO technique.

Materials & Methods: 40 patients of closed extra articular distal tibial fractures were treated with anatomical LCP applied on antero-medial surface of lower end tibia with MIPO technique. Parameters such as AO/OTA classification system, duration of surgery, duration of fracture union and complications were recorded.

Results: AO fracture type was 43 A1 seen in 24, 43 A2 in 10, 43 A3 in 6. Duration of surgery was 0-60 minutes in 3, 60-90 minutes in 17 and 90-120 minutes in 20. Duration of fracture union was 12-16 weeks in 4, 16-20 weeks in 18, 20- 24 weeks in 6 and >24 weeks in 12. Complications were superficial skin infection in 1, deep skin infection in 2, implant failure in 1 and varus angulation in 3 cases. The difference was significant ($P<0.05$).

Conclusion: MIPO with LCP is a reliable and effective method of treatment for the distal tibial extraarticular fractures.

Keywords: distal tibial, extraarticular fractures, MIPO

Introduction

Distal tibial fractures are one of the most complex injuries around the ankle joint, accounting for approximately 7% of all tibial fractures ^[1]. Fractures of the distal tibial metaphysis with or without intra-articular extension can present a management challenge because of their inherent instability, scarcity of soft tissues, subcutaneous nature and poor vascularity of bone ^[2]. Treatment modality is dictated by the fracture displacement, comminution, intra-articular extension and injury to the soft-tissue envelope. Soft-tissue management has been seen to play a vital role in the management alongside the bony reconstruction. Several methods of treatment are implemented including non-operative treatment, external fixation, intramedullary nailing, and internal fixation with traditional implants (standard screws and plates). However, each of these treatment options is associated with certain challenges ^[3].

We can treat stable fractures with minimal shortening conservatively, but it has to be immobilized for long time. It has also been associated with malunion, shortening of affected limb, restriction of range of motion and early osteoarthritis ^[4]. External fixation is useful in open fractures, but it can lead to mal-alignment, delayed union, pin-track infections & septic arthritis. Large exposure is required for the dynamic compressive plating technique to perform reduction and plate fixation. Associated with the large exposure is an increase in the risk of non-union and infection ^[5]. The present study was conducted to assess distal tibial extra-articular fractures fixed with locking compression plate using MIPO technique.

Materials and Methods

The present study comprised of 40 patients of closed extra articular distal tibial fractures. All were enrolled in the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All were treated with anatomical LCP applied on antero-medial surface of lower end tibia with MIPO technique. Parameters such as

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AO/OTA classification system, duration of surgery, duration of fracture union and complications were recorded. Results were assessed using chi- square test. P value less than 0.05

was considered significant.

Results

Table 1: Distribution of patients

Total- 40		
Gender	Males	Females
Number	22	18

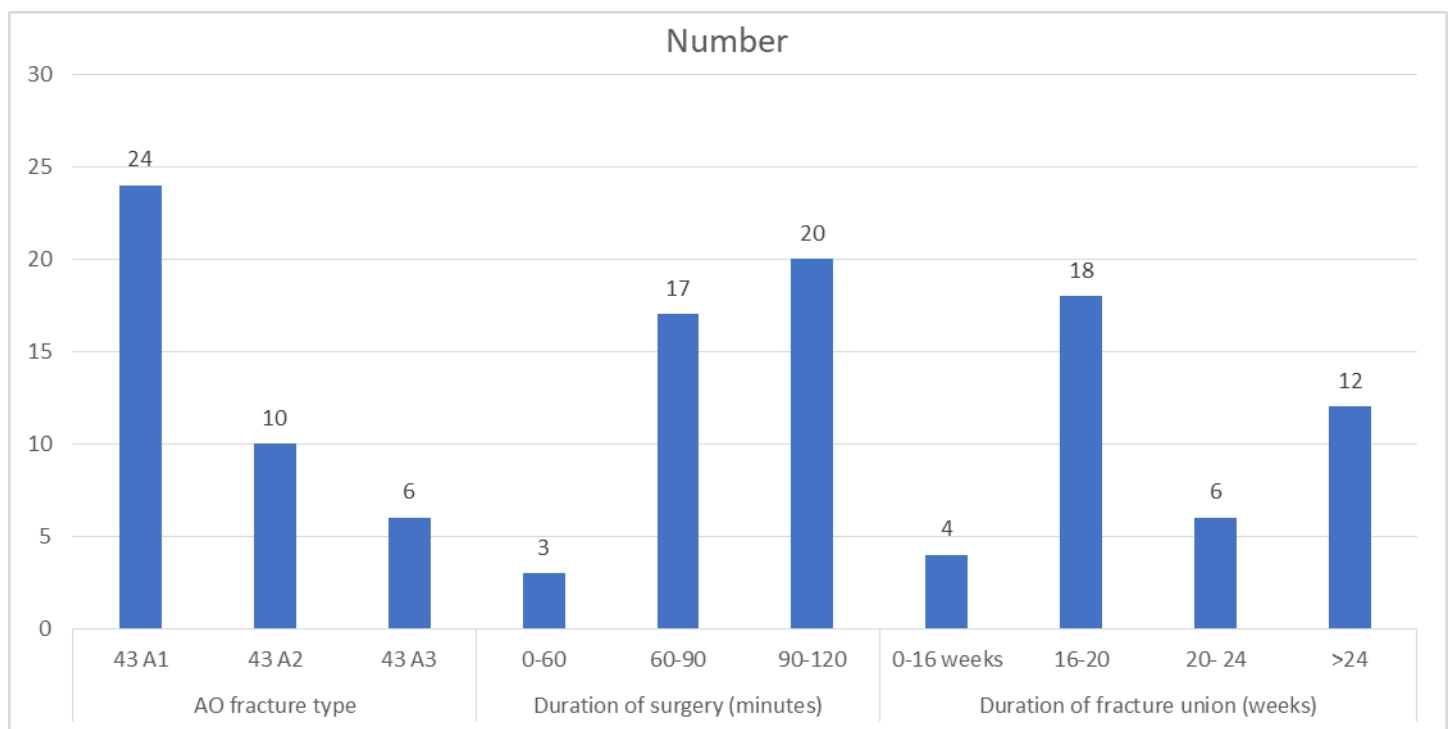
Table 1 shows that out of 40 patients, males were 22 and females were 18.

Table 2: Assessment of parameters

Parameters	Variables	Number	P value
AO fracture type	43 A1	24	0.01
	43 A2	10	
	43 A3	6	
Duration of surgery (minutes)	0-60	3	0.02
	60-90	17	
	90-120	20	
Duration of fracture union (weeks)	12-16	4	0.05
	16-20	18	
	20- 24	6	
	>24	12	

Table 2, graph 1 shows that AO fracture type was 43 A1 seen in 24, 43 A2 in 10, 43 A3 in 6. Duration of surgery was 0-60 minutes in 3, 60-90 minutes in 17 and 90-120 minutes in 20.

Duration of fracture union was 12-16 weeks in 4, 16-20 weeks in 18, 20- 24 weeks in 6 and >24 weeks in 12. The difference was significant ($P<0.05$).



Graph 1: Assessment of parameters

Table 3: Complications in patients

Complications	Number	P value
Superficial skin infection	1	0.01
Deep skin infection	2	
Implant failure	1	
Varus angulation	3	

Table 3 shows that complications were superficial skin infection in 1, deep skin infection in 2, implant failure in 1 and varus angulation in 3 cases. The difference was significant ($P<0.05$).

Discussion

Minimally invasive plate osteosynthesis (MIPO) techniques are advantageous because soft tissue stripping is limited and osteogenic fracture haematoma is maintained without interrupting vascular supply to the individual fracture fragments [6]. MIPO works on biological fixation principles in which percutaneously inserted plate is placed epiperiosteally and fixed away from the fracture site to preserve blood supply of the fracture fragments maximally. It assists physiological process of bone healing wisely and optimally with minimal

amount of operative intervention [7]. Anatomical LCP are commonly used for fracture fixation as it provides an angular stability to the fixation. Locked screws prevent the plate from pressing the bone, preserving periosteal blood supply. Callus formation is stimulated as it is flexible elastic fixation [8]. The present study was conducted to assess distal tibial extra-articular fractures fixed with locking compression plate using MIPO technique.

We found that out of 40 patients, males were 22 and females were 18. AO fracture type was 43 A1 seen in 24, 43 A2 in 10, 43 A3 in 6. Duration of surgery was 0-60 minutes in 3, 60-90 minutes in 17 and 90-120 minutes in 20. Duration of fracture union was 12-16 weeks in 4, 16-20 weeks in 18, 20- 24 weeks in 6 and >24 weeks in 12. Ladani *et al.* [9] conducted a study in which 20 patients of closed extra articular distal tibial fractures treated with anatomical LCP applied on antero-medial surface of lower end tibia with MIPO technique. Age was ranging from 20 to 60 yrs. 14 male and 6 female patients were there. 7 patients were having fibula fracture at same level of tibia fracture, they were fixed with DCP/ 1/3rd tubular plate before fixing tibia. AO/OTA type 43 A1 fractures were there in 15 patients. 4 patients were having 43 A2 and one pt. was having 43 A3 type fracture. Average operation time was 80 mins. Average union time was 18.5 weeks. One patient was having delayed union, one having superficial skin infection, one having 6 varus angulation and one having malleolar skin irritation. No pts. required second surgery of bone grafting and implant failure.

We found that complications were superficial skin infection in 1, deep skin infection in 2, implant failure in 1 and varus angulation in 3 cases. Somashekar *et al.* [10] evaluated the functional and radiological results of locking compression plate (LCP) osteosynthesis in extra articular distal tibial fractures using Minimal Invasive Percutaneous Plate Osteosynthesis Technique (MIPPO). The average age of patients was 46 years (19 – 68) with the male predominance (75%). Average time interval between injury and operation in our study was 3.2 days (2-7 days). Mean duration of surgery was 98.80 minutes. Mean interval of follow up was 7.8 months (6 to 10 months). Average period for radiological consolidation was 22 weeks. All patients achieved functional range of ankle movements during follow up period of 6-10 months. Functional outcome was measured using AOFAS score and mean AOFAS score was 88 at the end of 24 weeks. 02 cases of superficial wound infection/ delayed wound healing were encountered. 01 of case Deep Infection needing implant removal was seen. No other complications like deformities, compartment syndrome, non-union, implant irritation/skin impingement or implant failure were seen.

Guo JJ *et al.* [11] reported more wound complications in LCP group (14.6%) compared to nailing group (6.8%). Lau *et al.* [12] reported late infection rate of 15% in fixation with locking plates. Average rate of infection in various literature was 5-15%.

Conclusion

Authors found that MIPO with LCP is a reliable and effective method of treatment for the distal tibial extraarticular fractures.

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