

## Outcome Analysis of Surgical Management of Distal 1/3rd TIBIA Fractures

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### Abstract

**Introduction:** The management of distal tibia fractures has always held a particular interest for orthopedic surgeons. Distal Tibia fractures continue to be one of the most controversial fractures that we treat. In Plate osteosynthesis for fractures of the distal tibia is often associated with delayed healing, infection, and hardware problems with MIPPO [Minimally invasive percutaneous plate osteosynthesis] method rate of delayed union and infection rate is come down. Locked intramedullary nailing is the treatment of choice for closed simple diaphysal fractures of the tibial distal 1/3rd shaft. **Aim:** To evaluate the surgical outcome of both intraarticular and extraarticular distal 1/3rd tibia fracture. **Material and method:** This study consisted of 50 patients undergoing fracture distal 1/3rd tibia surgery. Patients operated between January 2013 to June 2017 were included and were followed by both retrospectively and prospectively from January 2013 to June 2018. **Results:** Number of case were taken randomly in our study we have 13 cases done with Nailing technique 23 with plating and 14 of MIPO on the basis of intra and extraarticular basis. Mean duration of union of fracture with MIPPO was 18.71 weeks which is better than Plating and nailing which was 19.21 and 21.38 weeks. **Conclusion :** Minimally invasive plate osteosynthesis (MIPO) technique using stainless steel Medial Locking compression plate are found a rapid healing by secondary fracture union with few complication and hence achieving strong bone union across the fracture site due to inherent benefits of less tissue damage and minimal disturbance of fracture site biology.

**Keywords:** Olerud and Molander Score, AO classification, T-test.

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### Introduction

The management of distal tibia fractures has always held a particular interest for orthopedic surgeons. Not only are these fractures relatively common, but they are often difficult to treat. The subcutaneous location of the anteromedial surface of the tibia made it more prone to complications[1]. Although treatment planning for fracture should be considered individually to achieve the optimal results, the effect of decision must be considered in the light of overall injury status and general condition of the patient.

Most of the controversy resides in the treatment techniques regarding the choice of implants, as the indication for surgery is fairly clear. In Plate osteosynthesis for fractures of the distal tibia is often associated with delayed healing, infection, and hardware problems[2] with MIPPO [Minimally invasive percutaneous plate osteosynthesis] method rate of delayed union and infection rate is come down. Locked intramedullary nailing is the treatment of choice for closed simple diaphysal fractures of the tibial shaft and distal 1/3rd tibia [3,4]. For proper alignment, the nail should be centrally placed in both the proximal and distal fragments [5,6] but most of the time does not fit properly into the distal fragment of the lower third of the tibia which leads complications. This places additional stress on the

distal locking bolts that may lead to breakage and misalignment[7]. This study will provide the surgeons to choose the better treatment option for distal 1/3rd tibia fractures and outcome of different procedure.

### Materials and Methods

**Duration of the study:** The Patients operated between January 2013 to June 2017 with One year for data collection and six months for analysis and writing. i.e. December 2016 – June 2018. Study consists of 50 patients undergoing fracture distal 1/3rd tibia surgery were included in the study.

**Place of study:** The study was conducted at Department of Orthopedics, Sri Aurobindo Medical College & Postgraduate Institute, Indore (M.P.) [Retrospective study from January 2013 to December 2016 prospective study from December 2016 to June 2018]. Method of Collection of Data and Selection of Cases - Patients undergoing fracture distal 1/3 tibia (both intra and extraarticular) surgery were included in the study .

### Mode of Selection of Cases

#### Inclusion Criteria

Patients having fracture of distal 1/3rd tibia-Intraarticular or extraarticular by using AO classification. Patients of both sex & in age groups of above 18 years. Closed fracture of within 1month duration.

#### Exclusion Criteria

Open fracture of distal 1/3rd tibia, Patients less than 18 years, A previous operated distal 1/3rd tibia, Associated head injury, fibula

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fracture alone. Approximately 15 Cases of distal 1/3rd tibial fracture were evaluated radiologically and managed by various surgical modalities in past years. Hence, this study was feasible for a sample size of 50 cases in view of considering past 3 year and 1 ½ year present.

**Procedure Planned**

All the patients operated surgically and follow up done at intervals of 6 weeks, 3 months, 6 months and 1 year[Fig 2,3and 4]. All cases were underwent for Pre-anesthetic evaluation. Parenteral routine (Cephalosporin and aminoglycoside group) antibiotics was given 1

hour prior to surgery which is MIPPO, open plating and closed Nailing(Fig-1). Under tourniquet control fracture site was exposed. Total duration of the surgery was approximately ranges from 60 minutes to 70 minutes. Immediately after the surgery above knee slab was applied and check X-ray was taken. Parenteral antibiotics (cephalosporin and aminoglycoside group) were given till second post-operative day and then oral antibiotics (cephalosporin) till fifth day and on the second day, wound inspection and dressing was done. Suture removal was done on fourteenth day. Follow-up scoring was done by Olerud and Molander score.

**Observation Chart**



Fig 1(a):MIPPO, Fig 1(b):Open plating, Fig 1(c) :Closed intramedullary nailing  
 Table 1: Comparison of mean surgery duration (minutes) in relation to procedure

Procedure	Number	Mean±SD	df	F	p Value
MIPPO	14	56.79±5.409	2	24.659	0.001
NAILING	13	85.00±12.247			
PLATING	23	77.83±12.777			
Total	50	73.80±15.537			

One-way ANOVA applied. P value < 0.05 was taken as highly significant

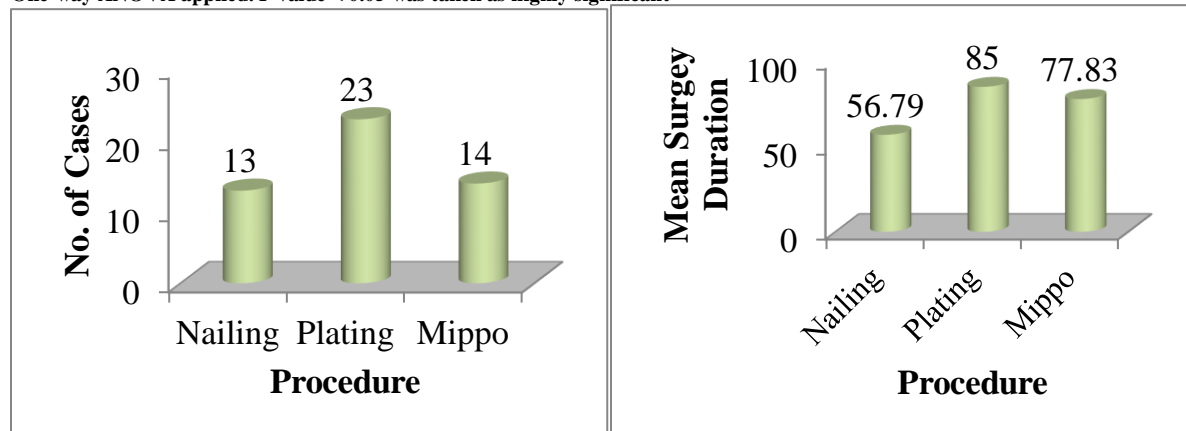


Fig 2(a): Comparison of no.of cases and procedure Fig 2(b):Mean surgery duration and procedure

Distribution according to Modality of Treatment      Distribution according to Injury- Operation Interval

Mean time of radiological union was 19.68 weeks

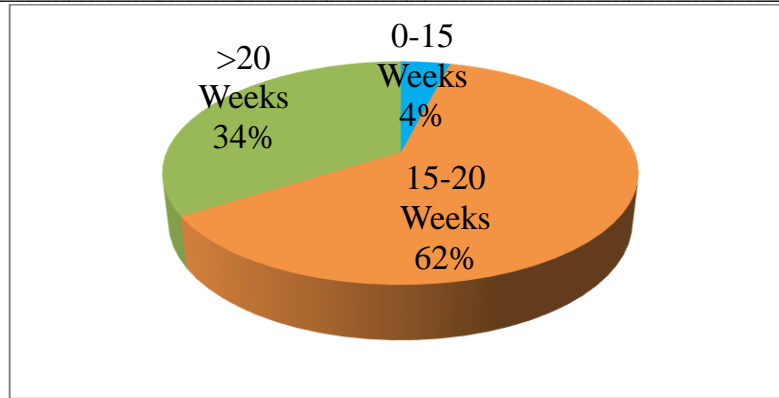


Fig 3: Distribution according to fracture union

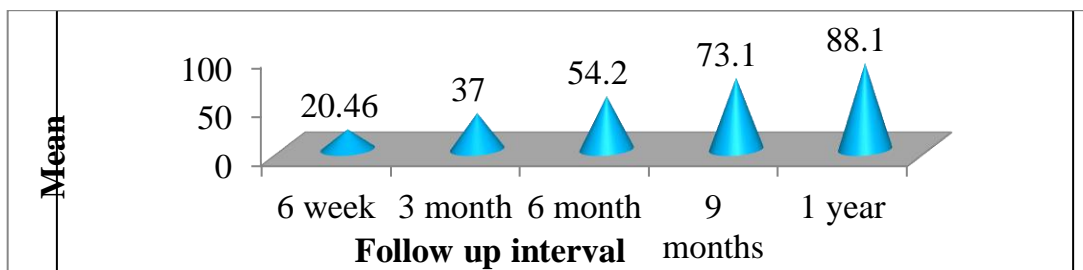


Fig 4: Mean Olerud and Molander score at regular follow up

Table2: Overall comparison of Olerud and Molander scores at regular follow ups

Comparison Between		't' value	df	P value
Pair 1	6 weeks – 3 months	-17.413	49	0.001
Pair 2	3 months – 6 months	-14.692	49	0.001
Pair 3	6 months – 9 months	-16.249	49	0.001
Pair 4	9 months – 1 year	-12.772	49	0.001

Students paired 't' test was applied. Highly significant

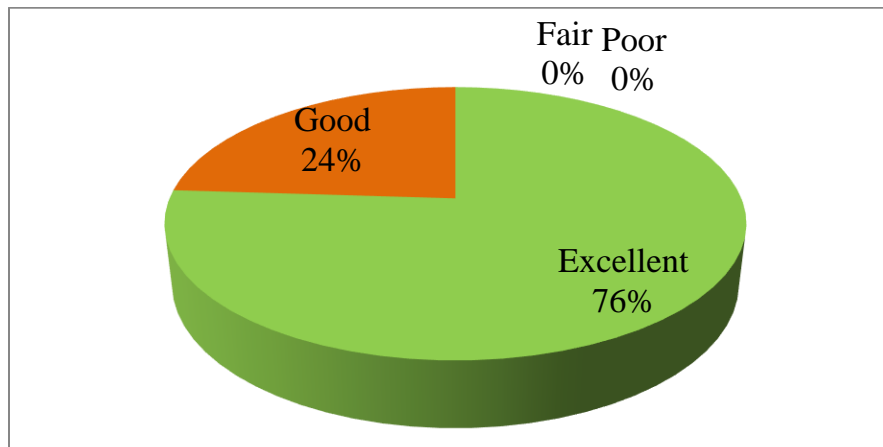


Fig 5: Distribution according to results



Fig. 6: 41 Year old male closed fracture distal 1/3<sup>rd</sup> tibia/ fibula right fracture AO-43-A3A-Pre operative x ray , B- immediate post op x ray , C- 1 month follow up, D- 3 months follow up, E- 6 months follow up, F- 9 month follow up, G- 1 year follow up  
CASE 2

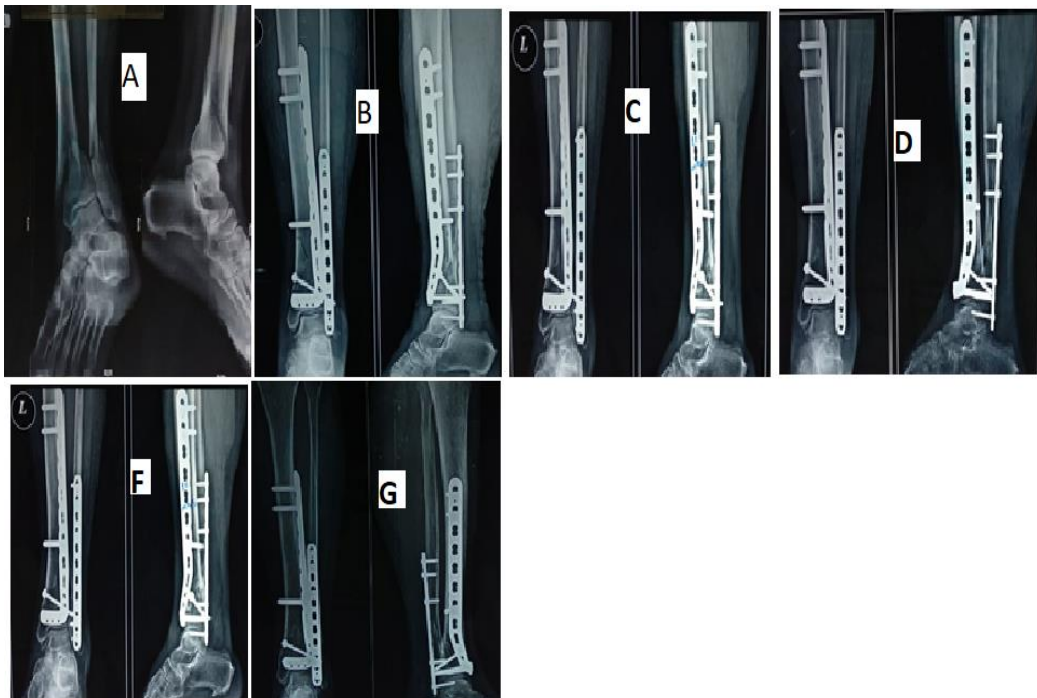


Fig. 7:64-year-old female with distal 1/3<sup>rd</sup> tibia and fibula left fracture A0-43-A3 A-Pre operative x ray , B- immediate post op x ray , C- 1 month follow up, D- 3 months follow up, E- 6 months follow up, F- 9 month follow up, G- 1 year follow up

## Results

In this study, patients were in the age group between 18-70 years, majority (86.00%) of the patient in the age group of 21-50 years, maximum incidence being in the age group of 31-40 years (30%). Mean age was found to be 38.50 years. AO classification for the fracture distal 1/3<sup>rd</sup> tibia was used. Majority cases is of type 43A3 which is 16 (32%) and after that 43A1 has 12 (24%), 43A2 has 4 (8%), 43B1 has 1 (2%), 43B2 has 7(14%), 43C1 has 10 (20%). Average injury operation interval was 3.98±1.74 (mean±SD) days. MIPPO technique took average time of union of 20.50 weeks plating took 19.57 weeks and of nailing technique took 19.85 weeks and which is not significant (p-value >0.5). The mean Olerud and Molander scores at regular follow up intervals. The mean score at 6 week post operatively was 20.46±5.56, 3 months post operatively was 37.00±7.69, 6 months post operatively was 54.20±9.76, 9 months post operatively was 73.10±8.97 and 1 year post operatively was 88.10±6.38. There was a significant increase in score from 6 weeks postoperative stage to 1 year. The mean duration in MIPPO was 56.79±5.409 minutes, in NAILING is 85.00± 12.247 minutes, and in Plating group was 77.83±12.777 minutes. There was a statistically highly significant difference in the mean duration between the three groups (P<0.05).

The comparison between the mean Olerud and Molander scores at 6 weeks, 3 month, 6 months, 9 months and 1 year post operatively. To see the statistical difference students paired 't' test was applied. The P-value obtained was p < 0.001, which is statistically highly significant. There were 4 (8%) patients having superficial skin infection over the incision site. 78% of the patients showed excellent results in our study, and 22% showed good results.

## Statistical Analysis

Data was compiled using MS excel 2007 and analysis was done with the help of Epi-Info 7 software. Frequency and percentage were calculated & statistical test (Chi Square) was applied wherever applicable; Both descriptive and inferential statistical analysis was used. T test was used and data found was that 'p' value is less than 0.05 which is considered as significant.

## Discussion

The goal of operative treatment is to obtain anatomical alignment of the joint surface while providing enough stability to allow early motion. The present study was undertaken to evaluate the outcome of various surgical modalities [Nailing, plating and minimal invasive plate osteosynthesis, techniques] in the treatment of fracture of distal 1/3<sup>rd</sup> tibia fracture. We evaluated our results and compared with those obtained by various other studies utilizing different modalities of treatment. Our analysis is as follow: 50 cases of fracture distal 1/3<sup>rd</sup> tibia, those were treated by various modalities mainly three technique Nailing, plating, minimal invasive plate osteosynthesis (MIPO) at department of orthopaedics, Sri Aurobindo medical college and post graduate institute, Indore Madhya Pradesh were included. Study was done from January 2013 – June 2018.

## Fracture pattern

The fracture pattern was classified based on AO classification for fractures of distal tibia. Out of 50 cases studied, 12 cases of 43A1 type (24%), 4 cases of 43A2 type (8%), 16 cases of 43A3 type (32%), 1 cases of 43B1 (2%), 7 cases of 43B2 type (14%), 10 cases of 43C1 type (20%) showing majority of cases was extraarticular type. V Vaza et al[8] in April 2011 done comparative study of plating versus nailing in Distal tibia metaphyseal fractures in 40 patients. According to AO classification 9 cases of 43A1 type, 18 cases of type 43A2, 8 cases of type 43A3, 5 cases of type 43B1 fractures.

## Duration of surgery

Of the 50 cases 14 cases treated MIPO technique with mean duration was 56.79 minutes, 13 cases treated with intramedullary nailing took mean time of 85 minutes, 23 cases of open plating with distal medial and lateral LCP took mean time of 77.83 minutes. J.J. Guo et al[9] in

July 2014, compared 50 patients with intra operative variable, Mean operating time between nailing and plating technique with mean duration in nailing technique 97.9 minutes and with plating technique 81.23 minutes.

Duration of fracture union: All fracture united with all procedure MIPPO technique took average time of union of 18.71 weeks which is better than of plating took 19.21 weeks and of nailing technique took 21.38 weeks. Jayesh V Vaza et al[8] in April 2011 done comparative study of plating versus nailing in Distal tibia metaphyseal fractures in 40 patients. The average time before union was 23.45 weeks (range, 16-36 weeks) in Nailing group and 26 weeks (range, 19-41 weeks) in plating.

## Criteria for assessment

Olerud and Molander scoring was used at regular follow up intervals. The mean score at 6 weeks post operatively was 20.46, 3 months was 37.00, 6 months was 54.20, 9 months was 73.10 and 1 year was 88.10. Mukara Prakesh et al[10] in June 2017 done study in management of distal tibia fracture with MIPPO on 20 patients using Olerud and Molander score the results was excellent (50%), good (30%), fair (10%), poor (10%) were attained in distal tibial pilon fractures.

## Complications

We had 4 (8%) patients with the complication includes superficial infection. ImGi et al[7] in his study, ORIF can restore alignment better than IM nailing. They treated 64 consecutive distal tibia fractures with ORIF or IM nailing. They found an average angulation of 0.9° after plating versus 2.8° after IM nailing (p=0.01). Vallier et al[11]. shown that angular malalignment is more with nail, varus of more than 5° in 29% and 5.4% with plating. Had 12% delayed and non-union with nailing group. 2.5% non-union with plating group.

## Conclusion

We treated all the fracture in our study but, minimally invasive plate osteosynthesis (MIPO) technique using stainless steel Medial Locking compression plate are found a rapid healing by secondary fracture union with few complication and hence achieving strong bone union across the fracture site due to inherent benefits of less tissue damage and minimal disturbance of fracture site biology.

## What this study add to existing knowledge

Our aim of study is to better understand current common Concept of management of distal tibia fracture management with early union, less complications with either of the surgical methods of fixation. Management of these fracture even controversial but effectively can be treated with Nail, plate and MIPPO technique.

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