



## Outcomes of different modalities of treatment of distal tibia fractures

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### Abstract

**Introduction:** *The aim of our study is to compare and analyse the best modality of treatment for management of distal tibial fractures. Distal tibia fractures are usually injuries due to high velocity trauma with damage to the soft tissue. The best modality of treatment for distal tibial fracture is that method in which we achieve a good reduction and stability; and minimise soft tissue compromise.*

**Material and Methods:** *Study was conducted at Rajendra Institute Of Medical Sciences, Bariatu, Ranchi. This study consists of 30 patients of fractures of distal tibia and was performed from November 2020–October 2022. Required consents from all the patients were taken. Data was collected from all the patients during their hospital stay and regular follow-up was done.*

**Results:** *Patients were treated with MIPO (Minimally Invasive Percutaneous Osteosynthesis) and External Fixators and had average AOFAS (American Orthopaedic Foot and Ankle Society) score 88.1 and 70.5 respectively. Treatment was also done with Intra-Medullary Interlocking Nail and had mean AOFAS score of 77.2.*

**Conclusion:** *We have analysed overall results including, radiological assessment, functional recovery and complications related to different modalities of treatment of fractures of distal tibia in our study.*

**Keywords:** *MIPO, AOFAS score, IM Nail, Gustilo Anderson, AO classification.*

### Introduction

The aim of our study is to compare and analyse the best modality of treatment for management of distal tibial fractures. Lower limb bones are commonly fractured in road traffic accidents. Tibia is the commonest long bone fractured and most commonly open type. In tibia bone, distal tibia has 2<sup>nd</sup> highest incidence of the fracture. In non-fatal road traffic accidents, fractures are the common injuries. Force and velocity of the vehicle at the time of trauma has shown to play a major role in such types of injury.

Distal tibial fractures are usually due to high velocity injuries with extensive soft tissue

damage. We face situations like non union, mal-union, delayed union and wound dehiscence caused by inefficient soft tissue coverage, reduced vascularity of distal tibia region and associated soft tissue injury. There is a dilemma over whether to give importance to soft tissue or to anatomic reduction and articular congruity while managing these fractures.

Anatomic reduction of the articular surface, restoration of fracture alignment, proper soft tissue handling and early ankle mobilisation has shown effective results in such cases. With enhancement in understanding of biomechanics and biology, over the long period, more advanced

surgical methods have been developed which have finally led to better outcome for patients. In early times main focus was anatomical reduction and rigid fixation to gain stability. Injury to the soft tissue around the fractured are a caused increased rate of delayed union and non-union making this method less rewarding.

Thus, it came to light that more focus be given biology rather than stability and this technique evolved with the time.

Fractures of distal tibial are usually caused by high velocity traumatic forces and extensive soft tissue damage also occur. Therefore it creates a dilemma whether to prioritise soft tissue handling or stable reduction and articular conformity.

During 1970s and 1980s, extensive use of the technique of ORIF was used in the treatment of distal tibia fractures but it caused increased rate of complications like infections, non-union, malunion, osteomyelitis, and post-traumatic osteoarthritis. Therefore orthopedicians discovered the importance of soft tissue handling in fractures of distal tibia. Ruedi and Allgower studied set of patients who had low-energy injuries and in 1979 they came up with another study in which patients had high energy injuries and concluded that the overall results were better in low energy injuries compared to high energy injuries. Good soft tissue handling along with stable fixation of fracture resulted better.

Different modalities of treatment in these types of fractures are- a) ilizarov fixator, b) joint spanning external fixator, c) hybrid external fixator, d) intra medullary nailing, e) minimally invasive plate osteosynthesis (MIPO)

Any one of these fixations or any other implant chosen should provide stability enough to maintain the reduction.

The best treating method for distal tibial fracture is that one which provides good reduction and stability and cares for soft tissue coverage.

Treatment of distal tibia fractures are tricky and prognosis depends upon following factors- a) whether articular surface is involved or not, b)

status of soft tissue, c) degree of comminution of fracture.

Our aim is to get good stable reduction of articular surface, providing fracture stability and using methods which decreases bone and soft tissue devascularisation.

### **Material and methods**

Numbers of patients- 30 patients of fractures of distal tibia

Place of study- RIMS , RANCHI

Time of study- November 2020- October 2022.

Before conducting the study, consents from all the patients were taken. Fracture pattern and skin condition around the fracture site advocated the use of different modalities for distal tibial fracture. Data was written and tabulated from all the patients during their hospitalised period and regular follow-up was done.

### **Inclusion and Exclusion Criteria**

#### **Inclusion Criteria**

- a) Patient with distal tibia fracture
- b) Age group of 15-65 years
- c) Patients fit for the operative procedure

#### **Exclusion Criteria**

- a) Age-patients below 15 years and above 65 years,
- b) Any bony deformity of distal tibia
- c) Crush injury cases with neurovascular involvement.

### **Deciding factors for different treatment modalities:**

- 1) IM nail - In cases which have
  - a) minimal soft tissue injury,
  - b) less amount of comminution and
  - c) no articular involvement.
- 2) MIPO technique is suitable in cases with
  - a) minimal soft tissue injury,
  - b) extensive comminution and
  - c) extra articular fractures.
- 3) External Fixation is suitable in cases with
  - a) severe soft tissue injury and
  - b) articular involvement.

**Scoring**

The American Orthopaedic Foot and Ankle Society score (AOFAS score) is used to record the functional outcome in our study.

**Post-op**

Suture removal-post op day 12 or 14<sup>th</sup> after checking the wound site. After evidence of bone union on x-ray was seen weight bearing was started and then weight bearing was progressed as tolerated by the patients. Partial weight bearing was started after 8-11 weeks but in cases of MIPO plating average time for weight bearing was delayed and started by 12-15 weeks.

**Observation and Results**

**Table 1 Age distribution**

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Age group	Number	Percentage
15-20	2	6.66
21-30	9	30
31-40	6	20
41-50	5	16.66
51-60	4	13.33
>60	4	13.33
Total	30	100.0

**Table 2 Gustilo Anderson classification**

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Type	Number	Percentage
1	5	16.66
2	2	6.66
3A	6	20
None	17	56.66
Total	30	100.0

**Table 6 Complications**

View full table

Complications	IM Nail		Ext. Fix		MIPO	
	Number		Number		Number	
Ankle stiffness	0		1		2	
Non-Union	0		2		0	
Wound discharge	1		2		1	
Total	1		5		3	

**Table 7 Varus and Valgus deformity in different modality of treatment**

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Complications	IM Nail		Ext Fix*		MIPO		Total;
	Number	%	Number	%	Number	%	
Varus deformity	1	12.5	1	14.28	0	0	2
Valgus deformity	1	12.5	3	42.85	3	20	7

**Table 3 AO classification and patient distribution**

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AO classification	Number	Percentage
A1	7	23.33
A2	2	6.66
A3	14	46.66
B1	2	6.66
C1	2	6.66
C2	2	6.66
C3	1	3.33
Total	30	100.0

**Table 4 Different modalities of treatment in different AO type of fractures**

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AO Type	IM Nail		Ext.Fix		MIPO	
	Number	%	Number	%	Number	%
A1	5	71.4	0	0	2	28.5
A2	2	100.0	0	0	0	0
A3	1	7.14	2	14.2	11	78.5
B1	0	0	0	0	2	100.0
C1	0	0	2	100.0	0	0
C2	0	0	2	100.0	0	0
C3	0	0	1	100.0	0	0
All	8		7		15	

**Table 5 Mean score of American Orthopaedic Foot and Ankle Society (AOFAS) according to the chosen modality for the management**

View full table

Management	Mean score
IM Nail	77.2
Ext. Fix	70.5
MIPO	88.1



Fig 01



Fig 02



Fig 03



Fig 04



Fig 05



Fig 06



Fig 07





Fig 08



Fig 09

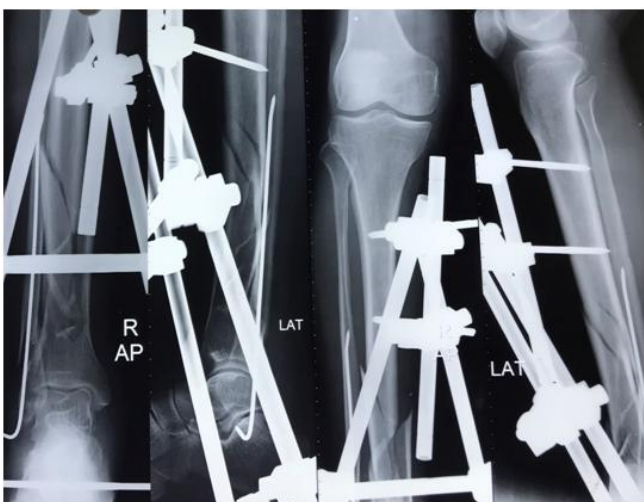


Fig 10

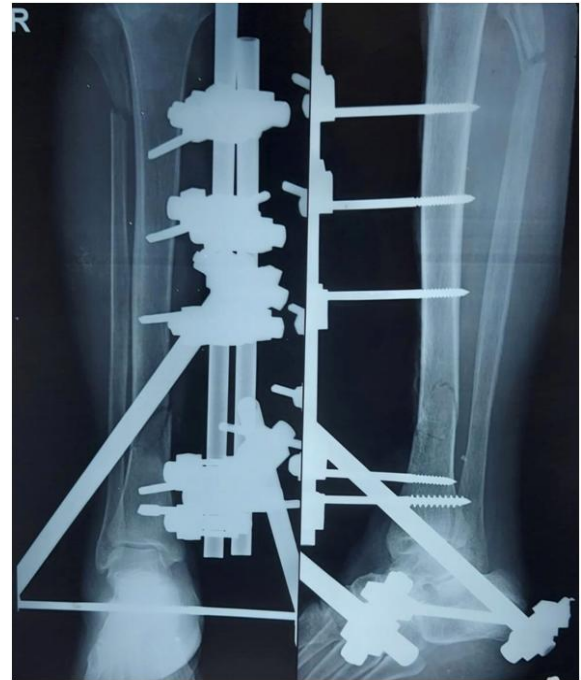


Fig 11

**Discussion**

We found that 43.3% of the patients had open fractures in this study. Therefore definitive surgical procedures were delayed till the healing of the wound (and they were managed initially by pin traction in calcaneum). In our study we found that calcaneal pin traction was beneficial because we could wait for definitive fractures fixation till the soft tissue wound heal.

Total 30 patients were treated between November 2020-October 2022 in which 8 patients were with IM nail, while 7 patients were treated with external fixator and 50% of patients (15 patients) were treated with MIPO. Patients belonging to age group 15 to 65 years were studied. Studies suggest high energy trauma is main cause for such fractures. This is comparable with a study conducted by Cory Colling et al. where range of age was from 17 to 62 years and Vallier et al. had patients with age ranging from 16 to 77 years.

Our Study had 43.3% patients with compound injuries and 56.7% with closed injuries. This was comparable with the studies done by Heather A Vallier et al; his study had 30% open injuries and 70% closed injuries. Study conducted by Hazarika et al had 40% open fractures and 60% closed fractures.

Patients treated with IM nail had mean AOFAS score of 77.2 while patients treated with External Fixator and MIPO had mean AOFAS score 70.5 and 88.1 respectively. This AOFAS score was comparable to study conducted by Pierre Joveniaux et al. where mean AOFAS score of external fixations and MIPO was 67.7 and 85.2 respectively.

### Conclusion

To conclude we would like to state that we have analysed overall results including functional recovery, radiological assessment in terms of malalignment and complications related to different modalities of treatment of distal tibial fractures and we have learnt that soft tissue status, location of fracture and involvement of articular surface play a major role in individualising a treatment method.

In cases where severe soft tissue involvement were present and/or with articular comminution, external fixation was done.

In cases with lower degree of soft tissue injury, extended comminution and with extra articular fracture, MIPO technique was preferred.

IM nail proves to be better in cases with minimal soft tissue involvement, lesser comminution and no articular damage; and it is advantageous in restoring ankle movements and provides reduced wound problems.

Here treatment was individualized on the basis of wound, type, time of presentation, associated injury and the available facilities of treatment.

We found that choosing a treatment method which values soft tissue status and focuses on fracture pattern gives better outcomes.

MIPO maintains the reduction better and preserves the biology of the fracture better.

AOFAS score was higher in patients treated with MIPO followed by IM nail and External fixation.

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