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**Dr. Vipul Kumar**  
Assistant Professor, Department  
of Orthopaedics, Muzaffarnagar  
Medical College, Muzaffarnagar,  
Uttar Pradesh, India

**Dr. Hari Kripal Singh Tanwar**  
Assistant Professor, Department  
of Orthopaedics, Muzaffarnagar  
Medical College, Uttar Pradesh,  
India

## Outcome of various modalities of management of distal tibia fracture

**Dr. Vipul Kumar and Dr. Hari Kripal Singh Tanwar**

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### Abstract

**Background:** Distal tibial fractures represent less than 7% of all tibial fractures. The present study was conducted to compare outcome of various modalities of management of distal tibia fractures.

**Materials & Methods:** 45 distal tibia fracture patients of both genders were divided equally into 3 groups of 15 each. Group I patients were treated with intra-medullary nail, group II patients treated with external fixator and group III patients with MIPO (Minimally Invasive Percutaneous Osteosynthesis). The American Orthopaedic Foot and Ankle Society score was recorded. Gustilo Anderson (GA) type of fractures and complications were recorded.

**Results:** GA type 1 was seen in 10, 2 in 8, 3A in 7 and no GA type in 20 patients. AO classification A1 was present in 5, A2 in 6, A3 in 15, B1 in 8, C1 in 5, C2 in 5 and C3 in 3 patients. The mean AOFAS score was 74.2 in group I, 70.5 in group II and 89.2 in group III. Complications were non-union seen in 1, 2 and 3, ankle stiffness in 2, 2 and 1, wound discharge in 0, 1 and 1, vagus deformity in 3, 2 and 0 and valgus deformity in 1, 3 and 2 in group I, II and III respectively. The difference was significant ( $P < 0.05$ ).

**Conclusion:** All treatment modalities found to be equally effective in management of distal tibia fracture.

**Keywords:** distal tibia, fracture, intra-medullary nail

### Introduction

Distal tibial fractures represent less than 7% of all tibial fractures. Of all lower extremity fractures less than 10% belongs to distal tibial fractures. It is more common in males in the age group of 30-50 years. The spectrum of injuries vary from low energy to high energy injuries. The low energy distal tibial fractures are mainly seen in older age group, usually due to rotational forces<sup>[1]</sup>. The spiral fracture with or without intra articular extension is commonly encountered in these mechanisms of injuries. In high energy distal tibial fractures younger age groups are involved due to road traffic accident and fall from height<sup>[2]</sup>. Axial loading, compression and torsional forces are involved in the mechanism of injury. The distal tibial fractures are mainly due to road traffic accident, fall from height and twisting of ankle. Fractures around the ankle joint are difficult to manage because of precarious vasculature in nature<sup>[3]</sup>.

Open reduction and internal fixation, joint spanning external fixator, hybrid external fixator, ilizarov fixator application, closed reduction and internal fixation with intra medullary nailing, biological minimally invasive plate osteosynthesis (MIPO) are the various modalities of treatment in these types of fractures<sup>[4]</sup>. Method selected for stabilization should be sufficient enough to maintain the reduction. The best modality of method of management for distal tibial fracture is one that achieves a good reduction and stability and minimizes soft tissue compromise as well as devascularization of the bony fragments<sup>[5]</sup>. The present study was conducted to compare outcome of various modalities of management of distal tibia fractures.

### Materials and Methods

The present study comprised of 45 distal tibia fracture patients of both genders. All were enrolled with the consent of patients. Ethical clearance was obtained before starting the study. Demographic data such as name, age, gender etc. was recorded. Patients were divided equally into 3 groups of 15 each. Group I patients were treated with intra-medullary nail, group II patients treated with external fixator and group III patients with MIPO (Minimally Invasive

**Corresponding Author:**  
**Dr. Hari Kripal Singh Tanwar**  
Assistant Professor, Department  
of Orthopaedics, Muzaffarnagar  
Medical College, Uttar Pradesh,  
India

Percutaneous Osteosynthesis). The American Orthopaedic Foot and Ankle Society score was recorded. Gustilo Anderson (GA) type of fractures and complications were recorded. Results thus obtained were compared and assessed statistically. P value less than 0.05 was considered significant.

**Results**

**Table 1:** Distribution of patients

Groups	Group I	Group II	Group III
Method	IM nail	External fixator	MIPO
M:F	9:6	10:5	7:8

Table 1 shows that group I had 9 males and 6 females, group II had 10 males and 5 females and group III had 7 males and 8 females.

**Table 2:** GA type & AO classification

Parameters	Variables	Number	P value
GA type	1	10	0.02
	2	8	
	3A	7	
	No GA type	20	
AO classification	A1	5	0.04
	A2	6	
	A3	15	
	B1	8	
	C1	5	
	C2	5	
	C3	3	

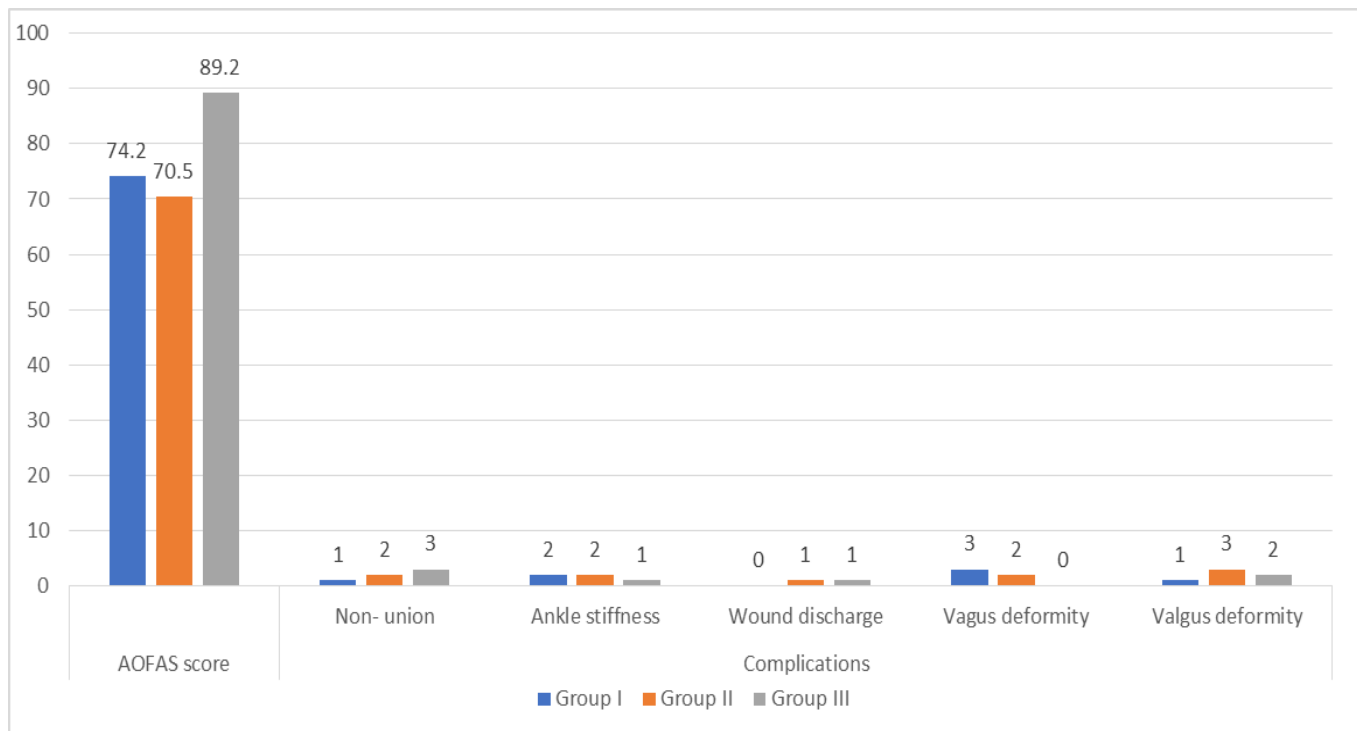
Table 2 shows that GA type 1 was seen in 10, 2 in 8, 3A in 7 and no GA type in 20 patients. AO classification A1 was present in 5, A2 in 6, A3 in 15, B1 in 8, C1 in 5, C2 in 5 and C3 in 3 patients. The difference was significant ( $P < 0.05$ ).

**Table 3:** Comparison of parameters

Parameters	Variables	Group I	Group II	Group III	P value
AOFAS score		74.2	70.5	89.2	0.05
Complications	Non- union	1	2	3	0.04
	Ankle stiffness	2	2	1	
	Wound discharge	0	1	1	
	Vagus deformity	3	2	0	
	Valgus deformity	1	3	2	

Table 3, graph 1 shows that mean AOFAS score was 74.2 in group I, 70.5 in group II and 89.2 in group III. Complications were non- union seen in 1, 2 and 3, ankle stiffness in 2, 2 and 2 respectively. The difference was significant ( $P < 0.05$ ).

1, wound discharge in 0, 1 and 1, vagus deformity in 3, 2 and 0 and valgus deformity in 1, 3 and 2 in group I, II and III respectively. The difference was significant ( $P < 0.05$ ).



**Graph 1:** Comparison of parameters

**Discussion**

In non-fatal road traffic injuries, fractures are the commonest injuries. Bones of the lower extremity are commonly involved in road traffic accidents [6]. Gravitational force and velocity of the vehicle at the time of trauma has shown to play a major role in such types of injury. The commonest long bone fractured and most common open one is tibia. According to

the location in the tibia bone; distal tibia has 2nd highest incidence of the fracture [7]. Fractures of distal tibia are usually due to high velocity injuries with extensive damage to the soft tissue. Surgeons face a dilemma over whether to give importance to soft tissue healing or to anatomic reduction and articular congruity while managing these fractures [8]. Orthopaedicians have been challenged with problems like

mal-union, delayed union, non-union and wound dehiscence due to poor soft tissue coverage, reduced vascularity of distal tibia region and associated soft tissue injury<sup>[9]</sup>. The present study was conducted to compare outcome of various modalities of management of distal tibia fractures.

In present study, group I had 9 males and 6 females, group II had 10 males and 5 females and group III had 7 males and 8 females. Solanki *et al.*<sup>[10]</sup> included 30 patients of distal tibial fractures. Patients treated with Intra-Medullary Nail had mean AOFAS (American Orthopaedic Foot and Ankle Society) score of 75.2, while patients treated with External Fixator and MIPO (Minimally Invasive Percutaneous Osteosynthesis) had mean AOFAS (American Orthopaedic Foot and Ankle Society) score 71.5 and 87.1 respectively.

We found that GA type 1 was seen in 10, 2 in 8, 3A in 7 and no GA type in 20 patients. AO classification A1 was present in 5, A2 in 6, A3 in 15, B1 in 8, C1 in 5, C2 in 5 and C3 in 3 patients. Nara *et al.*<sup>[11]</sup> included 24 patients with distal tibia extra-articular fractures, AO type 43 A1,43A 2,43A3 were randomly selected and 12 of them were operated with multidirectional interlocking nailing and remaining 12 with anterolateral locking compression plate. The patients were regularly followed up for a period of one year and were evaluated clinically and radiologically with respect to tenderness at fracture site, abnormal mobility, infection, pain on movement of knee, ankle joints and anteroposterior and lateral radiographs of the leg for union of the fracture. About 40 to 50% complication rate was attributed in internal fixation device and extensive surgical procedure due to soft tissue injury. Therefore ankle spanning external fixation became popular to maintain the articular surface of tibia with minimal internal fixation. In multidirectional Interlocking intramedullary group average time for union was 4.5 months compared to 6.4 months in plating group which was significant.

We observed that mean AOFAS score was 74.2 in group I, 70.5 in group II and 89.2 in group III. Complications were non-union seen in 1, 2 and 3, ankle stiffness in 2, 2 and 1, wound discharge in 0, 1 and 1, vagus deformity in 3, 2 and 0 and valgus deformity in 1, 3 and 2 in group I, II and III respectively. Non-surgical management have a limited role in medically unfit patient. For those patient the treatment modalities are traction or plaster of paris but the complication rate is higher like shortening, malunion, secondary osteoarthritis of the ankle and limited range of movements. In addition to the long bed ridden patient are more prone for pneumonia, deep vein thrombosis and pressure sores are encountered. Tscherne classification of soft tissue injury was accepted by the AO group to grade and evaluate each component the skin, neurovascular tissue and the musculotendinous structure gave way for reconsideration of open reduction and internal fixation of distal tibial fractures. For distal tibial fractures various modalities of internal fixation have been described<sup>[12]</sup>. They are anterior plating using tplates, AO medial plating using medial buttress plate, cloverleaf plate and dynamic compression plates. Each plate osteosynthesis has their own advantages and their complications.

## Conclusion

Authors found that all treatment modalities found to be equally effective in management of distal tibia fracture.

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