



# Comparison of Post-Operative Outcome of Interlocking Nailing of Tibia with or Without Fibular Plating in Distal Third Both Bone Fractures

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## KEYWORDS

Distal tibial fractures, fibular fixation, valgus deformity, intramedullary nailing, fracture union, radiological outcomes, complication rates.

## ABSTRACT:

**Introduction:** Distal one-third tibia and fibula fractures are common and pose significant challenges due to potential complications like valgus deformity. The aim of this study was to evaluate the functional outcomes of fibular fixation in managing these fractures and assess its effect on valgus deformity correction.

**Objective:** The primary objective was to compare valgus angle correction in distal tibial fractures treated with intramedullary interlocking nails, with or without fibular plating, focusing on radiological outcomes and alignment.

**Methods:** This prospective study included 20 patients divided into two groups: Group A (intramedullary nailing without fibular plating) and Group B (intramedullary nailing with fibular plating). Both groups underwent surgical treatment, with pre-treatment, post-treatment, and follow-up valgus angulation measured to evaluate radiological outcomes. Inclusion criteria involved closed Grade I Gustillo-Anderson fractures of the distal tibia and fibula in patients aged 20-60 years.

**Results:** There was a significant reduction in valgus angulation in both groups post-treatment and at follow-up, with Group B (fibular plating) demonstrating better alignment. Fracture union time was similar in both groups, ranging from 10 to 20 weeks. Complications included delayed union, infection, and anterior knee pain, with no significant differences between groups.

**Conclusion:** Fibular fixation significantly improves alignment in distal tibial fractures without affecting healing time or increasing complication rates. It serves as an effective adjunct to intramedullary nailing for better stabilization and valgus deformity correction.

## Introduction

Fractures of the distal one-third of the tibia and fibula represent some of the most common and clinically significant injuries encountered in orthopedic practice. These fractures are not only frequent but also pose considerable challenges due to the potential for deformities, particularly valgus deformity. (1) The

mechanical properties and anatomical positioning of the tibia and fibula contribute to the complexity of these fractures, with the tibia bearing the majority of weight during weight-bearing activities and the fibula serving as a stabilizing structure. Following fractures, the differential stress distribution and the direction of applied forces can lead to a valgus displacement of the distal fibula. Additionally, the anatomical shift of the fibula



from postero-lateral to more lateral positioning in the distal one-third of the leg further predisposes this region to valgus deformity. (2)

The rising incidence of road traffic accidents, particularly involving two-wheelers, has resulted in an increase in the frequency of distal tibial fractures, as reported by the World Health Organization in 2018. Other causes, such as falls from heights and industrial accidents, also contribute to the prevalence of these fractures. (3) In these cases, effective management and rehabilitation are essential to restoring function and enabling patients to return to their daily activities and livelihoods. However, challenges such as soft tissue injury, infection, and fracture comminution complicate the treatment process, requiring careful diagnostic evaluation and management strategies. (4)

The management of distal leg fractures can range from conservative treatment to surgical intervention, depending on the stability of the fracture following reduction. Conservative approaches may be appropriate for stable fractures, while surgical options are necessary for unstable fractures or cases with significant soft tissue involvement. Internal fixation techniques, such as intramedullary nailing and locking plates, have revolutionized the treatment of distal tibial fractures. Locking plates, though effective, may result in greater soft tissue disruption, while intramedullary nailing offers a less invasive alternative, preserving surrounding tissues and promoting faster recovery. (5)

This study aims to evaluate the functional outcomes of fibular fixation in the management of distal one-third tibial fractures. By comparing union rates, alignment, and complication rates between fractures treated with and without fibular fixation, this research seeks to clarify the potential advantages and limitations of incorporating fibular plating into the treatment protocol. The findings will contribute to evidence-based

clinical decision-making, ultimately improving patient outcomes in the treatment of these complex injuries.

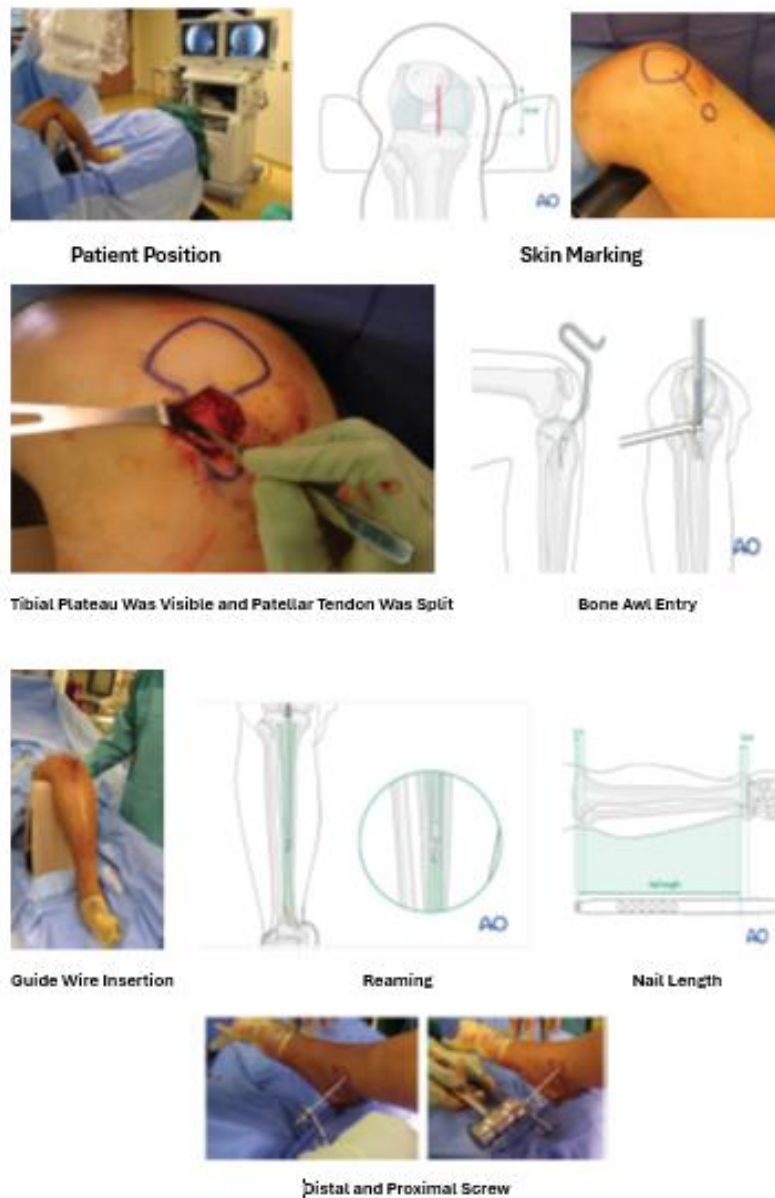
## Objective

The primary objective of this study is to assess the differences in valgus angle correction in distal one-third tibia and fibula fractures following the use of intramedullary interlocking nails, with or without the addition of fibular plating. Specifically, the study aims to evaluate and compare the radiological outcomes of valgus deformity correction in cases treated with intramedullary nailing alone versus those treated with intramedullary nailing combined with fibular plating. By examining the alignment and correction of the valgus deformity in both treatment groups, the study seeks to determine the impact of fibular plating on the overall reduction and stabilization of the fracture, contributing valuable insights into optimal treatment strategies for distal tibial fractures.

## Methods

This prospective study was conducted in the Orthopaedic Outpatient and Emergency Departments of Sree Balaji Medical College and Hospital, following ethical approval (Approval number: Ref. No.002/SBMCH/IHEC/2022/1861). The study, conducted from October 2022 to March 2024, included 20 patients with diagnosed distal one-third tibia and fibula fractures. Informed consent was obtained from all participants before they were enrolled in the study.

Patients aged 20 to 60 years with closed distal one-third tibia and fibula fractures were considered eligible for inclusion in the study. The participants were divided into two groups using a simple convenient sampling method. Group A comprised 10 patients who were treated with Intramedullary Interlocking Nailing without the addition of fibular plating. The procedure is illustrated in Figure 1.



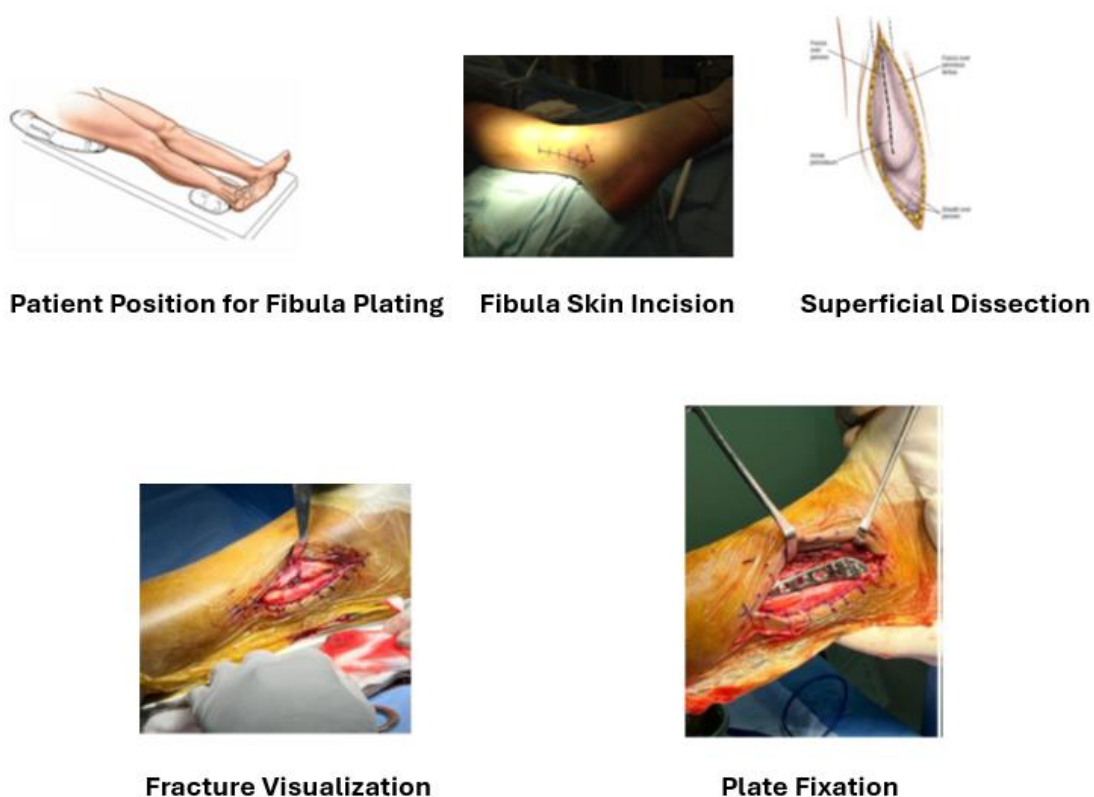
**Figure 1: Intramedullary Interlocking nail without fibula plating**

Group B included 10 patients who underwent Intramedullary Interlocking Nailing with fibular plating. All surgeries were performed by a Chief Surgeon following standardized surgical protocols. To assess

alignment outcomes, valgus angulation measurements were recorded at three key points: preoperatively, immediately postoperatively, and during follow-up visits. The procedure is depicted in Figure 2.



**Figure 2: Intramedullary Interlocking nail with fibula plating**



Inclusion criteria specified closed fractures of the distal tibia and fibula, classified as Grade I under the Gustilo-Anderson system, including various fracture patterns such as wedge, oblique, spiral, and transverse comminuted types. Patients with a severe initial valgus deformity or inadequate reduction following plaster of Paris application were also included. Only individuals aged between 20 and 60 years were eligible.

Exclusion criteria ruled out fractures located in the middle or upper segments of the tibia and fibula, compound fractures classified as Grade II or III, severely multi-fragmented fractures, and patients outside the 20 to 60-year age range.

The primary outcome measure was the correction of valgus angulation, assessed radiologically at pre-treatment, post-treatment, and follow-up stages. Secondary outcomes included the time to fracture union, the occurrence of complications, and overall alignment stability. Follow-up evaluations continued until complete fracture healing was documented. Data collected for analysis included demographic information, fracture characteristics, valgus angulation changes, and fracture healing time. A statistical comparison between the two groups focused on valgus angulation correction and complication rates, aiming to determine the efficacy of fibular plating as an adjunct to intramedullary nailing in achieving better alignment and stability.



## Result

Table 1: Demographic and Clinical Characteristics of Participants in Group A and Group B

Parameter	Group A (Number, %)	Group B (Number, %)
<b>Age (Years)</b>		
21-30	3 (30%)	3 (30%)
31-40	4 (40%)	5 (50%)
41-50	2 (20%)	2 (20%)
51-60	1 (10%)	0 (0%)
<b>Sex</b>		
Male	8 (80%)	8 (80%)
Female	2 (20%)	2 (20%)
Total	10 (100%)	10 (100%)
<b>Nail Length (cm)</b>		
28 - 30	2 (20%)	2 (20%)
31 - 32	3 (30%)	4 (40%)
33 - 34	4 (40%)	2 (20%)
35 - 36	1 (10%)	2 (20%)
<b>Mechanism of Injury</b>		
RTA	8	7
Fall from Height	2	3
AO Classification		
42-A (Simple Fracture)	4	3
42-B (Wedge Fracture)	6	7
<b>Nail Tip Distance on Either Side (cm)</b>		
< 2 cm	4 (40%)	3 (30%)



Parameter	Group A (Number, %)	Group B (Number, %)
≥ 2 cm	6 (60%)	7 (70%)
<b>Nail Diameter</b>		
≤ 9 cm	3 (30%)	2 (20%)
> 9 cm	7 (70%)	8 (80%)
<b>Fracture Union Time (Weeks)</b>		
10-12 Weeks	1	2
13-14 Weeks	3	3
15-16 Weeks	3	2
17-18 Weeks	2	2
19-20 Weeks	1	1
<b>Complications</b>		
Delayed union	1	1
Infection	2	1
Anterior Knee pain	3	2

Table 2: Comparison of Valgus Angulation Between Group A and Group B at Various Time Points

Parameter	Group A	Group B	P Value
<b>VALGUS ANGULATION</b>			
Pre-Treatment	Mean = 8.72, S.D = 4.10	Mean = 10.97, S.D = 6.10	> 0.05
Post-Treatment	Mean = 4.28, S.D = 1.74	Mean = 3.95, S.D = 1.93	< 0.05
1 Month Follow-Up	Mean = 4.72, S.D = 1.60	Mean = 4.11, S.D = 1.93	< 0.05
3 Month Follow-Up	Mean = 4.86, S.D = 1.60	Mean = 4.12, S.D = 1.43	< 0.05
6 Month Follow-Up	Mean = 5.02, S.D = 1.60	Mean = 4.08, S.D = 1.32	< 0.05



## Discussion

The current study examined the clinical outcomes of distal tibia and fibula fractures, focusing on the role of fibular fixation in improving alignment, healing time, and complication rates. The age distribution revealed a higher prevalence of fractures in the 31–40-year age group, with an average age of 36.9 years in Group A and 35.7 years in Group B, aligning with previous studies by Prasad et al. (2013) (6) and Javdan et al. (2017) (7), which also reported a significant proportion of patients in this age range. Male predominance, observed in 80% of patients, further supports findings from Rouhani et al. (2012) (8), Prasad et al. (2013) (6), and Javdan et al. (2017) (7), highlighting the higher risk of trauma in males due to their engagement in physically demanding activities. Nail selection, with a preference for diameters greater than 9 mm, was consistent across both groups, emphasizing the need for enhanced stability in treating distal tibial fractures. Fracture union times were similar in both groups, with most fractures healing within 13–16 weeks, suggesting that fibular fixation may not accelerate healing time but plays a crucial role in maintaining alignment. The study observed significantly lower valgus angulation in the fibular fixation group, supporting the hypothesis that fibular fixation improves alignment, consistent with findings from Prasad et al. (2013) (6) and Javdan et al. (2017) (7). Complications such as delayed union, infection, and anterior knee pain were observed in both groups, with no significant differences between the groups, aligning with the results of Rouhani et al. (2012) (8), Prasad et al. (2013) (6), and Javdan et al. (2017) (7). Delayed union occurred in both groups due to premature weight-bearing, but fractures ultimately healed by 18 weeks. These findings suggest that fibular fixation provides significant benefits in terms of alignment and stability without significantly altering healing time or increasing complications, reinforcing its safety and efficacy as an adjunct treatment for distal tibial fractures.

## Conclusion:

The findings of this study indicate that fibular fixation plays a crucial role in enhancing the radiological outcomes of distal tibial fractures. Specifically, fibular plating in conjunction with intramedullary nailing significantly improves valgus alignment compared to nailing alone. Despite the additional step of fibular fixation, the overall healing time for fracture union

remained consistent between both groups, indicating that fibular plating does not delay recovery. Complication rates, including delayed union, infection, and anterior knee pain, were comparable in both groups, suggesting that fibular fixation does not elevate the risk of postoperative complications. Thus, incorporating fibular plating with intramedullary nailing offers a more reliable solution for correcting valgus deformity in distal tibial fractures without compromising the overall clinical outcome. This study supports the use of fibular fixation as an effective adjunct to standard nailing techniques, providing better stabilization and alignment without increasing surgical risks.

## Reference

1. Gururaj G . Road traffic deaths, injuries and disabilities in India: Current scenario. THE NATIONAL MEDICAL JOURNAL OF INDIA VOL. 21, NO. 1, 2008
2. Isik M, Subasi M, Karsli B, Saricicek V, Karsli G. Intramedullary Nailing and Angulation Prevention in Distal Metaphyseal Tibial Fractures. *Orthopedics*. 2012;35(12): e1765-e1768.
3. Intramedullary nailing and plate osteosynthesis for fractures of the distal metaphyseal tibia and fibula. Ajay Krishan, Chetan Peshin, Dara Singh Department of Orthopaedics, GMC Jammu, India, *Journal of Orthopaedic Surgery* 2009;17(3):317-20
4. Freedman EL1, Johnson EE..Radiographic analysis of tibial fracture malalignment following intramedullary nailing. *Clin Orthop Relat Res*. 1995 Jun;(315):25-33.
5. Rouhania A. Elmia, H. Akbari Aghdama, F. Panahib, Y. Dokht Ghafaric. The role of fibular fixation in the treatment of tibiadiaphysis distal third fractures. *Orthopaedics & Traumatology: Surgery & Research* (2012) 98, 868—872
6. Prasad M, Yadav S, Sud A, Arora NC, Kumar N, Singh S. Assessment of the role of fibular fixation in distal-third tibia–fibula fractures and its significance in decreasing malrotation and malalignment. *Injury, Int. J. Care Injured* 44



(2013) 1885–1891.

doi:10.1016/j.injury.2013.09.017

7. Javdan M, Tahririan MA, Nouri M. The Role of Fibular Fixation in the Treatment of Combined Distal Tibia and Fibula Fracture: A Randomized, Control Trial. *Adv Biomed Res* 2017;6:48.
8. Rouhani A, Elmi A, Akbari Aghdam H, Panahi F, Dokht Ghafari Y. The role of fibular fixation in the treatment of tibia diaphysis distal third fractures. *Orthop Traumatol Surg Res* 2012;98:868-872.  
doi:10.1016/j.otsr.2012.09.009