

## ASSESSMENT OF FUNCTIONAL OUTCOME IN DISTAL BOTH LEG BONE FRACTURES – INTERNAL FIXATION FOR FIBULA AND TIBIAL INTERLOCKING NAILING

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### Abstract

**Introduction:** Tibial fractures are common fractures of distal leg accounting 20-30% of its fractures. Fractures in the distal third of Both Bones Leg when treated by conservative line of management, here are high chances of malunions ankle stiffness due to prolonged immobilization, delayed union, valgus or varus mal-alignment of tibia. The present study was designed to assess the functional outcome of internal fixation of both bone leg fractures

**Material and Methods:** Twenty-one cases with distal both bone leg fractures above 21 years of age with distal both bone leg fractures undergoing fibular fixation with tens nailing and tibia nailing were included. Postoperative follow up was done at the end of 6<sup>th</sup> week, 3<sup>rd</sup> month, 6<sup>th</sup> month and 12<sup>th</sup> month and participants were assessed clinically and radiologically for the status of the fractures.

**Results:** Road traffic accidents were common cause of injury in 80.95%, followed by fall on floor in 14.29%. Ankle range of motion by Merchant and Deitz rating showed excellent outcome in 81%, good in 14% and fair in 5% of cases. The final functional outcome by Johner and Wruh's criteria showed that the outcome was excellent in 85.71% and good in 14.28% of cases.

**Conclusion:** For optimal ankle function and tibial and fibular anatomical restoration, the fixation of the fibula by closed tens nailing, followed by tibia nailing, is a successful procedure.

**Keywords:** Johner and Wruhs criteria, Distal leg bone fractures, Functional outcome, Ten's nailing.

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### Introduction

Distal tibial fractures are frequently resulted in high energy traumatic events including road traffic accidents, falling from height, motorcycle accident, assault or sport injury due to a force directed from the foot towards the leg [1]. About 20–30% of all leg bone fractures are distal in

nature [2]. When rigid internal fixation and anatomical reduction are required, it may be essential to extensively expose the fracture's surrounding tissues, which could result in delayed or incomplete healing because too much soft tissue and blood supply were destroyed [3]. The

conservative treatment approach may be involved with malunion or delayed union, ankle stiffness and tibial varus/valgus [4]. The therapy of distal both leg bone fractures has been investigated using a variety of surgical techniques, including intramedullary nailing, minimally invasive plate osteosynthesis (MIPO), external fixation, and open reduction and internal fixation (ORIF) [5]. Intramedullary nails were widely used in open fractures because of their successful outcomes and minimal damage to bone and soft tissue [6].

Intramedullary fixation of unstable distal tibia and fibula fractures can result excellent outcome that are comparable with modern plating techniques [7, 8]. However, recurrence of symptoms, delayed healing of fractures, and a high incidence of primary and secondary malalignment have been associated with intramedullary nailing and still its successful surgical and functional outcome is ongoing debate [9]. With reference to the above literature, the present study was designed to assess the functional outcome of internal fixation of both bone leg fractures.

### Materials and Methods

The present prospective interventional study was conducted in the Department of Orthopedics, Maheshwara Medical College and Hospital, Isnapur, Telangana from February 2021 to April 2023. A total of 21 cases with distal both bone leg fractures above 21 years of age attending Department of Orthopedics were recruited. Cases with compound grade 1 fracture, with distal both bone leg fractures

undergoing fibular fixation with tens nailing and tibia nailing and willing to participate were included. Cases with compound grade II, IIIa, IIIb & IIIc fractures, intraarticular fracture and not willing to participate were excluded. According to orthopedic trauma association classification fractures were classified based on nature of injury at the time of admission. Informed consent was obtained from all the study participants and the study protocol was approved by the institutional ethics committee.

All the participants were undergone clinical and radiological assessment to examine fracture leg on anteroposterior and lateral view. All the participants were undergone with closed reduction and internal fixation of fibula by tens nailing and intramedullary nailing of tibia. Static quadriceps and ankle pump exercises and active knee range of motion exercises were initiated at the end of 2<sup>nd</sup> postoperative day. Suture were removed on 11<sup>th</sup> postoperative day and then patients were allowed for full knee range of motion exercises. Patients were advised to avoid lifting weight until 6 weeks. Postoperative follow up was done at the end of 6<sup>th</sup> week, 3<sup>rd</sup> month, 6<sup>th</sup> month and 12 months and then until the complete closure of fractures. During each visit participants were undergone detailed clinical and radiological examination to assess the status of the tibial malalignments, details of length and angulation. Functional assessment of ankle movements was done by using Ankle evaluation rating system by Merchant and Deitz. The final evaluation was conducted using Johner and Wruhs criteria.

**Table 1: Ankle range of motion evaluation rating system by Merchant and Deitz (10)**

Range	Percentage
Excellent	100%
Good	76-99%
Fair	51-75%
Poor	<50%

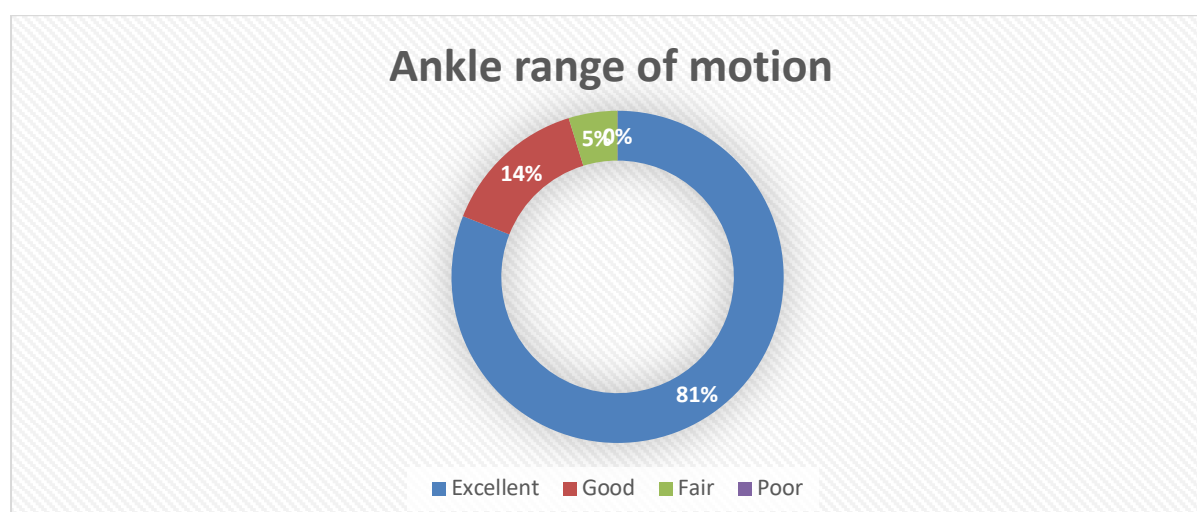
**Table 2: Functional evaluation was conducted using Johner and Wruhs criteria (11)**

Criteria	Excellent	Good	Fair	Poor
Non-union of fracture	None	None	None	Yes
Deformity of tibia (Varus/Valgus)	None	2-5 <sup>0</sup>	6-10 <sup>0</sup>	>10 <sup>0</sup>
Degree of mobility at ankle joint	Normal	>75%	50-75%	<50%
Gait	Normal	Normal	Insignificant limp	Significant limo

## Results

**Table 1: Demographic and clinical history of study participants**

Parameter	Total participants (n=21)	
	Frequency	Percentage
Age (Mean±SD)	35.87±5.62	
<b>Gender</b>		
Male	15	71.42%
Female	06	28.58%
<b>Side of fracture</b>		
Unilateral right	10	47.62%
Unilateral left	11	52.38%
<b>Mode of fracture</b>		
Road traffic accidents	17	80.95%
Fall on floor	03	14.29%
Assault	01	4.76%
<b>Type of fracture (OTA classification)</b>		
A1	04	19.05%
A2	06	28.58%
A3	05	23.81%
B2	03	14.29%
B3	03	14.29%
<b>Tye of fractures</b>		
Closed fractures	20	95.24%
Open fractures	01	4.76%

**Figure 1: Outcome of aankle range of motion evaluation by Merchant and Deitz rating**

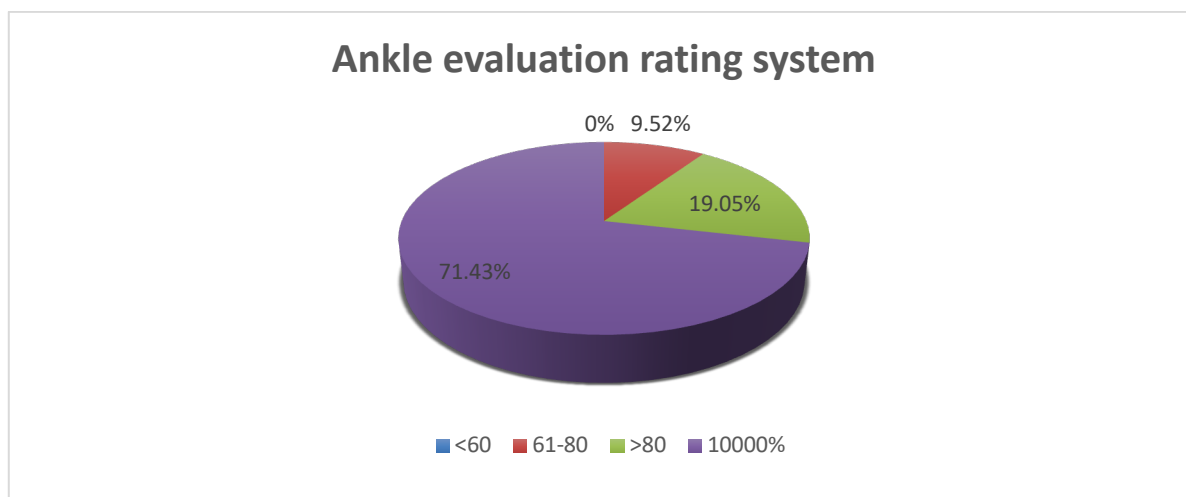


Figure 2: Details of ankle evaluation rating system score

Table 2: Assessment of surgical outcome among study participants

Parameter	Total participants (n=21)	
	Frequency	Percentage
<b>Radiological angulation of tibia</b>		
Good	04	19.05%
Excellent	17	80.95%
<b>Duration of reunion of fracture (In months)</b>		
Up to 5	15	71.42%
>5	06	28.57%
<b>Postoperative follow up period (In months)</b>		
Up to 6	-	-
7-12	12	57.14%
12-24	08	38.10%
Above 24 months	01	4.76%
<b>Postoperative complications</b>		
No infection	18	85.71%
Superficial Infection	01	4.76%
Deep infection	01	4.76%
Pain	01	4.76%

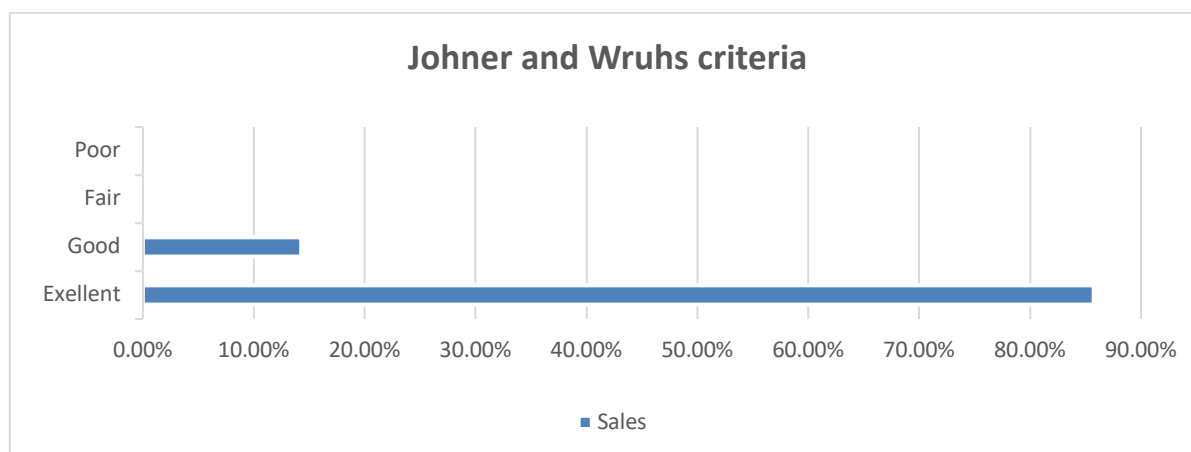


Figure 3: Evaluation of final function outcome by using Johner and Wruhs criteria

## Discussion

The mean age of study participants was 35.87 years. Majority participants were males (71.42%) than females (28.58%). Unilateral right-side fractures were seen in 47.62% and left side fracture in 52.38%. Fractures due to road traffic accident were common in 80.95%, due to fall on floor in 14.29% and due to assault in 4.76% of cases. According to Orthopaedic trauma association classification, 19.05% of fracture was A1 type, A2 type in 28.58%, A3 in 23.81%, B2 in 14.29% and B3 in 14.29% type of fractures. Closed fractures were observed in 95.24% of cases and open fractures was seen in one case (Table 1). A study by Prabhu VA et al., included 15 participants with mean age of 37.2 years, with road traffic accidents (73.3%) as common mode of fractures, followed by fall from height (26.6%). Closed fractures were observed in 80% and open fracture in 20% of cases [12].

A study by Zadbuke Y et al., included 20 cases with diaphyseal tibia fractures found that road traffic accident was common cause of fractures. Followed by fall from height and sports injuries [13]. Vijayakumar SK et al., included 30 cases with majority male participants (60%). Right side (56.7%) leg fractures were commonly seen than left side (43.3%) and road traffic accidents (80%) was the common cause of fractures followed by fall from height (20%) injuries. Closed fractures were observed in 86.7% and open grade 1 fracture in 13.3% of cases [14]. Gupta A et al., included 30 cases (12 female & 18 male) with mean age of 42.4 years. Majority cases had fracture on right side (63.33%) than left side (36.6%). Road traffic accidents were common cause of injury (73.33%), followed by slips and twisting injuries in 20% and others in 6.66% of cases [15]. In present study, assessment of ankle range of motion by Merchant and Deitz rating showed excellent outcome in 81%, good in 14% and fair in 5% and none of the cases

showed poor outcome (Graph 1). The ankle evaluation rating system score showed score 61-80 in 9.52% cases, score above 80 in 19.05% and 71.43% showed score 100 (Graph 2). A study by Prabhu VA et al., assessed the ankle range of motion showed excellent range in 73.3%, good range in 26.7% and none of the cases showed fair and poor range of motion. The ankle evaluation rating score showed 60-80 in 13.3%, >80 in 33.3% and 100 in 66.4% of cases [12]. A study by Kailash S et al., reported that the pattern of ankle evaluation rating system score was <60 in 13.3%, between 60-80 in 60%, >80 in 26.6% [16]

The radiological assessment of angulation of tibia showed excellent outcome in 80.95% and good outcome in 19.05% of cases. The total duration of fracture reunion was up to 5 months in 71.42% of cases and more than 5 months in 28.57% of cases. The follow up duration was 7-12 months in 57.14% of cases, 12-24 months in 38.10% and above 24 months in 4.76%. Postoperative complications including superficial infection, deep infection, and pain was observed in one case each and remaining 85.71% did not reported complication (Table 2). The evaluation of final functional outcome by Johner and Wruhs criteria showed that the outcome was excellent in 85.71% and good in 14.28% of cases (Graph 3). A study by Prabhu VA et al., found time of fracture union was above 5 months in 33.3% and less than 5 months in 66.6% of cases.

The final function outcome assessed by using Johner and Wruhs criteria showed excellent outcome in 80% and good outcome in 20% of cases [12]. Zadbuke Y et al., assessed functional outcome by Flynn's criteria showed excellent outcome in 95%, satisfactory in 5% and none with poor functional outcome [13]. Vijayakumar SK et al., assessed final outcome by Johner and Wruhs criteria showed excellent functional outcome in 56.7%, good in 13.3% and fair outcome in

30% of cases [14]. Gupta A et al., reported that none of the case showed signs of deep infection, delayed union or non-union of fracture, but three cases had superficial infection at the tibial incision [15]. Kailash S et al., assessed final outcome according to Johner and Wruhs criteria showed excellent outcome in 13.3%, good in 66.36%, and fair in 20% of cases [16].

In order to prevent soft tissue problems, exposed implants, and an elevated risk of infection, Gupta A et al. [15] indicate that it is preferable to utilise a rush nail for the fibula with a contemporaneous MIPPO for the tibia in the management of fractures of the distal tibia and fibula. According to Prasad Manish et al., fixing the fibula in addition to interlocking nailing the tibia reduces tibial malalignment and ankle malrotation in distal-third fractures of the tibia and fibula compared to just interlocking nailing [17].

According to a systemic review on the intramedullary fixing of fibula fractures, this method of treatment is effective for maintaining reduction in distal fibular fractures [18]. According to Jain Sameer et al., intramedullary treatment of distal fibular fractures that are unstable can produce outstanding results that are equivalent to contemporary plating procedures [19]. According to Bastas Gonzalo F et al., the restoration of anatomical ankle characteristics, including fibular rotation, length, and syndesmoti diastasis, is possible with FN fixation of DF fractures [20].

The results present study was in accordance with above findings that by fixation of fibula by closed tens nailing followed by tibia nailing is efficient for good ankle function and anatomical restoration of tibia and fibula.

The present study has limitations in terms of low sample size with limited postoperative follow up duration. Further long-term follow-up studies with large scale participants are required to assess the

distal both leg bone fractures managed with various plating and nailing methods.

### Conclusion

The final functional outcome by Johner and Wruhs criteria exhibited was excellent outcome in 85.71% and good outcome in 14.28% of cases The findings of the current study indicated that the anatomical reduction of the tibia and the reduction of tibial malalignment with good ankle functions may be achieved by fixing the fibula by closed tight nailing, followed by tibia nailing, in the treatment of distal third both bone leg fractures.

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