International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Website: https://ijmpr.in/

Research Article

Comparative Study of Intramedullary Nailing versus Plating in Distal Tibia Fractures

Dr. Parth Narayanbhai Sharda[1], Dr Jay Bankimchandra Tailor[2], Dr Sudhanshu Kumar Mishra[3]

[1]Senior Resident, Orthopaedics Department, GMERS Medical College & Hospital, Sola, Ahmedabad, Gujarat, India
[2]3rd Year Resident, Orthopaedics Department, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan, India
[3]3rd Year Resident, Orthopaedics Department, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan, India

OPEN ACCESS

Corresponding Author:

Dr. Parth Narayanbhai Sharda
Senior Resident, Orthopaedics Department, GMERS Medical College & Hospital, Sola, Ahmedabad, Gujarat, India.

Received: 25-04-2026
Accepted: 01-06-2026
Published: 12-06-2026

ABSTRACT

Background: Distal tibial fractures are among the most challenging injuries encountered in orthopedic trauma due to their subcutaneous location, limited soft tissue coverage, and proximity to the ankle joint. Various surgical techniques have been employed for their management, with intramedullary nailing and plate fixation being the most commonly used methods. However, the optimal treatment modality remains a subject of debate.

Aim: To compare the clinical, radiological, and functional outcomes of intramedullary nailing and plate fixation in the management of distal tibial fractures.

Methods: A prospective comparative observational study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital in Jaipur, Rajasthan. A total of 30 patients with distal tibial fractures were included and divided into two groups: intramedullary nailing (n=15) and plating (n=15). Demographic details, operative parameters, fracture union, functional outcomes, and postoperative complications were evaluated. Functional assessment was performed using the American Orthopaedic Foot and Ankle Society (AOFAS) score. Statistical analysis was carried out using appropriate tests, and a p-value of less than 0.05 was considered statistically significant.

Results: The mean age of the study population was 40.5 ± 12.0 years, with males constituting 70.0% of cases. Road traffic accidents were the most common mode of injury (63.3%). The intramedullary nailing group demonstrated significantly shorter operative duration (82.6 ± 11.4 vs. 103.8 ± 14.2 minutes; $p<0.001$), shorter hospital stay (5.8 ± 1.2 vs. 7.4 ± 1.5 days; $p=0.003$), and earlier partial and full weight bearing compared with the plating group. The mean time to fracture union was 18.2 ± 2.4 weeks in the nailing group and 20.1 ± 2.8 weeks in the plating group. The mean AOFAS score was higher in the intramedullary nailing group (89.6 ± 6.2) compared to the plating group (85.4 ± 7.1). Excellent functional outcomes were observed in 53.3% of patients treated with intramedullary nailing and 33.3% treated with plating. The overall complication rate was lower in the nailing group (26.7%) compared with the plating group (46.7%).

Conclusion: Both intramedullary nailing and plate fixation provided satisfactory fracture union and functional outcomes in distal tibial fractures. However, intramedullary nailing was associated with shorter operative time, reduced hospital stay, earlier mobilization, and fewer complications. Therefore, intramedullary nailing may be considered a preferred treatment option for appropriately selected distal tibial fractures, while plating remains a valuable alternative in fractures requiring precise anatomical reduction.

Keywords*: Distal Tibial Fracture; Intramedullary Nailing; Plate Fixation; Locking Compression Plate; AOFAS Score; Fracture Union; Functional Outcome; Orthopedic Trauma..*

INTRODUCTION

Distal tibia fractures represent a challenging group of injuries encountered in orthopedic trauma practice. They account for approximately 7–10% of all tibial fractures and are often associated with significant soft tissue injury due to the subcutaneous location of the tibia and its limited soft tissue coverage [1]. The distal metaphyseal region of the tibia has relatively poor vascularity, making fracture management difficult and increasing the risk of complications such as delayed union, non-union, malunion, and infection [1].

The distal tibia plays a crucial role in transmitting body weight across the ankle joint and maintaining lower limb alignment. Fractures involving this region commonly occur following high-energy trauma such as road traffic accidents, falls from height, and industrial injuries among younger adults. In contrast, low-energy injuries in elderly osteoporotic individuals may also result in distal tibial fractures [2]. With the increasing incidence of road traffic accidents worldwide, the burden of distal tibial fractures continues to rise, particularly in developing countries such as India [5].

Historically, these fractures were managed conservatively with casting and prolonged immobilization. However, conservative treatment was frequently associated with complications such as prolonged hospital stay, joint stiffness, muscle wasting, malalignment, and delayed functional recovery [2]. Advances in surgical techniques and implant technology have shifted the management of distal tibial fractures toward operative fixation, aiming to achieve anatomical reduction, stable fixation, early mobilization, and improved functional outcomes [2,3].

Among the available surgical options, intramedullary nailing (IMN) and plate fixation are the two most commonly employed methods for treating distal tibial fractures. Intramedullary nailing offers several advantages, including minimal soft tissue disruption, preservation of periosteal blood supply, shorter operative time, smaller incisions, reduced blood loss, and early weight bearing. As a load-sharing device positioned centrally within the medullary canal, the nail promotes secondary fracture healing through callus formation [4,6]. Nevertheless, intramedullary nailing may be associated with challenges such as malalignment, difficulty in controlling distal fracture fragments, and anterior knee pain [4].

Plate fixation, particularly through minimally invasive plate osteosynthesis (MIPO), has gained popularity because of its ability to provide stable fixation while preserving fracture biology. Locking compression plates allow angular stability and improved control of alignment, especially in metaphyseal and comminuted fracture patterns [3]. The MIPO technique minimizes soft tissue dissection and periosteal stripping, thereby reducing the risk of vascular compromise. However, plating may be associated with wound complications, infection, implant prominence, and delayed weight bearing due to the limited soft tissue envelope around the distal tibia [3].

Numerous studies have compared intramedullary nailing and plating in the treatment of distal tibial fractures. Both techniques have demonstrated satisfactory fracture union rates and functional outcomes. Some investigators have reported advantages of intramedullary nailing in terms of shorter operative duration, earlier mobilization, and lower infection rates, whereas others have highlighted the superior alignment control achieved with plating [4,5,7]. Despite these findings, controversy persists regarding the optimal fixation method, particularly for extra-articular distal tibial fractures.

The choice between intramedullary nailing and plating is influenced by several factors, including fracture configuration, degree of comminution, soft tissue status, patient characteristics, and surgeon expertise. Therefore, a direct comparison of these two treatment modalities is necessary to determine their relative effectiveness with regard to fracture union, functional outcome, operative parameters, and complication rates [4,7].

The present study was undertaken to compare intramedullary nailing and plating in the management of distal tibial fractures. By evaluating clinical, radiological, and functional outcomes, this study aims to provide evidence that may assist orthopedic surgeons in selecting the most appropriate treatment modality for achieving optimal patient outcomes.

The aim of the present study was to compare the clinical, radiological, and functional outcomes of intramedullary nailing and plate fixation in the management of distal tibial fractures. The objectives were to evaluate and compare functional outcomes using the American Orthopaedic Foot and Ankle Society (AOFAS) score, assess the time required for fracture union, compare operative parameters such as duration of surgery, evaluate the time to weight bearing, and analyze postoperative complications including infection, delayed union, malunion, non-union, implant irritation, and implant failure associated with both treatment modalities. Distal tibial fractures continue to pose a significant challenge to orthopedic surgeons because of their anatomical location, limited soft tissue coverage, and higher risk of complications. Although intramedullary nailing and plate fixation are commonly used surgical options, there remains considerable debate regarding the optimal treatment method. Intramedullary nailing offers the advantages of minimal soft tissue disruption, preservation of fracture biology, and early mobilization, whereas plating provides better control of fracture alignment and stability, particularly in metaphyseal fractures. Previous studies have reported varying results regarding fracture healing, functional recovery, and complication rates, highlighting the need for further comparative evaluation. Therefore, this study was undertaken to generate evidence regarding the relative effectiveness of these two treatment modalities in a tertiary care setting. The findings are expected to provide valuable information regarding the advantages and limitations of each technique, facilitate evidence-based clinical decision-making, aid in selecting the most

appropriate treatment according to fracture characteristics and patient factors, and contribute toward improving functional outcomes, reducing complications, and optimizing the management of distal tibial fractures in routine orthopedic practice.

METHODOLOGY

The present study was designed as a prospective comparative observational study conducted in the Department of Orthopaedics at a tertiary care teaching hospital in Jaipur, Rajasthan, India. The hospital serves as a major referral center for trauma and orthopedic cases from both urban and rural populations. The study was carried out over a period of one year.

All patients presenting with distal tibial fractures to the Department of Orthopaedics during the study period were screened for eligibility. A total of 30 patients meeting the inclusion criteria were enrolled in the study after obtaining written informed consent. The patients were divided into two groups based on the surgical treatment modality employed. Group A consisted of 15 patients treated with intramedullary interlocking nailing, while Group B consisted of 15 patients treated with plate fixation using locking compression plates.

Patients aged 18 years and above with closed distal tibial fractures or Gustilo-Anderson Grade I open fractures, including extra-articular distal tibial fractures and fractures with minimal articular extension suitable for either treatment modality, were included in the study. Patients younger than 18 years, those with pathological fractures, Gustilo-Anderson Grade II and III open fractures, associated neurovascular injuries, previous fractures or deformities of the affected limb, polytrauma requiring prolonged intensive care management, and those unwilling to participate or unavailable for follow-up were excluded from the study.

A detailed clinical history was obtained from each patient, including demographic information, mechanism of injury, side involved, and associated comorbidities. Thorough general and local examinations were performed, and radiological evaluation was carried out using standard anteroposterior and lateral radiographs of the leg including the ankle joint. Fractures were classified based on standard orthopedic classification systems, and treatment decisions were made by the operating surgeon according to fracture characteristics and clinical considerations.

All surgical procedures were performed under standard aseptic precautions. Patients underwent either intramedullary interlocking nailing or plate fixation using locking compression plates. Relevant operative details including duration of surgery, intraoperative blood loss, and any perioperative complications were documented. Postoperative care and rehabilitation protocols were standardized as far as possible for both groups.

Patients were followed up clinically and radiologically at regular intervals of 6 weeks, 12 weeks, 18 weeks, and 24 weeks after surgery. Clinical assessment included evaluation of pain, wound healing, ankle and knee range of motion, weight-bearing status, and postoperative complications. Radiological assessment was performed to evaluate fracture alignment, callus formation, and progression toward union. Functional outcome was assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) scoring system at the final follow-up visit.

The primary outcome measure of the study was functional outcome as assessed by the AOFAS score. Secondary outcome measures included duration of surgery, hospital stay, time to fracture union, time to partial and full weight bearing, and postoperative complications such as infection, delayed union, malunion, non-union, implant irritation, and implant failure.

All data were collected using a predesigned case record form and entered into Microsoft Excel for analysis. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Comparisons between the intramedullary nailing group and plating group were performed using the independent Student's t-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Confidentiality of all patient information was maintained throughout the study. Participation was entirely voluntary, and all patients were informed about the purpose of the study, potential benefits, and risks before obtaining written informed consent. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

RESULTS SUMMARY

A total of 30 patients with distal tibial fractures were included in the study and were equally distributed between the intramedullary nailing group (n=15) and the plating group (n=15). The mean age of the study population was 40.5 ± 12.0 years, with a predominance of male patients (70.0%). Road traffic accidents were the most common mode of injury, accounting for 63.3% of cases, followed by falls from height (30.0%). Most fractures were closed injuries (83.3%), while 16.7% were Grade I open fractures.

Comparison of operative and clinical outcomes demonstrated favorable results in the intramedullary nailing group. The mean duration of surgery was significantly shorter in the intramedullary nailing group (82.6 ± 11.4 minutes) compared to the plating group (103.8 ± 14.2 minutes) ($p < 0.001$). Similarly, the mean hospital stay was significantly lower among

patients treated with intramedullary nailing (5.8 ± 1.2 days) than those treated with plating (7.4 ± 1.5 days) ($p = 0.003$). Patients in the intramedullary nailing group achieved partial weight bearing earlier (4.2 ± 0.8 weeks vs. 6.1 ± 1.0 weeks; $p < 0.001$) and full weight bearing sooner (10.4 ± 1.5 weeks vs. 12.6 ± 1.8 weeks; $p = 0.001$) compared with the plating group.

Radiological union was achieved in both groups with satisfactory results. The mean time to fracture union was 18.2 ± 2.4 weeks in the intramedullary nailing group and 20.1 ± 2.8 weeks in the plating group. Although fracture union occurred earlier in the intramedullary nailing group, the difference was not statistically significant ($p = 0.055$).

Functional outcome assessment using the American Orthopaedic Foot and Ankle Society (AOFAS) score revealed a mean score of 89.6 ± 6.2 in the intramedullary nailing group and 85.4 ± 7.1 in the plating group. Excellent functional outcomes were observed in 53.3% of patients treated with intramedullary nailing compared to 33.3% in the plating group. Overall, 43.3% of patients achieved excellent outcomes, while 36.7% achieved good outcomes. Although the intramedullary nailing group demonstrated superior functional recovery, the difference in mean AOFAS scores between the two groups was not statistically significant ($p = 0.096$).

Postoperative complications were observed less frequently in the intramedullary nailing group. Infection, delayed union, malunion, and implant irritation were each reported in 6.7% of patients in the intramedullary nailing group, while no cases of non-union or implant failure were encountered. In the plating group, infection, delayed union, and implant irritation were each observed in 13.3% of patients, while non-union and implant failure occurred in 6.7% of patients each. Overall complication rates were 26.7% in the intramedullary nailing group and 46.7% in the plating group; however, this difference was not statistically significant ($p = 0.252$).

In summary, both intramedullary nailing and plating provided satisfactory fracture union and functional outcomes in distal tibial fractures. However, intramedullary nailing was associated with significantly shorter operative duration, reduced hospital stay, earlier mobilization, and a trend toward better functional outcomes with fewer complications. These findings suggest that intramedullary nailing may offer advantages in terms of early recovery and rehabilitation, while both techniques remain effective treatment options for distal tibial fractures.

Table 1: Demographic and Baseline Characteristics of Study Participants (n = 30)

Variable	Intramedullary Nailing (n=15)	Plating (n=15)	Total (n=30)
Age (years), Mean ± SD	39.8 ± 12.4	41.2 ± 11.8	40.5 ± 12.0
Male, n (%)	11 (73.3)	10 (66.7)	21 (70.0)
Female, n (%)	4 (26.7)	5 (33.3)	9 (30.0)
Right Side Involvement, n (%)	9 (60.0)	8 (53.3)	17 (56.7)
Left Side Involvement, n (%)	6 (40.0)	7 (46.7)	13 (43.3)
Road Traffic Accident, n (%)	10 (66.7)	9 (60.0)	19 (63.3)
Fall from Height, n (%)	4 (26.7)	5 (33.3)	9 (30.0)
Other Causes, n (%)	1 (6.6)	1 (6.7)	2 (6.7)
Closed Fracture, n (%)	13 (86.7)	12 (80.0)	25 (83.3)
Grade I Open Fracture, n (%)	2 (13.3)	3 (20.0)	5 (16.7)

Table 2: Comparison of Clinical and Operative Outcomes

Parameter	Intramedullary Nailing (n=15)	Plating (n=15)
Duration of Surgery (minutes), Mean ± SD	82.6 ± 11.4	103.8 ± 14.2
Hospital Stay (days), Mean ± SD	5.8 ± 1.2	7.4 ± 1.5
Time to Partial Weight Bearing (weeks), Mean ± SD	4.2 ± 0.8	6.1 ± 1.0
Time to Full Weight Bearing (weeks), Mean ± SD	10.4 ± 1.5	12.6 ± 1.8
Time to Radiological Union (weeks), Mean ± SD	18.2 ± 2.4	20.1 ± 2.8
AOFAS Score at Final Follow-up, Mean ± SD	89.6 ± 6.2	85.4 ± 7.1

Table 3: Functional Outcome and Postoperative Complications

Variable	Intramedullary Nailing n (%)	Plating n (%)	Total n (%)
Excellent Outcome (AOFAS ≥90)	8 (53.3)	5 (33.3)	13 (43.3)
Good Outcome (AOFAS 80–89)	5 (33.3)	6 (40.0)	11 (36.7)

Fair Outcome (AOFAS 70–79)	2 (13.3)	3 (20.0)	5 (16.7)
Poor Outcome (AOFAS <70)	0 (0.0)	1 (6.7)	1 (3.3)
Infection	1 (6.7)	2 (13.3)	3 (10.0)
Delayed Union	1 (6.7)	2 (13.3)	3 (10.0)
Malunion	1 (6.7)	1 (6.7)	2 (6.7)
Non-union	0 (0.0)	1 (6.7)	1 (3.3)
Implant Irritation	1 (6.7)	2 (13.3)	3 (10.0)
Implant Failure	0 (0.0)	1 (6.7)	1 (3.3)
No Complications	11 (73.3)	8 (53.3)	19 (63.3)

Table 4: Comparison of Outcomes Between Intramedullary Nailing and Plating Groups

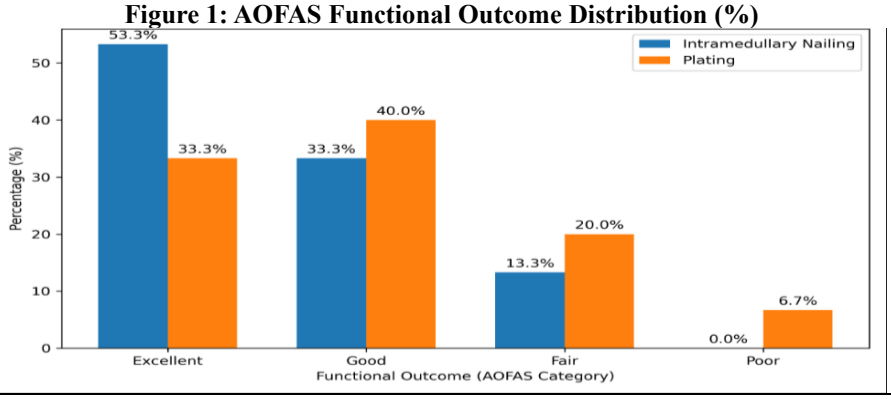
Parameter	Intramedullary Nailing Mean ± SD	Plating Mean ± SD	Test Statistic	p-value
Age (years)	39.8 ± 12.4	41.2 ± 11.8	t = 0.32	0.751
Duration of Surgery (minutes)	82.6 ± 11.4	103.8 ± 14.2	t = 4.52	<0.001*
Hospital Stay (days)	5.8 ± 1.2	7.4 ± 1.5	t = 3.24	0.003*
Time to Partial Weight Bearing (weeks)	4.2 ± 0.8	6.1 ± 1.0	t = 5.76	<0.001*
Time to Full Weight Bearing (weeks)	10.4 ± 1.5	12.6 ± 1.8	t = 3.65	0.001*
Time to Union (weeks)	18.2 ± 2.4	20.1 ± 2.8	t = 2.00	0.055
AOFAS Score	89.6 ± 6.2	85.4 ± 7.1	t = 1.72	0.096
Overall Complication Rate	26.7%	46.7%	$\chi^2 = 1.31$	0.252

*Statistically significant ($p < 0.05$)

Interpretation

- Intramedullary nailing showed significantly shorter operative time, hospital stay, and earlier weight bearing compared to plating.
- Fracture union was achieved slightly earlier in the nailing group, though the difference was not statistically significant.
- Functional outcomes (AOFAS score) were better in the nailing group but did not reach statistical significance.
- The plating group demonstrated a higher complication rate; however, the difference was not statistically significant.
- Overall, intramedullary nailing provided superior early recovery and rehabilitation outcomes, while both techniques achieved comparable fracture union and functional results at final follow-up.

Figure 1: AOFAS Functional Outcome Distribution (%)



DISCUSSION

The present study compared the outcomes of intramedullary nailing and plate fixation in the management of distal tibial fractures. Distal tibial fractures continue to represent a challenging orthopedic problem because of their subcutaneous location, limited soft tissue envelope, and proximity to the ankle joint. The primary objective of treatment is to achieve fracture union while maintaining alignment and restoring optimal functional outcomes with minimal complications.

In the present study, the mean age of patients was 40.5 ± 12.0 years, with a predominance of males (70.0%). Similar demographic findings were reported by Vallier et al. [8], who observed a mean patient age of approximately 42 years with a male predominance. Guo et al. [9] also reported that distal tibial fractures occur more commonly among young and middle-aged males due to increased exposure to high-energy trauma. The predominance of road traffic accidents (63.3%) as the mode of injury in the present study is also consistent with findings reported by Im et al. [10] and Li et al. [11].

The mean duration of surgery in the present study was significantly shorter in the intramedullary nailing group (82.6 ± 11.4 minutes) compared with the plating group (103.8 ± 14.2 minutes). Similar findings were reported by Janssen et al. [12], who demonstrated significantly reduced operative time in patients treated with intramedullary nailing. Guo et al. [9] also reported that intramedullary nailing required less operative exposure and surgical dissection, thereby reducing operative duration and intraoperative soft tissue trauma. The shorter operative time associated with intramedullary nailing may contribute to decreased anesthesia exposure and faster postoperative recovery.

Hospital stay was significantly lower among patients treated with intramedullary nailing (5.8 ± 1.2 days) compared with plating (7.4 ± 1.5 days). These findings are comparable to those reported by Li et al. [11], who observed earlier discharge and faster rehabilitation in the nailing group. The reduced surgical trauma and earlier mobilization associated with intramedullary nailing may explain the shorter hospitalization period.

Patients treated with intramedullary nailing achieved both partial and full weight bearing significantly earlier than those treated with plating. Similar observations were reported by Vallier et al. [8], who noted earlier mobilization and weight-bearing in patients undergoing intramedullary fixation. Im et al. [10] also concluded that intramedullary nailing facilitates early rehabilitation because of its load-sharing biomechanical properties. Early weight bearing is advantageous in minimizing complications related to prolonged immobilization and improving overall patient satisfaction.

The mean time to radiological union was 18.2 ± 2.4 weeks in the intramedullary nailing group and 20.1 ± 2.8 weeks in the plating group. Although fracture union occurred earlier in the nailing group, the difference did not reach statistical significance. Similar results were reported by Costa et al. [13], who found comparable union rates between plating and intramedullary nailing. A meta-analysis by Kwok et al. [14] also concluded that both fixation methods achieve satisfactory fracture union with no significant difference in overall healing rates.

Functional outcome assessment using the AOFAS score revealed a higher mean score in the intramedullary nailing group (89.6 ± 6.2) compared with the plating group (85.4 ± 7.1). Excellent functional outcomes were observed in 53.3% of patients treated with intramedullary nailing compared with 33.3% of those treated with plating. Similar findings were reported by Janssen et al. [12], who demonstrated superior early functional recovery following intramedullary nailing. Guo et al. [9] also reported improved patient-reported outcomes and earlier return to daily activities among patients treated with intramedullary fixation. However, the difference in functional outcome in the present study did not reach statistical significance, suggesting that both treatment modalities are capable of producing satisfactory long-term results.

The overall complication rate in the present study was lower in the intramedullary nailing group (26.7%) compared with the plating group (46.7%). Infection, delayed union, implant irritation, and implant failure were more frequently observed in the plating group. Similar findings were reported by Vallier et al. [8], who observed higher wound-related complications following plate fixation because of the extensive soft tissue dissection required. Kwok et al. [14] also demonstrated a higher incidence of superficial infection and wound complications among patients treated with plating. Nevertheless, both groups in the present study achieved acceptable complication rates and successful fracture healing.

Overall, the findings of the present study are in agreement with most contemporary literature indicating that intramedullary nailing offers several advantages including shorter operative duration, reduced hospital stay, earlier mobilization, and a lower complication profile. However, plating remains an effective treatment option, particularly in fractures where precise anatomical reduction and alignment are required. Both modalities achieved satisfactory fracture union and functional outcomes, although intramedullary nailing demonstrated superior early recovery characteristics. Therefore, treatment selection should be individualized based on fracture morphology, soft tissue condition, surgeon expertise, and patient-specific factors.

CONCLUSION

The present study concludes that both intramedullary nailing and plate fixation are effective treatment modalities for distal tibial fractures, providing satisfactory fracture union and favorable functional outcomes. However, intramedullary nailing demonstrated significant advantages in terms of shorter operative duration, reduced hospital stay, earlier initiation of partial and full weight bearing, and a lower overall complication rate. Although fracture union and functional outcomes as assessed by the AOFAS score were comparable between the two groups, patients treated with intramedullary

nailing exhibited a trend toward better functional recovery and rehabilitation. Based on the findings of this study, intramedullary nailing may be considered the preferred treatment option for suitable distal tibial fractures because of its minimally invasive nature and superior early postoperative recovery, while plating remains a valuable alternative in fractures requiring precise anatomical reduction and alignment.

LIMITATIONS OF THE STUDY

The present study had certain limitations. The sample size was relatively small, which may have limited the statistical power of the study and the generalizability of the findings. Being a single-center study, the results may not be representative of all patient populations and healthcare settings. The duration of follow-up was limited and may not have been sufficient to assess long-term functional outcomes, implant-related complications, or the development of post-traumatic ankle arthritis. Treatment allocation was based on surgical decision-making rather than randomization, which could have introduced selection bias. Additionally, factors such as fracture pattern variability, bone quality, patient compliance with rehabilitation protocols, and surgeon experience may have influenced the outcomes.

RECOMMENDATIONS

Further multicentric studies with larger sample sizes and longer follow-up periods are recommended to validate the findings of the present study. Randomized controlled trials comparing intramedullary nailing and plating would provide stronger evidence regarding the optimal management of distal tibial fractures. Future research should also evaluate patient-reported outcome measures, quality of life, cost-effectiveness, and long-term complications associated with both treatment modalities. Careful preoperative assessment of fracture morphology, soft tissue condition, and patient-related factors should guide the choice of fixation method. Based on the findings of the present study, intramedullary nailing may be preferred in appropriately selected distal tibial fractures due to its advantages of shorter operative time, earlier mobilization, reduced hospital stay, and lower complication rates.

REFERENCES

1. Joveniaux P, Harisboure A, Ohl X, Dehoux E. Distal tibia fractures: management and complications. Int Orthop. 2010;34(4):583-588.
2. Rushdi I, Rahman MM, Rahman MM. Surgical management of distal tibia fracture. Malays Orthop J. 2020;14(3):1-8.
3. Jain D, Kumar V, Sinha S, et al. Minimally invasive plate osteosynthesis in distal tibial fractures: a review of surgical technique and outcomes. J Clin Orthop Trauma. 2017;8(Suppl 2):S40-S46.
4. Ekman E, et al. Comparison between intramedullary nailing and plating in distal tibial fractures. Acta Orthop. 2020;91(4):421-427.
5. Mahapatra SK, et al. Comparative study of intramedullary nailing and plating in extra-articular distal third tibial fractures in adults. Healthcare Bulletin. 2025;15(2):112-118.
6. Guran O, et al. Intramedullary nailing at different distal tibial fracture levels. Medicine (Baltimore). 2024;103(19):e38122.
7. Comparative study of the management of distal tibia fractures by nailing versus plating. Cureus. 2023;15(11):e49281.
8. Vallier HA, Le TT, Bedi A. Radiographic and clinical comparisons of distal tibia shaft fractures (4 to 11 cm proximal to the plafond): plating versus intramedullary nailing. J Orthop Trauma. 2008;22(5):307-311.
9. Guo JJ, Tang N, Yang HL, Tang TS. A prospective, randomized trial comparing closed intramedullary nailing with percutaneous plating in the treatment of distal metaphyseal fractures of the tibia. J Bone Joint Surg Br. 2010;92(7):984-988.
10. Im GI, Tae SK. Distal metaphyseal fractures of the tibia: a prospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screw fixation. J Trauma. 2005;59(5):1219-1223.
11. Li Y, Liu L, Tang X, Pei F, Wang G, Fang Y, et al. Comparison of low, multidirectional locked nailing and plating in the treatment of distal tibial metadiaphyseal fractures. Int Orthop. 2012;36(7):1457-1462.
12. Janssen KW, Biert J, van Kampen A. Treatment of distal tibial fractures: plating versus nail. A retrospective outcome analysis of matched pairs of patients. Int Orthop. 2007;31(5):709-714.
13. Costa ML, Achten J, Griffin J, Petrou S, Pallister I, Lamb SE, et al. Effect of locking plate fixation versus intramedullary nail fixation on six-month disability among adults with displaced distal tibia fractures: the UK FixDT randomized clinical trial. JAMA. 2017;318(18):1767-1776.
14. Kwok CS, Crossman PT, Loizou CL. Plate versus nail for distal tibial fractures: a systematic review and meta-analysis. J Orthop Trauma. 2014;28(9):542-548.
15. Liu XK, Xu WN, Xue QY, Liang QW. Intramedullary nailing versus minimally invasive plate osteosynthesis for distal tibial fractures: a systematic review and meta-analysis. Orthop Surg. 2019;11(6):954-965.