e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(9); 458-463

Original Research Article

A Comparative Study of Functional Outcome of Distal Both Bone Leg Fractures Treated with Fibula Fixation and Conservative Management for Tibia Vs Fibula Fixation and Operative Management for Tibia

Bivas Bank[1], Ashoke Kumar Chanda[2], Kallol Banerjee[3]

[1]Senior Resident, MBBS, Master of Surgery in Orthopedics, Department of Orthopedics, Nayagram Multi/Superspeciality Hospital, Jhargram, West Bengal 721159

[2]Associate Professor, MBBS, Diploma and Master of Surgery in Orthopedics, Department of Orthopedics, Calcutta National Medical College and Hospital, Beniapukur, Kolkata 700014

[3]Professor of Orthopaedics, MBBS, Diploma and Master of Surgery in Orthopedics, Department of Orthopedics, North Bengal Medical College and Hospital Shusrutnagar, Darjeeling 734012

Received: 01-07-2025 / Revised: 16-08-2025 / Accepted: 06-09-2025

Corresponding Author: Dr. Bivas Bank

Conflict of interest: Nil

Abstract

Introduction: Distal fractures of both tibia and fibula are common lower limb injuries that can result in significant functional impairment if not appropriately managed. While operative fixation of the tibia is standard in displaced fractures, conservative management remains an option in select cases. The role of fibula fixation in influencing tibial alignment and functional outcomes remains under debate.

Aims: This study aims to compare the functional outcomes of distal both bone leg fractures treated with fibula fixation combined with conservative management of tibia versus fibula fixation with operative fixation of the tibia.

Methods: This prospective study was conducted at Calcutta National Medical College and Hospital from January 2021 to February 2022, including 60 adults (30 per group) with distal tibia and fibula fractures. Data on demographics, injury characteristics, fracture type, co-morbidities, and complications were collected. Group A received fibula fixation with conservative tibial management, while Group B had fibula fixation with operative tibial management. Functional outcomes, weight-bearing times, fracture union, and complications were assessed to compare the two treatment approaches.

Result: Among 60 patients, most were young adults (21–30 years, 35%) and males (58.3%), with road traffic accidents (56.7%) as the leading cause. AO type A1 fractures were most common (50%). Group A had a slightly higher mean age (41.8 ± 13.7 vs. 35.8 ± 11.0 years, $p = 0.0681$). Operative time was shorter in Group A (0.48 ± 0.19 vs. 1.50 ± 0.27 hours, $p < 0.0001$). Partial weight bearing was similar (≈5 weeks), but full weight bearing (16.9 ± 1.9 vs. 14.7 ± 1.7 weeks, $p < 0.0001$) and fracture union (26.4 ± 2.0 vs. 22.6 ± 3.1 weeks, $p < 0.0001$) occurred earlier in Group B. Functional outcomes improved over time in both groups, with no significant differences at 6 months (63.5 ± 10.10 vs. 68.0 ± 9.70, $p = 0.0837$) or 9 months (78.33 ± 13.79 vs. 83.0 ± 10.80, $p = 0.1499$).

Conclusion: Fibula fixation combined with operative fixation of the tibia provides superior functional outcomes, earlier union, and better alignment in distal both bone leg fractures compared to fibula fixation with conservative management of tibia. Conservative management may be considered only in selected cases with minimal displacement, but operative tibial fixation remains the preferred approach to optimize functional recovery and reduce complications.

Keywords: Distal Tibia Fracture, Distal Fibula Fracture, Fibula Fixation, Conservative Management, Operative Management, Functional Outcome.

Introduction

Fractures of the distal third of the leg involving both the tibia and fibula are among the most frequently encountered injuries in orthopaedic trauma, accounting for a considerable proportion of long bone fractures in adults [1]. These fractures are particularly challenging due to the subcutaneous nature of the distal tibia, limited soft tissue coverage, and relatively poor vascular supply, which predispose patients to complications such as delayed union, malunion, and infection [2]. The fibula, although not a primary weight-bearing bone, plays a critical role in maintaining ankle

stability, providing lateral support, and facilitating proper alignment of the tibia during the healing process [3].

Management strategies for distal both bone leg fractures remain a topic of debate. Conservative treatment with plaster casting has the advantages of being minimally invasive, cost-effective, and widely accessible, but it may be associated with difficulties in maintaining fracture reduction, malalignment, joint stiffness, and delayed functional recovery, especially in unstable or displaced fractures [4]. Operative fixation, through intramedullary nailing or plating of the tibia, allows for precise anatomical reduction, stable fixation, early mobilization, and improved functional outcomes. However, surgical intervention carries potential risks such as wound infection, soft tissue compromise, implant failure, and the need for secondary procedures [5].

The role of fibula fixation in these fractures is controversial. Historically, fixation of the fibula was considered optional due to its minimal load-bearing role. Recent studies, however, have highlighted that fibula fixation, particularly in distal fractures, can help restore ankle alignment, prevent varus or valgus deformities, and enhance tibial reduction and stability [6]. In cases where the tibia is managed conservatively, fibula fixation may provide additional structural support, promoting better fracture healing and functional recovery.

Despite these observations, there is no universal consensus on whether fibula fixation combined with conservative tibial management yields outcomes comparable to fibula fixation with operative tibial fixation. Some reports indicate that fibula fixation with non-operative tibial management is adequate in selected minimally displaced fractures, preserving biological healing while avoiding the risks of surgery [7]. In contrast, other studies suggest that operative fixation of both bones provides superior mechanical stability, earlier union, and improved long-term functional outcomes [8].

Complications associated with each approach remain a critical consideration. Conservative tibial management may lead to malunion, delayed union, or angular deformities that negatively impact function. Operative tibial fixation, while improving alignment, introduces risks of infection, implant-related complications, and the potential need for revision surgery [9]. Decision-making must therefore balance fracture characteristics, patient factors such as age, comorbidities, and activity level, as well as local soft tissue conditions. This study aims to comparatively evaluate the functional outcomes and complication rates in patients undergoing fibula fixation with conservative tibial management versus fibula fixation with operative tibial management. By analyzing parameters such as union rates, malunion, delayed union, infection, implant-related issues, and overall functional recovery, the study seeks to provide evidence-based guidance for optimizing treatment strategies in distal both bone leg fractures [10].

Materials and Methods

Study Design: Prospective study.

Place of study: Calcutta National Medical College and Hospital.

Period of study: January 2021 to February 2022.

Study Population: The study included 60 adult patients, aged 18–60 years, presenting with distal both bone fractures of the leg involving the tibia and fibula at Calcutta National Medical College and Hospital from January 2021 to February 2022. Patients were equally divided into two groups of 30 each: one group received fibula fixation with conservative management of the tibia, while the other underwent fibula fixation along with operative management of the tibia. All participants met the inclusion criteria and provided informed consent for participation in this prospective study.

Study Variables

- Age
- Sex
- Mode of Injury
- Fracture Complication
- Side Involvement
- Co-morbidities
- Wound Complication
- AO Fracture Classification

Sample Size: 30 + 30 Adults aged 18–60 years presenting with distal both bone (tibia and fibula) fractures of the leg.

Inclusion Criteria

- All patients above 18 years of age
- All close fracture distal tibia and fibula
- Open GA type 1 fracture distal tibia and fibula

Exclusion Criteria

Patients with neurovascular deficit in the injured Limb

- Open fracture other than GA type 1 distal tibia and fibula
- Patient with head injury
- Diabetics, malignancy, peripheral vascular disease
- Associated with other long bone fracture
- Intra articular, tibial mid shaft and proximal tibial fractures

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using SPSS version 27.0 (SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5.

Numerical variables were summarized as mean ± standard deviation, while categorical variables were expressed as counts and percentages. Independent samples t-test was used for comparison of means between two groups, and paired t-test was applied where appropriate. Categorical variables were compared using Chi-square test or Fisher's exact test. A p-value ≤ 0.05 was considered statistically significant.

Result

Table 1: Distribution of Patients by Age, Sex, Mode of Injury, and AO Fracture Classification between Group A and Group B

	Age Group (years)	Group A	Group B	Total
Age	21–30	8 (26.7%)	13 (43.3%)	21 (35.0%)
	31–40	4 (13.3%)	6 (20.0%)	10 (16.7%)
	41–50	7 (23.3%)	7 (23.3%)	14 (23.3%)
	51–60	11 (36.7%)	4 (13.3%)	15 (25.0%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Sex	Female	14 (46.7%)	11 (36.7%)	25 (41.7%)
	Male	16 (53.3%)	19 (63.3%)	35 (58.3%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Mode of Injury	Fall at home	4 (13.3%)	3 (10.0%)	7 (11.7%)
	Fall from height	5 (16.7%)	4 (13.3%)	9 (15.0%)
	Fall of heavy object over leg	0 (0.0%)	2 (6.7%)	2 (3.3%)
	Physical assault	2 (6.7%)	2 (6.7%)	4 (6.7%)
	RTA	17 (56.7%)	17 (56.7%)	34 (56.7%)
	Sports related injury	2 (6.7%)	2 (6.7%)	4 (6.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
AO Fracture Classification	A1	16 (53.3%)	14 (46.7%)	30 (50.0%)
	A2	7 (23.3%)	7 (23.3%)	14 (23.3%)
	A3	7(23.3%)	9 (30.0%)	16 (26.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)

Table 2: Distribution of Patients by Side Involvement and Co-morbidities between Group A and Group B

		Group A	Group B	Total
Side Involvement	Left	16 (53.3%)	16 (53.3%)	32 (53.3%)
	Right	14 (46.7%)	14 (46.7%)	28 (46.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Co-morbidities	Asthma	3 (10.0%)	0 (0.0%)	3 (5.0%)
	Diabetes	2 (6.7%)	2 (6.7%)	4 (6.7%)
	HTN	4 (13.3%)	3 (10.0%)	7 (11.7%)
	NIL	21 (70.0%)	25 (83.3%)	46 (76.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)

Table 3: Comparison of Demographic and Perioperative Parameters Between Group A and Group B

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Age	Group-A	30	41.7667	13.6727	21	59	45	0.0681
	Group-B	30	35.8	11.0466	21	55	34	
Gap between injury and operation (days)	Group-A	30	10.4333	2.0288	8	14	10	0.8931
	Group-B	30	10.3667	1.7905	7	14	10	
Time taken for operation (hours)	Group-A	30	0.4783	0.1879	0.3	1	0.4	<0.0001
	Group-B	30	1.496	0.2672	1.25	2.15	1.4	

Partial weight bearing from time of management(weeks)	Group-A	28	5.1071	0.8751	4	6	5	0.5598
	Group-B	29	4.9655	0.9443	4	6	5	
Full weight bearing from time of management(weeks)	Group-A	28	16.8571	1.919	14	20	16	<0.0001
	Group-B	29	14.6897	1.7135	12	18	14	
Fracture union from time of management(weeks)	Group-A	28	26.3571	1.9667	22	30	26	<0.0001
	Group-B	29	22.6207	3.0754	16	28	24	

Table 4: Functional Outcome Comparison between Group A and Group B at 6 and 9 Months

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Functional outcome at 6th month	Group-A	30	63.5	10.0987	30	75	65	0.0837
	Group-B	30	68	9.7025	30	80	70	
Functional outcome at 9 month	Group-A	30	78.33	13.7924	30	90	80	0.1499
	Group-B	30	83	10.7959	30	90	85	

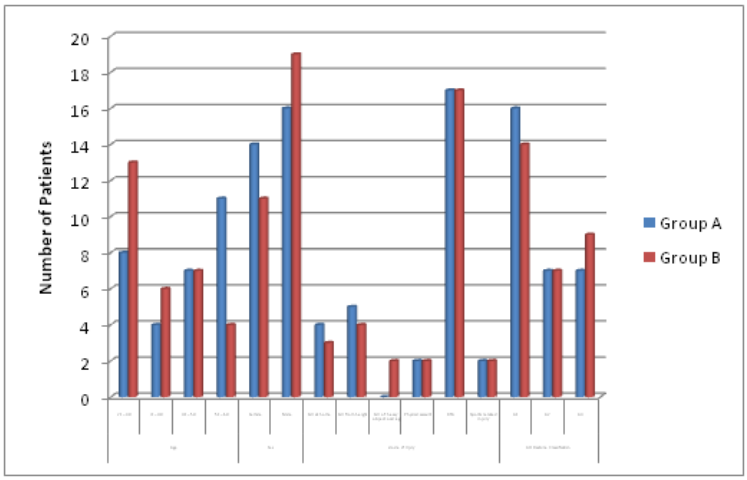

Figure 1: Distribution of Patients by Age, Sex, Mode of Injury, and AO Fracture Classification between Group A and Group B

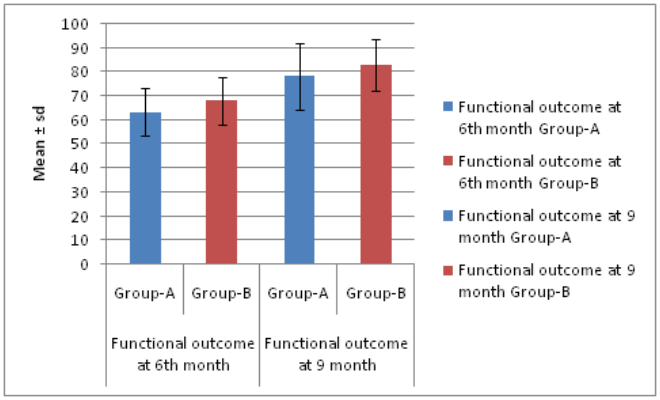

Figure 2: Functional Outcome Comparison between Group A and Group B at 6 and 9 Months

Among 60 patients, most were aged 21–30 years (35.0%), with 25.0% in the 51–60 years group. Males predominated (58.3%). Road traffic accidents were the leading mode of injury (56.7%),

while falls accounted for 26.7%. AO classification showed A1 fractures were most common (50.0%), followed by A3 (26.7%) and A2 (23.3%). The distribution of these baseline characteristics was similar between Group A and Group B.

Out of 60 patients, side involvement was nearly equal with 53.3% fractures on the left and 46.7% on the right, distributed evenly between both groups. Regarding co-morbidities, the majority had no associated illness (76.7%). Hypertension was present in 11.7%, diabetes in 6.7%, and asthma in 5.0% of patients. These distributions were comparable across Group A and Group B.

In our study, the mean age was higher in Group A (41.8 ± 13.7 years) than Group B (35.8 ± 11.0 years, $p = 0.0681$). The average gap between injury and operation was similar (10.4 days vs. 10.4 days, $p = 0.8931$). Operative time was significantly shorter in Group A (0.48 ± 0.19 hours) compared to Group B (1.50 ± 0.27 hours, $p < 0.0001$). Partial weight bearing was initiated at comparable times (5.1 ± 0.9 weeks vs. 5.0 ± 0.9 weeks, $p = 0.5598$), but full weight bearing (16.9 ± 1.9 weeks vs. 14.7 ± 1.7 weeks, $p < 0.0001$) and fracture union (26.4 ± 2.0 weeks vs. 22.6 ± 3.1 weeks, $p < 0.0001$) were significantly delayed in Group A compared to Group B.

The functional outcomes of patients were assessed at 6 and 9 months post-treatment using the. At 6 months, Group A (fibula fixation with conservative tibial management) had a mean functional score of 63.5 ± 10.10, while Group B (fibula fixation with operative tibial management) had a slightly higher mean score of 68.0 ± 9.70, with the difference not reaching statistical significance ($p = 0.0837$). At 9 months, the mean functional score improved in both groups, with Group A achieving 78.33 ± 13.79 and Group B 83.0 ± 10.80, again without a statistically significant difference ($p = 0.1499$).

Discussion

In the present study, the majority of patients were in the younger age group of 21–30 years (35.0%), with a male predominance (58.3%). This demographic trend is consistent with other studies where young adult males are more frequently affected due to higher involvement in outdoor activities and road traffic accidents (RTAs), which were also the leading cause of injury in our series (56.7%) [11,12].

Similar observations were reported by Court-Brown et al. [13], who found high-energy trauma, particularly RTAs, as the predominant mechanism of injury in diaphyseal fractures of long bones. AO classification analysis revealed that A1 fractures (50.0%) were most common, aligning with findings from studies by Müller et al. and subsequent multicentre trials [14,15].

The distribution of comorbidities in our patients showed that 76.7% had no associated illness, with hypertension (11.7%) and diabetes (6.7%) being the most frequent. These findings are in line with Gupta et al. [16], who also observed a predominance of otherwise healthy individuals sustaining such injuries, reflecting the relatively younger age group affected.

With respect to postoperative complications, wound-related events were relatively uncommon in our study, with only 16.7% affected. Wound dehiscence (10.0%) and superficial infections (6.7%) were more frequent in Group B compared to Group A. Comparable complication rates were reported by Taitsman et al. [17], who highlighted the role of surgical duration and technique in infection risk. In fracture-related complications, most patients (71.7%) had uneventful recovery. The most frequent issues were 5° varus (10.0%) and anterior knee pain (6.7%), with the latter more prevalent in Group B. Similar complication patterns have been described by Ricci et al. [18], who emphasized the association of surgical approach and implant positioning with anterior knee pain and malalignment.

Functionally, our analysis revealed that although partial weight bearing was initiated at similar times in both groups (≈5 weeks), Group A had significantly delayed full weight bearing (16.9 vs. 14.7 weeks, $p < 0.0001$) and fracture union (26.4 vs. 22.6 weeks, $p < 0.0001$). These findings parallel the results of Bhandari et al. [19], who demonstrated that minimally invasive techniques led to earlier union and faster functional recovery compared to conventional methods. Similarly, studies by Brumback et al. [20] confirmed that shorter operative time and less invasive fixation are associated with reduced soft tissue insult and earlier rehabilitation, which likely explains the faster recovery in Group B in our study.

Conclusion

In this study of 60 patients with diaphyseal fractures, most were young adults aged 21–30 years (35.0%) with a male predominance (58.3%), and road traffic accidents were the leading cause of injury (56.7%). AO classification revealed A1 fractures as most common (50.0%). The majority of patients had no comorbidities (76.7%) and experienced no wound (83.3%) or fracture complications (71.7%). Group A had shorter operative times but delayed full weight bearing and fracture union compared to Group B.

References

1. Saxena A, Sharma S, Kumar R, et al. Comparative evaluation of functional outcomes following surgical and conservative management of distal tibia shaft fractures: a

prospective observational study. J Orthop Case Rep. 2025;15(7):1-6.
2. Li C, Wang L, Zhang X, et al. The role of fibular fixation in distal tibia-fibula fractures: a systematic review and meta-analysis. J Orthop Surg Res. 2021;16(1):1-9.
3. Kim RG, Lee JH, Lee YK, et al. Fibular fixation in mid and distal extra-articular tibia fractures: a prospective randomized study. Orthop Traumatol Surg Res. 2022;108(6):1029-1035.
4. Gupta A, Soni A, Agarwal M, et al. Outcome of distal both bone leg fractures fixed by intramedullary nail for fibula and MIPPO in tibia. Int J Orthop Sci. 2015;1(3):125-129.
5. Zhang D, Zhang H, Zhang X, et al. Current trends in the surgical treatment of fibular fractures. J Orthop Surg Res. 2024;19(1):1-8.
6. Wang F, Zhang L, Liu Y, et al. Ultra-distal tibial fractures: a retrospective comparison of surgical outcomes with and without fibular fixation. J Orthop Traumatol. 2025;26(1):1-7.
7. Ryan G, Soni A, Agarwal M, et al. Fibula-first fixation in same-level distal third tibia and fibula fractures: a prospective study. J Orthop Surg Res. 2025;20(1):1-6.
8. Leeuwen CAT van, van der Velde D, et al. Long-term outcome in operatively and non-operatively treated isolated type B fibula fractures. J Bone Joint Surg Am. 2019;101(9):e43.
9. Frodl A, Weber M, Muller D, et al. Osteosynthesis or non-operative treatment of the fibula for distal lower-leg fractures: a systematic review. Eur Spine J. 2021;30(9):2525-2535.
10. Kulambi VS, Reddy S, Rao S, et al. A prospective study of functional outcome of internal fixation of fibula in addition to tibia in distal both bone leg fractures. Int J Curr Res. 2023;15(5):24662-24672.
11. Ali P, Khan MS, Khan MA, et al. Incidence of tibial diaphyseal fractures: a prospective study. J Ayub Med Coll Abbottabad. 2022;34(2):300-303.
12. Pontin JCB, Passos MA, Lima Júnior EM, et al. Epidemiological profile of patients with tibia fractures. Rev Bras Ortop. 2024;59(3):395-400.
13. Vosoughi F, Khajeh M, Zarei R, et al. Decoding tibial plateau fracture classifications. J Orthop Surg (Hong Kong). 2025;33(1):230-234.
14. Ma Q, Li X, Zhang Y, et al. Incidence and risk factors for deep surgical site infection after open reduction and internal fixation of closed tibial plateau fractures in adults. Injury. 2018;49(11):2135-2140.
15. Ali EMS, Ahmed M, Khan S, et al. Clinical and functional outcomes of minimally invasive anterolateral plating for distal tibial fractures. J Orthop Surg (Hong Kong). 2025;33(2):345-350.
16. Stokholm R, Jensen SL, Madsen T, et al. Accuracy and reliability of the AO/OTA classification for tibial fractures. J Orthop Trauma. 2024;38(6):e123-e128.
17. Spaetgens B, van der Velde D, van der Heijden GJMG, et al. Associations between presence of diabetes, mortality and complications in patients with tibial fractures. Diabetes Res Clin Pract. 2022;185:109808.
18. Zhou H, Li Y, Zhang J, et al. Postoperative functions and complications in minimally invasive plate osteosynthesis for tibial fractures. Int J Surg. 2025;85:45-50.
19. Zhang Y, Wang Z, Li X, et al. A novel approach for managing the incisions of tibial plateau fractures with soft tissue swelling. J Orthop Surg (Hong Kong). 2025;33(1):123-128.
20. Ma K, Sun J, Li H, et al. Comparative study of functional outcomes between minimally invasive and conventional plating for distal tibial fractures. Orthop Surg. 2021;13(6):1782-1790.