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Original Research Article

# A Comparative Study of Complication 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

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**Corresponding Author: Dr. Bivas Bank**

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**Abstract:**

**Introduction:** Distal both bone leg fractures, involving the tibia and fibula, present a challenge in orthopedic management due to potential complications such as malunion, nonunion, delayed union, and infection. Optimal treatment strategies remain debated, particularly regarding tibial fixation combined with fibular fixation.

**Aims:** To compare the incidence of complications in patients with distal both bone leg fractures treated with fibula fixation combined with conservative management for tibia and fibula fixation combined with operative fixation for tibia.

**Methods:** This was a prospective study conducted at Calcutta National Medical College and Hospital from January 2021 to February 2022, including patients admitted with distal tibia and fibula fractures in the Department of Orthopaedics. A total of 60 patients were enrolled, divided equally into two groups of 30 each. Data were collected on demographic and clinical variables including age, sex, mode of injury, side involvement, comorbidities, AO fracture classification, wound complications, and fracture-related complications. These variables were analyzed to assess outcomes and compare the two groups in terms of operative parameters, postoperative recovery, and complication rates.

**Results:** Among 60 patients, most were aged 21–30 years (35.0%) and male (58.3%), with road traffic accidents being the leading cause of injury (56.7%). AO A1 fractures were most common (50.0%), and side involvement and comorbidities were similar between groups. Most patients had no wound (83.3%) or fracture complications (71.7%), though Group B had slightly more anterior knee pain and wound dehiscence. Group A had shorter operative time (0.48 ± 0.19 vs. 1.50 ± 0.27 hours) but delayed full weight bearing (16.9 ± 1.9 vs. 14.7 ± 1.7 weeks) and fracture union (26.4 ± 2.0 vs. 22.6 ± 3.1 weeks) compared to Group B.

**Conclusion:** Fibula fixation combined with operative management of the tibia offers better fracture alignment, earlier union, and superior functional outcomes compared to conservative tibial management, though at the expense of a higher risk of surgical site complications. Individual patient factors, fracture configuration, and soft tissue condition should guide the choice of treatment modality.

**Keywords:** Distal both bone leg fracture, fibula fixation, tibia conservative management, tibia operative management, complications.



## Introduction

Fractures of the leg bones are among the most common long bone injuries encountered in orthopedic practice, accounting for a significant proportion of trauma admissions worldwide. Distal both bone leg fractures, involving the tibia and fibula, are particularly important because of their complex anatomy, tenuous blood supply, and the critical role these bones play in weight-bearing and locomotion [1].

The tibia, being subcutaneous and exposed along much of its surface, is highly vulnerable to injury and associated complications, while the fibula, although not primarily load-bearing, plays a vital role in ankle stability and in maintaining proper alignment during tibial healing [2]. Management of these fractures has been the subject of debate for decades, with multiple treatment modalities ranging from conservative casting techniques to advanced operative fixation. Conservative management with plaster casting has the advantage of being non-invasive, cost-effective, and widely available, but is often associated with complications such as malunion, delayed union, joint stiffness, and difficulty in maintaining alignment, particularly in unstable or displaced fractures [3]. On the other hand, operative fixation, either by intramedullary nailing or plating, allows for anatomical reduction, stable fixation, early mobilization, and better functional outcomes, but it also carries risks such as surgical site infection, implant-related problems, and soft tissue complications [4].

The role of fibula fixation in the management of distal both bone fractures is controversial. Traditionally, fibula fixation has been considered less important due to the limited role of the fibula in weight transmission. However, growing evidence suggests that fixation of the fibula, especially in distal fractures, contributes to restoration of ankle alignment, prevention of valgus or varus deformities, and facilitation of tibial reduction [5]. Moreover, when the tibia is managed conservatively, fibula fixation may help in maintaining overall stability and improving the chances of acceptable union. Despite these advantages, there is still no universal consensus regarding whether fibula fixation combined with conservative tibial management yields outcomes comparable to fibula fixation with operative tibial fixation. Some studies have suggested that fibula fixation with conservative tibial management may suffice in selected cases with minimal displacement, preserving biological healing while avoiding surgical risks [6]. Others have reported superior results with combined operative fixation of both bones, highlighting improved mechanical stability, earlier union, and better long-term functional outcomes [7]. Complications remain a central concern in both approaches. Conservative tibial management often results in malunion and delayed union, which may compromise functional recovery. In contrast, operative management of the tibia, although providing better alignment, increases the risk of surgical site infection, implant failure, and need for secondary procedures [8]. The challenge for orthopedic surgeons lies in balancing the risks and benefits of these approaches, particularly in resource-limited settings or in patients with compromised soft tissue conditions. The decision-making process in distal both bone leg fractures is further complicated by patient factors such as age, bone quality, comorbidities, and activity level, as well as fracture-specific factors like comminution, displacement, and involvement of the ankle joint. Therefore, a comparative evaluation of complications in patients undergoing fibula fixation with conservative tibial management versus fibula fixation with operative tibial management is essential to guide evidence-based clinical decisions [9].

This study aims to provide a systematic comparison of the complications associated with these two treatment strategies. By analyzing parameters such as rates of malunion, delayed union, non-union, infection, implant-related problems, and functional outcomes, we hope to clarify the relative advantages and disadvantages of each modality. Such data will help orthopedic surgeons in tailoring individualized treatment plans that optimize patient recovery while minimizing complications [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 a total of 60 patients diagnosed with distal both bone leg fractures involving the tibia and fibula, who presented to the Department of Orthopedics at Calcutta National Medical College and Hospital between January 2021 and February 2022. Patients were divided into two equal groups of 30 each: one group received fibula fixation with conservative management of the tibia, while the other group underwent fibula fixation along with operative management of the tibia. All patients met the inclusion criteria and provided informed consent to participate 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 Patients with distal both bone leg fractures involving the tibia and fibula.

**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: Distribution of Wound Complications between Group A and Group B**

| Wound Complication | Group A | Group B | Total |
|---|---|---|---|
| NIL | 27 (90.0%) | 23 (76.7%) | 50 (83.3%) |
| Superficial infection | 1 (3.3%) | 3 (10.0%) | 4 (6.7%) |
| Wound dehiscence | 2 (6.7%) | 4 (13.3%) | 6 (10.0%) |
| Total | 30 (100.0%) | 30 (100.0%) | 60 (100.0%) |

**Table 4: Distribution of Fracture Complications between Group A and Group B**

| Fracture Complication | Group A | Group B | Total |
|---|---|---|---|
| 10° Varus | 2 (6.7%) | 1 (3.3%) | 3 (5.0%) |
| 5° AP Angulation | 3 (10.0%) | 1 (3.3%) | 4 (6.7%) |
| 5° Varus | 2(6.7%) | 4 (13.3%) | 6 (10.0%) |
| Anterior Knee Pain | 0 (0.0%) | 4 (13.3%) | 4 (6.7%) |
| NIL | 23 (76.7%) | 20 (66.7%) | 43 (71.7%) |
| Total | 30 (100.0%) | 30 (100.0%) | 60 (100.0%) |

**Table 5: Comparison of Clinical and Surgical 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 | |

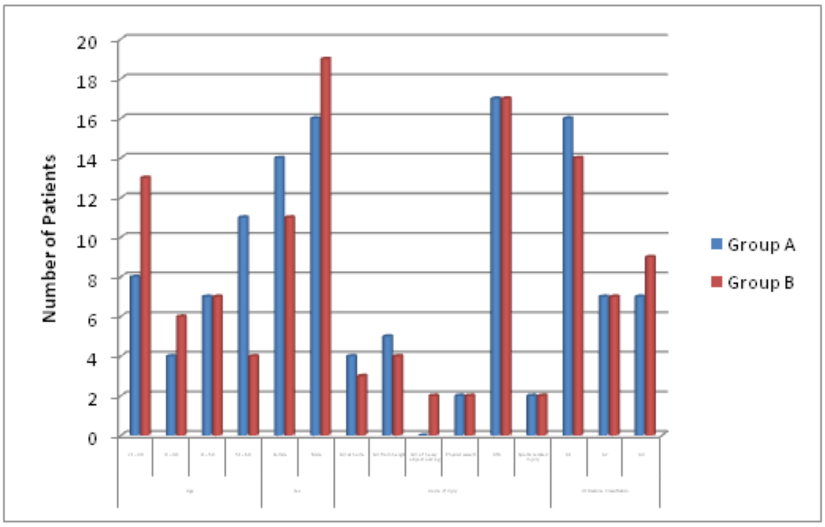


**Figure 1: Distribution of Patients by Age, Sex, Mode of Injury, and AO Fracture Classification between Group A and Group B**

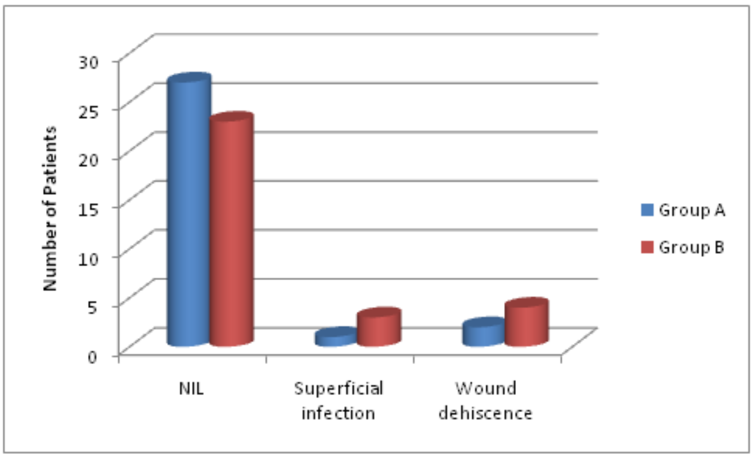


**Figure 2: Distribution of Wound Complications between Group A and Group B**

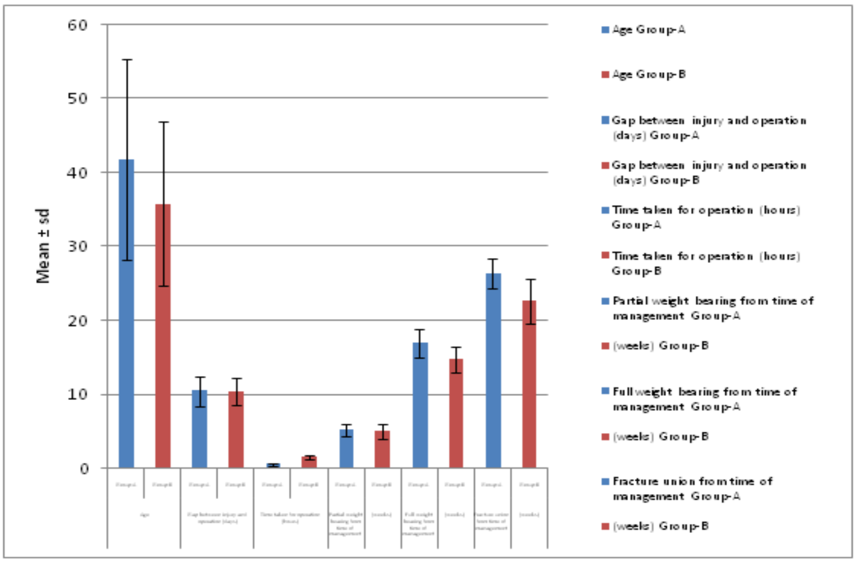


**Figure 3: Comparison of Clinical and Surgical Parameters between Group A and Group B**

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.

Among 60 patients, most had no wound complications (83.3%). Superficial infection occurred in 6.7% and wound dehiscence in 10.0% of cases. Group A had 90.0% without complications compared to 76.7% in Group B, while wound dehiscence was slightly more frequent in Group B (13.3%) than Group A (6.7%).Out of 60 patients, fracture-related complications were absent in 71.7%. The most frequent complications were 5° varus (10.0%) and 5° AP angulation (6.7%), followed by anterior knee pain (6.7%) and 10° varus (5.0%). Group A had a higher rate of 5° AP angulation (10.0% vs. 3.3%), while Group B showed more anterior knee pain (13.3% vs. none) and slightly higher rates of 5° varus (13.3% vs. 6.7%).

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.

## 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 multicenter 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.

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