

**Functional Outcome of Extrarticular Distal Tibia Fractures Treated by Intramedullary Nailing - A Prospective Study**Shubham Pandit<sup>1</sup>, Vipin Bijlwan<sup>2</sup><sup>1</sup>Senior Resident, M.B.B.S, M.S, Department of Orthopedics, Nil Ratan Sircar Medical College and Hospital, Raja Bazar, Kolkata, West Bengal 700014<sup>2</sup>Senior Resident, MS, Department of Orthopedics, North Bengal Medical College and Hospital, West Bengal 734012

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**Abstract**

**Introduction:** Tibia is the most commonly fractured long bone. Because one third of the tibial surface is subcutaneous throughout most of its length, open fractures are more common in the tibia than in any other major long bone. High-energy tibial fractures may be associated with compartment syndrome or neural or vascular injury. On the basis of location, distal tibia fractures are second in incidence next to tibia diaphyseal fractures. The distal tibia due to its subcutaneous blood supply pose a challenge to treating surgeons in terms of choosing an appropriate implant to achieve adequate union and return to early preinjury levels.

**Aims:** To analyse the functional outcome of patients with extraarticular distal tibia fractures treated by intramedullary nailing

**Materials and Methods:** It was a prospective observational study this study was conducted from April 2021 to October 2022 Burdwan Medical College & Hospital in Department of Orthopaedics and Radiodignosis. 20 Patients were included in this study

**Result:** In our study 1 Patient had Gustilo Anderson classification 1, 3 Patients had Gustilo Anderson classification 2, 1 Patient had Gustilo Anderson classification 3A. In 2(10%) Patients had Infection, 9(45%) Patients had Malunion, 1(5.0%) Patient had Non-Union, 2(10%) Patients had Delayed Union. Out of 20 patients, 15 had sustained closed fractures and 5 patients have sustained open fractures.

**Conclusion:** The hypothesis of our study is that intramedullary nailing in distal tibia fractures achieve consistent union and earlier return to work. This objective has been achieved.

**Keywords:** Functional outcome, Extrarticular distal tibia fractures, intramedullary nailing, distal tibia fracture treatment, Functional recovery and Clinical outcomes.

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**Introduction**

Tibia is the most commonly fractured long bone. Because one third of the tibial surface is subcutaneous throughout most of its length, open fractures are more common in the tibia than in any other major long bone. [1] High-energy tibial fractures may be associated with compartment syndrome or neural or vascular injury. On the basis of location, distal tibia fractures are second in incidence next to tibia diaphyseal fractures.

The distal tibia due to its subcutaneous blood supply pose a challenge to treating surgeons in terms of choosing an appropriate implant to achieve adequate union and return to early preinjury levels. Closed reduction and cast immobilization have previously been regarded as the standard treatment for low-energy tibial shaft fractures. [2] However, during recent decades, the

use of intramedullary locking nails (IMLN) has become more popular, and many studies have shown that the outcome of treatment of a tibial shaft fracture with locked intramedullary (IM) nailing is superior to that of cast treatment. [3,4] Intramedullary nailing is the gold standard for tibial diaphyseal fractures. It has a small influence on the blood supply of the host tissue, which would contribute to a low rate of non-union and infection.

Intramedullary nailing preserves the soft-tissue sleeve around the fracture site and allows early motion of the adjacent joints. The ability to lock the nails proximally and distally provides control of length, alignment, and rotation in unstable fractures and permits stabilization of fractures. Initially the extreme high malunion rate and poor function prevented orthopaedic surgeons from using

Intramedullary nailing for distal tibia fractures. With the emerging shortened and multidirectional interlocking nail, for example expert tibia nail [5,6] and evolving reduction techniques, for example blocking screw or poler screw [7] and other percutaneous reduction technique [8], the interest in interlocking nail in distal tibia fractures has been renewed.

### Materials and Methods

**Study Area:** Burdwan Medical College & Hospital in Department of Orthopaedics and Radiodagnosis.

### Study Population:

Patients attending OPD and emergency of Burdwan Medical College & Hospital with fracture of distal 1/3 of tibia in the stipulated time periods.

### Inclusion Criteria:

- Extraarticular distal tibia fractures with in 11cms above the distal tibial articular surface.
- Age > 18yrs
- Sex: both sexes

### Exclusion Criteria:

- Patient with pathological fracture
- Distal tibia fracture with intraarticular involvement.
- Any Motor neuro deficit.
- Ongoing chemotherapy or radiotherapy for malignancy.
- Individuals who were unable to give consent.

**Study Period:** April 2021 to October 2022 [18 months]

**Sample Size:** From the Hospital data records we have found that total number of patients of extra articular distal tibia fracture in Burdwan Medical College and Hospital in 12 months period who was underwent surgery with intramedullary Nailing was 36. 15% of patients is removed after application of inclusion and exclusion criteria. 10% patient did not give valid consent. So total 25% will be excluded from the study. So we have 20 patients for this study.

### Result

**Table 1: Showing number of open fractures and their distribution according to Gustilo classification**

Gustilo anderson classification	Number
1	1
2	3
3A	1
3B	0
3C	0

**Table 2: Showing average malalignment angles and number of patients with malalignment**

	Minimu m	Maximu m	Average	No of patients with valgus > 5 degrees in AP view	No of patients with procurvatum/recurvatum angle > 10 degrees in lateral view
Immediate Post-Op Valgus Angle	1.3	10.7	5.81	12	NA
Valgus Angle In Follow Up	1.4	12.4	5.12	6	NA
Procurvatum/Recurvatum Immediate Post-Op	0	14.4	5.32	NA	2
Procurvatum/Recurvatum In Follow Up	1.2	10.5	4.72	NA	2

**Table 3: Showing number of Complications**

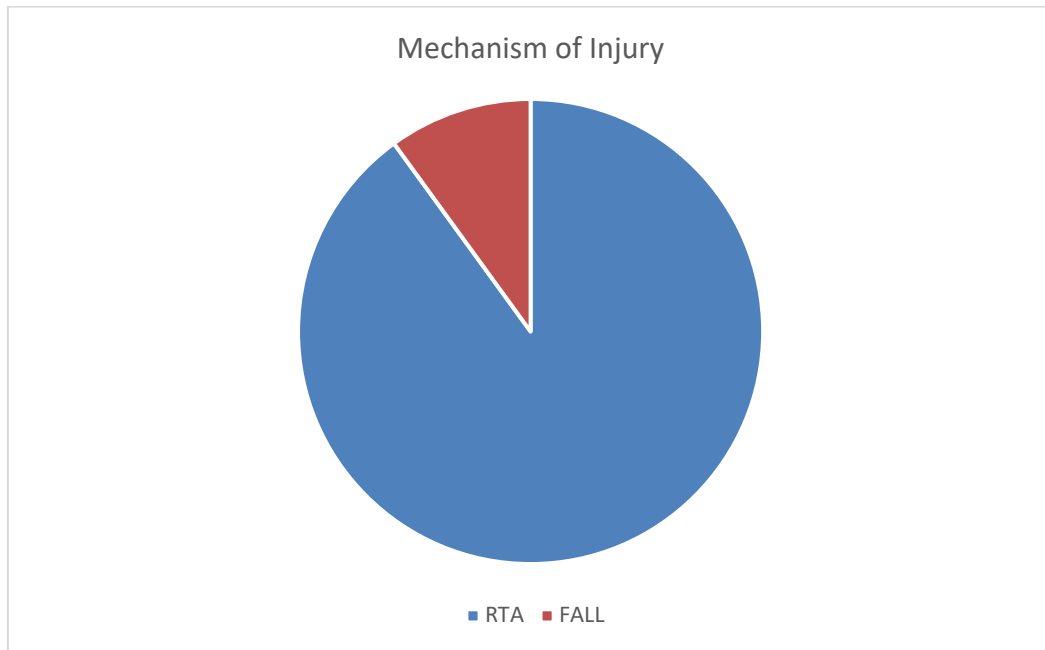
Complications	Number	Percentage
Infection	2	10%
Malunion	9	45%
Non-Union	1	5%
Delayed Union	2	10%
Re-Operation	0	0%

**Table 4: Showing Fracture Characteristics**

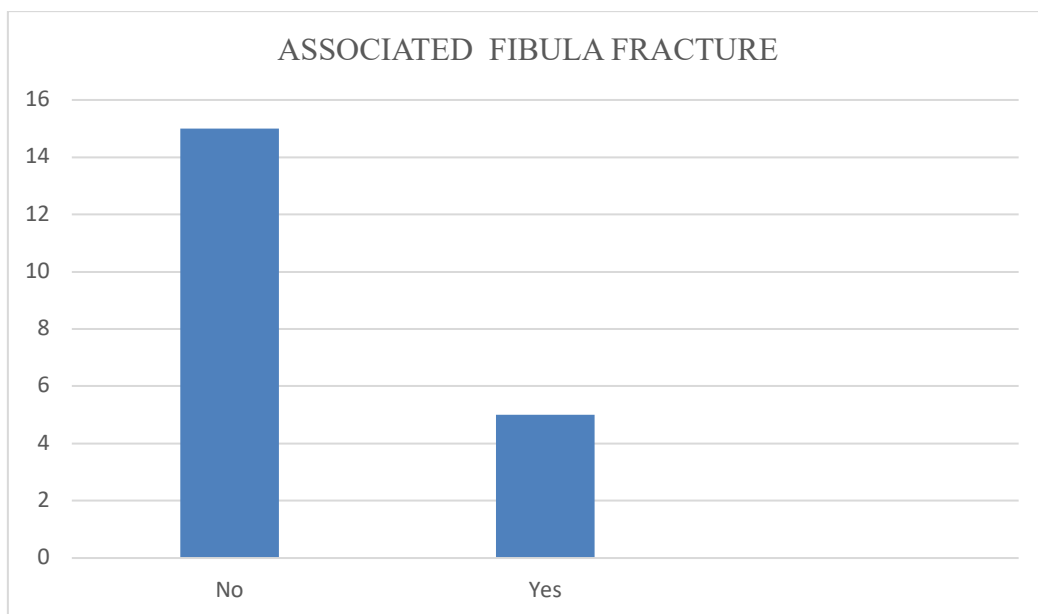
Fracture Characteristics	Number	Percentage
Closed fractures	15	75
Open fractures	5	25
Total	20	100

**Table 5: Showing Fracture Characteristics**

Parameter	Average	Range	Additional Notes
Distance of fracture site from tibial plafond	8.26 cm	5.1 cm - 10.8 cm	
Time taken to radiological union	19.88 weeks	21 weeks - 41 weeks	
Varus deformity in immediate post-op X-ray	None	-	
Valgus angle in immediate post-op	5.81°	1.3° - 10.7°	12 patients had valgus angle > 5°
Valgus angle in final follow-up	5.12°	1.4° - 12.4°	6 patients had valgus angle > 5°; 5 patients had higher valgus than post-op, indicating loss of reduction and malunion



**Figure 1: showing distribution of mechanism of injury**



**Figure 2: showing distribution of concurrent fibula fracture**

Three patients in our research had Gustilo Anderson classifications 1, 2, and 3A, whereas one patient had Gustilo Anderson classification 1. With an average angle of 5.81°, the immediate post-operative valgus angle ranges from 1.3° to 10.7°. A higher valgus angle (>5°) was observed in 12 patients, which suggests that a subset of patients developed a significant valgus alignment immediately after surgery. This can be a sign of inherent variability in post-operative results or a small over-correction. The valgus angle in follow-up assessments varied between 1.4° and 12.4°, with an average that was somewhat lower at 5.12° than in the immediate post-operative phase.

The fact that only six individuals had a valgus angle greater than 5° suggests that the valgus deformity has stabilized or improved over time. Following surgery, the procurvatum/recurvatum angle averaged 5.32° and varied from 0° to 14.4°. Although the majority of patients stayed within a smaller range, there were two individuals with a procurvatum/recurvatum angle more than 10°, suggesting that there were instances of significant sagittal plane alignment deviation. The procurvatum/recurvatum angle declined somewhat throughout follow-up, averaging 4.72° with values ranging from 1.2° to 10.5°. The procurvatum/recurvatum angle for the same two individuals remained more than 10°, indicating that for the majority of patients, the angle either stabilized or decreased somewhat. 2 (10%) suffered infection, 9 (45%) experienced malunion, 1 (5.0%) had non-union, and 2 (10%) had delayed union in our research. Out of 20 patients, 15 had sustained closed fractures and 5 patients have sustained open fractures.

The average distance of fracture site from the tibial plafond was 8.26cms (range of 5.1cm to 10.8cms). The average time taken to radiological union was 19.88 weeks (range of 21 weeks to 41 weeks). The radiological parameters revealed that none of the patients had a varus deformity in the immediate postop X-ray. The average valgus angle in the immediate post op period was 5.81 degrees (Range of 1.3 degrees to 10.7 degrees). 12 patients had a valgus angle more than 5 degrees. The final follow-up X-rays showed 6 patients with valgus angle more than 5 degrees. Out of 6 patients, 5 patients had higher valgus than the immediate post op period indicating a loss of reduction and malunion. The average valgus angle in final follow up period is 5.12 degrees (Range of 1.4 to 12.4).

### Discussion

The soft tissue condition and degree of comminution itself make the care plan more difficult for the surgeon when extra-articular distal tibia fractures are brought to the orthopedician. Achieving anatomical alignment of the joint

surface while maintaining sufficient stability to permit early mobility is the aim of surgical therapy. In order to reduce treatment-related problems, this should be achieved by employing methods that minimize osseous and soft tissue devascularisation. For years now, Intra-medullary nailing had an advantage over the other methods because of its early weight bearing and union rate and lesser incidence of infections.

The purpose of this study was to assess the functional outcome of persons who had an internal, intramedullary nail-fixed distal third tibia fracture. The study includes 20 individuals who present with an extra-articular lower third tibia fracture.

The amount of malalignment considered as malunion in the diagnostic criteria in this study is controversial. Because the anteroposterior angulation of upto 10 degrees are not considered as malalignment in this study. But this recommendation by Trafton [9] (acceptable malalignment is < 5 degrees of varus-valgus angulation, <10 degrees of anteroposterior angulation, 10 degrees of rotation and 15mm of shortening) considered in this study is generally agreed by many authors. In our study there is malalignment in nearly 9 out of the 20 cases (45%). Pynsent suggested that tibial fractures at any location with more than 5 degrees of deformity will result in radiographic changes in the ankle [10].

Van der schoot study of 88 patients with 15 yrs follow-up also revealed that more arthritis was found in the ankle joint adjacent to the fracture than compared to the ankle in uninjured limb. [11]

Puno et al observations also confirmed that poorer clinical results are associated with malaligned fractures of tibia [12].

Kyro in his article of 64 tibial shaft fractures concluded that malunion of tibial shaft fractures seems to produce more complications in distal tibia fractures, in fractures with marked previous displacement, in fractures caused by high energy injury and in patients age > 45 yrs [13].

The AOFAS Olerud and Molander scores have performed well in estimating the functional outcome in our study. There was significant correlation between both the scores.

The rate of non-union in IM nailing of distal tibia fractures is 5.5 % [14]. In our investigation, nonunion occurred in one patient (5.0%). During the initial postop, the fracture was nicely aligned within allowable bounds. No signs of infection were seen. The patient had fair ankle scores. In our investigation, the infection rate was 10%.

This study demonstrates that malalignment is linked to intramedullary nailing, which might be caused by a learning curve when utilizing Poller

screws. It also demonstrated that in order to lower the rate of malalignment, alignment should be closely examined throughout the process.

### Conclusion

Our study's premise is that intramedullary nailing results in a stable union and a quicker return to work for distal tibia fractures. This goal has been accomplished. On the other hand, malalignment complications are common. This suggested that further prospective studies were required before intramedullary nailing could be considered the preferred therapy for extrarticular distal tibia fractures.

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