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Original Research Article

# A Hospital Based Functional Outcome Assessment of Intramedullary Interlocking Nail and Minimally Invasive Plate Osteosynthesis

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**Abstract**

**Aim:** The aim of the present study was to evaluate the Functional outcome of Intramedullary Interlocking Nail and Minimally Invasive Plate Osteosynthesis.

**Methods:** The present study was conducted in the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India for one year and 50 patients with confirmed Extra articular distal tibial fractures were included in the study.

**Results:** The age of the patients ranged from 19 to 74 years with a mean of 42.3 years and standard deviation (SD) of 15.4 years. Majority of the patients belonged to 36-45 years of age and 60% were male. 48% had transverse fracture followed by 44% oblique. 58% underwent nailing and 42% underwent 42%. 48% had transverse fracture followed by 44% oblique. 58% underwent nailing and 42% underwent 42%. The average time for full weight bearing was 10.09 ± 1.41 weeks which was statistically significant ($P < 0.0001$). The average time of union was 18.26 ± 2.49 weeks (range 15–24 weeks) which comes out to be very significant ($P < 0.0001$).

**Conclusion:** Both ILN and MIPO are reliable methods of fixation and are helpful in maintaining most of the osseous vascularity, fracture hematoma which are most useful in providing biological repair. Both are less invasive and in both soft tissue dissection is less.

**Keywords:** ILN-Interlocking Nail, MIPO-Minimally Invasive Plate Osteosynthesis



## Introduction

As tibial fractures are commonly associated with soft tissue injury, if these are not properly treated these can cause substantial disability to the patient. High energy motor vehicle trauma constitutes the commonest cause [1] followed by falls, direct blow, and sports injury. The incidence of distal tibia fractures in most series is 0.6%, and it constitutes to about 10%–13% of all tibial fractures. [2] Distal tibial metaphysis is defined as by constructing a square, with sides of length defined by widest portion of tibial plafond. [3] Because of its subcutaneous location, poor blood supply and decreased muscular cover anteriorly, complications such as delayed union, nonunion, wound infection, and wound dehiscence are often seen as a great challenge to the surgeon. Minimally invasive plate osteosynthesis (MIPO) and intramedullary interlocking nail (IMLN) are two well-accepted and effective methods, but each has been historically related to complications.

Malalignment and knee pain are frequently reported after IMLN, [4-5] whereas wound complications, and implant prominence have been associated with tibial plating in some series. [6] To date, there is no consensus on the best mini-invasive internal fixation method for extra-articular distal tibial fractures. This may be attributed to many reasons. Basically, there is a controversy over the use of the term "distal tibial fractures." Some authors use the term to describe the distal metaphyseal fractures as defined by one muller square as Giannoudis et al. [7] Others use distal tibial fractures to refer to distal shaft fractures (metadiaphyseal region) from 4 cm to 11 cm from the plafond, as Polat et al. [8]

Others use the term for both regions, describing them as "2 muller squares," as Mauffrey et al. [9] Surprisingly, there is also a controversy over using the terms “extra-articular” or “non- articular” fractures. Most authors consider the absence of an articular extension to be mandatory to use the term, while others, as Casstevens et al [10] The bolts or screws that are inserted into the nail may break, [11] malalignment may occur, [12] and there is a risk that the nail will penetrate into the ankle joint [13-14] The development of locking plates, for which a thread on the head of the screws locks into the holes

in the plate to create a fixed-angle construct, has led to a recent increase in the use of plate fixation. However, plates are not without risks, they require greater soft tissue dissection, which carries a risk of infection, wound breakdown, and damage to the surrounding structures [15] The mode of treatment of distal third tibial fractures is still controversial. Distal third tibial fractures differ from proximal third fractures by their difference in anatomy and difference in healing potential [16]

The aim of the present study was to evaluate the Functional outcome of Intramedullary Interlocking Nail and Minimally Invasive Plate Osteosynthesis.

## Materials and Methods

The present study was conducted in the Department of Orthopaedics, SKMCH, Muzaffarpur, Bihar, India for one year and 50 patients with confirmed Extra articular distal tibial fractures were included in the study.

**Inclusion Criteria:** 1.Patients from19-74 years of age 2.Extra-Articular fractures.

**Exclusion Criteria**: 1.Intra-articular fractures. 2.Open fractures. 3.Pathological fractures. 4.Vascular Injury

### Surgical Technique Intramedullary Interlocking Nail:

Patients were operated under spinal anaesthesia in supine position on a standard radiolucent table. Prophylactic intravenous antibiotics were administered 30 min before skin incision. An image intensifier was used in all the cases to provide fluoroscopic guidance. The patient was positioned supine with the hip flexed 45° and the knees flexed to 90° on radiolucent table. A 5-cm incision along the medial border of the patellar tendon was made, extending from the tibial tubercle in a proximal direction. The patellar tendon was retracted laterally to expose the insertion site and protect the tendon during insertion. Then the awl is inserted where the anterior tibia reaches the joint. Nailing was done using standard technique and all fractures were fixed with two proximal and two distal locking screws.

### Minimally Invasive Plate Osteosynthesis

In MIPO, the leg was prepared circumferentially from the toes to mid thigh and draped free. A longitudinal incision of length 3–4 cm was made bone deep over the medial malleolus adequate enough to put screws in distal fragment. The saphenous nerve and vein were preserved and retracted anteriorly. Then an epiperiosteal space tunneling toward the diaphysis was made using the blunt tip of the plate. The reduction was achieved with manual traction and manipulation. Anatomically, precontoured plate was used and was positioned on anteromedial aspect of distal tibia by passing it through the subperiosteal tunnel. After insertion of plate and achieving the reduction, the plate was temporarily fixed to bone with K-wires and fixed proximal fragment with one locking screw. Distal fragment fixation was done with a combination of locking and cortical screws. Anatomically, precontoured plate was used and was positioned on anteromedial aspect of distal tibia by passing it through the subperiosteal tunnel. After insertion of plate and achieving the reduction, the plate was temporarily fixed to bone with K-wires and fixed proximal fragment with one locking screw. Distal fragment fixation was done with a combination of locking and cortical screws. Depending on fracture pattern and bone quality the decision of inserting the lag screw was made. Insertion of screws in the proximal fragment was done with small stab incisions.

### Post-Operative Protocol

Radiograph with standard antero-posterior and lateral view of the involved leg was taken immediate postoperatively, at 6 weeks , 6 months and at 12 months follow-up. Active range of movements of knee and ankle joint along with quadriceps strengthening exercises were started on the next day of surgery. Functional Outcome has been assessed using Olerud and Molander Scoring System.

## Results

**Table 1: Age and gender distribution**

| Age groups in years | N | % |
|---|---|---|
| 16-25 | 6 | 12 |
| 26-35 | 15 | 30 |
| 36-45 | 12 | 24 |
| 46-55 | 7 | 14 |
| 56-65 | 6 | 12 |
| 66-75 | 4 | 8 |
| **Gender** | | |
| Male | 30 | 60 |
| Female | 20 | 40 |

The age of the patients ranged from 19 to 74 years with a mean of 42.3 years and standard deviation (SD) of 15.4 years. Majority of the patients belonged to 36-45 years of age and 60% were male.

**Table 2: Pattern of fracture and operative procedure**

| Pattern of fracture | N | % |
|---|---|---|
| Transverse | 24 | 48 |
| Oblique | 22 | 44 |
| Comminuted | 4 | 8 |
| **Operative procedure** | | |
| Nailing | 29 | 58 |
| Plating | 21 | 42 |
| **Weight bearing weeks ±SD** | | |
| Partial weight bearing | 4.95±1.07 | |
| Full weight bearing | 10.09±1.41 | |
| Union time | 18.26±2.49 | |

48% had transverse fracture followed by 44% oblique. 58% underwent nailing and 42% underwent 42%. The average time for full weight bearing was 10.09 ± 1.41 weeks which was statistically significant (P < 0.0001). The average time of union was 18.26 ± 2.49 weeks (range 15–24 weeks) which comes out to be very significant (P < 0.0001).

## Discussion

Rapid technological advancements and urbanisation have resulted in a massive surge of new automobiles on the road. This has led to increase in accidents on road and number of deaths. Globally the mortality in major road traffic accidents is estimated at 1.2million deaths /year while the number injured is as high as 50 million injuries/year. The number of road traffic mortality globally is expected to rise 65 percent between 2000 – 2021 if care is not taken to prevent these injuries. These deaths are predicted to rise by as much as 80% in underdeveloped and developing countries. [17]

The age of the patients ranged from 19 to 74 years with a mean of 42.3 years and standard deviation (SD) of 15.4 years. Majority of the patients belonged to 36-45 years of age and 60% were male. Predominant male involvement in our study was probably due to more outdoor activities and heavier labor undertaken by males as compared to females in the Indian set up. The result were comparable to that of Kumar et al [18], Ram et al [19], Li et al [20] and Vallier et al. [21] 48% had transverse fracture followed by 44% oblique. 58% underwent nailing and 42% underwent 42%. 48% had transverse fracture followed by 44% oblique. 58% underwent nailing and 42% underwent 42%. The average time for full weight bearing was 10.09 ± 1.41 weeks which was statistically significant (P < 0.0001). The average time of union was 18.26 ± 2.49 weeks (range 15–24 weeks) which comes out to be very significant (P < 0.0001). In our study, we allowed partial weight bearing only after signs of the union in form of bridging callus on at least three cortices out of four cortices on radiograph and clinically as the absence of tenderness and movement at the fracture site [22] which was usually by 6–8 weeks. The majority of the cases, having fulfilling above criteria around 6–8 weeks and were allowed partial weight-bearing on the affected limb.

## Conclusion

Both ILN and MIPO are reliable methods of fixation and are helpful in maintaining most of the osseous vascularity, fracture hematoma which are most useful in providing biological repair. Both are less invasive and in both soft tissue dissection is less.

## References


1. Schatzker J, Tile M. The rationale of operative fracture care. Chirurgische Praxis. 1997;52(3) :488.
2. Rockwood CA. Rockwood and Green's fractures in adults. Lippincott; 1991.
3. Müller ME, Nazarian S, Koch P, Schatzker J. The comprehensive classification of fractures of long bones. Springer Science & Business Media; 2012 Dec 6.
4. Duda GN, Mandruzzato F, Heller M, Goldhahn J, Moser R, Hehli M, Claes L, Haas NP. Mechanical boundary conditions of fracture healing: borderline indications in the treatment of unreamed tibial nailing. Journal of biomechanics. 2001 May 1;34(5):639-50.
5. Habernek H, Kwasny O, Schmid L, Ortner F. Complications of interlocking nailing for lower leg fractures: a 3-year follow up of 102 cases. Journal of Trauma and Acute Care Surgery. 19 92 Dec 1;33(6):863-9.
6. Borrelli Jr J, Prickett W, Song E, Becker D, Ricci W. Extraosseous blood supply of the tibia and the effects of different plating techniques: a human cadaveric study. Journal of orthopaedic trauma. 2002 Nov 1;16(10):69 1-5.
7. Giannoudis VP, Ewins E, Taylor DM, Foster P, Harwood P. Clinical and functional outcomes in patients with distal tibial fracture treated by circular external fixation: a retrospective cohort study. Strategies in Trauma and Limb Reconstruction. 2021 May; 16(2):86.
8. Polat A, Kose O, Canbora K, Yanık S, Guler F. Intramedullary nailing versus minimally invasive plate osteosynthesis for distal extra-articular tibial fractures: a prospective

randomized clinical trial. Journal of Orthop aedic Science. 2015 Jan 1;20(4):695-701.
9. Mauffrey C, McGuinness K, Parsons N, Achten J, Costa ML. A randomised pilot trial of "locking plate" fixation versus intrame dullary nailing for extra-articular fractures of the distal tibia. The Journal of Bone & Joint Surgery British Volume. 2012 May 1;94(5):70 4-8.
10. Casstevens C, Le T, Archdeacon MT, Wyrick JD. Management of extra-articular fractures of the distal tibia: intramedullary nailing versus plate fixation. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2012 Nov 1;20(11):675-83.
11. Drosos G, Karnezis IA, Bishay M, Miles AW. Initial rotational stability of distal tibial fractures nailed without proximal locking: the importance of fracture type and degree of cortical contact. Injury. 2001 Mar 1;32(2):137-43.
12. Kneifel T, Buckley R. A comparison of one versus two distal locking screws in tibial fractures treated with unreamed tibial nails: a prospective randomized clinical trial. Injury. 1996 May 1;27(4):271-3.
13. Obremskey WT, Medina M. Comparison of intramedullary nailing of distal third tibial shaft fractures: before and after traumatolog -ists. Orthopedics. 2004 Nov 1;27(11):1180-4.
14. Boenisch UW, De Boer PG, Journeaux SF. Unreamed intramedullary tibial nailing—fatigue of locking bolts. Injury. 1996 May 1;27 (4):265-70.
15. Mosheiff R, Safran O, Segal D, Liebergall M. The unreamed tibial nail in the treatment of distal metaphyseal fractures. Injury. 1999 Feb 1;30(2):83-90.
16. Lau TW, Leung F, Chan CF. Campbell's Opertive Orthopaedics. 9th ed. 2001, Chapter 34, p-2675-2678.
17. Dhillon MS, Rajasekharan S, Sancheti P. Status of road safety and injury burden: India. Journal of Orthopaedic Trauma. 2014 Jun 1;28:S43-4.
18. Kumar D, Ram GG, Vijayaraghavan PV. Minimally invasive plate versus intramedullary interlocking nailing in distal third tibia fractures. IOSR J Dent Med Sci. 2014;13(3) :15-7.
19. Ram GG, Kumar D, Phagal VV. Surgical dilemma's in treating distal third leg fractures. International Surgery Journal. 2014;1(1):13-6.
20. Li Y, Liu L, Tang X, Pei F, Wang G, Fang Y, Zhang H, Crook N. Comparison of low, multidirectional locked nailing and plating in the treatment of distal tibial metadiaphyseal fractures. Int Orthop. 2012 Jul;36(7):1457-62.
21. Vallier HA, Cureton BA, Patterson BM. Randomized, prospective comparison of plate versus intramedullary nail fixation for distal tibia shaft fractures. J Orthop Trauma. 2011 Dec;25(12):736-41.
22. Nork SE, Schwartz AK, Agel J, Holt SK, Schrick JL, Winquist RA. Intramedullary nailing of distal metaphyseal tibial fractures. J Bone Joint Surg Am. 2005 Jun;87(6):1213-21.