

# Comparison of Intramedullary Interlocking Nailing (IMLNG) and Minimally Invasive Plate Osteosynthesis (MIPO) in Treating Extra Articular Distal Tibial Fractures

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## ABSTRACT

**Background:** Due to limited blood flow and sparse soft tissue coverage, treating distal tibia fractures presents a considerable challenge for orthopaedic surgeons.

**Objective:** Our study's objectives were to compare the outcomes of the two treatment modalities of minimally invasive plate osteosynthesis (MIPO) and intramedullary nailing (IMN) for extraarticular distal tibia fractures.

**Study Design:** Randomized Controlled Trial

**Place and Duration of the Study:** This study was conducted at Department of Orthopedic and Spine Surgery Sughra Shafi Medical Complex, Narowal from March 2021 to March 2022.

**Material Methods:** During A total of 59 patients ( 30 in IMLN group and 29 in MIPO group), both male and female, with AO Type A, b and C distal tibial fractures lasting less than three days and ages ranging from 20 to 60, were enrolled for this research. At the most recent follow-up, clinical and radiological data were assessed.

**Results:** The average duration to union was 21.9 weeks in the IMN group and 19.9 weeks in the MIPO group, and all of the examined patients eventually recovered. In the IMN group, the time to union was substantially greater ( $p= 0.001$ ).

**Conclusion:** Low operating, union, and hospitalisation times make MIPO advantageous. In order to lessen the morbidity of these patients, we advise using the minimally invasive plate osteosynthesis (MIPO) procedure as the first line of treatment for distal tibia fractures..

**Keywords:** Distal tibia fracture, minimally invasive plate osteosynthesis, intramedullary nailing,

## INTRODUCTION

A distal tibia fracture is a break in the metaphyseal region of the shinbone, which may extend to the articular surface where you put your weight. If the articular surface is affected, the fracture is referred to as a tibial pilon fracture or tibial plafond fracture.<sup>1,2</sup> Because of its location beneath the skin and its thin layer of soft tissue overlying the distal one-third of the bone, tibial fractures are more prevalent than those of any other long bone. 7–10% of all fractures in the lower extremities are fractures of the distal tibia.<sup>3</sup> The fibula is usually broken together with the tibia in roughly 85% of cases when the tibia is broken in the lower third.<sup>2</sup> It is widely accepted that these fractures are intrinsically unstable and prone to problems such as malunion, soft tissue issues, delayed union, and infection.<sup>4</sup>

Extra-articular pilon fractures are difficult to treat since there are no established standards for care. Closed reduction and casting has been the standard method for treating lower tibia fractures for quite some time. There are numerous approaches that can be taken within a given therapeutic method.<sup>5</sup> Plating extra-articular pilon fractures and concomitant fibular fractures has become increasingly common in recent years. However, due to the distal tibia's unique anatomy and the swelling and blistering that often accompany severe trauma, soft tissue problems such as wound dehiscence, superficial infection, exposed implants and delayed healing, are common following plating.<sup>6</sup>

For tibia shaft fractures, intramedullary nailing is the gold standard since it is less intrusive and more biological than other options for fixing. Indications are expanded to encompass distal tibial fractures with partial articular extension, and it has recently acquired appeal for the management of extra articular pilon fractures.<sup>7</sup> With the MIPO method, a plate is slipped over the periosteum without affecting the vascularity of the bone, and an indirect reduction is achieved through small stab incisions without evacuation of the fracture hematoma (3-5). However, this procedure places the patient at a considerable risk of radiation exposure and requires skilled surgeons.<sup>8</sup>

Since distal tibial fractures have been an ongoing issue in orthopaedic trauma, and since no local randomised trial had previously been conducted to compare the union rates of MIPO

and IMN method for treating these fractures, we decided to undertake this study. Depending on the findings, our standard of care for treating these fractures in general practise may shift to favour the method with the greater union rate, hence reducing patients' risk of complications.

## MATERIAL AND METHODS

This randomized controlled trial was conducted at Department of Orthopedic and Spine Surgery Sughra Shafi Medical Complex, Narowal from March 2021 to March 2022. Total 59 patients of either gender having age between 20 to 60 years duration of tibial fractures < 3 days were enrolled in this study. Patients were not included in the study if they had intra-articular tibial fracture extensions, open fractures, pathological fractures, major medical co-morbidities or aseptic non-unions. All patients gave their written informed consent before being enrolled in the trial, and the protocol was approved by our institution's ethics committee.

Treatment methods were used to separate patients into two primary groups: the IMN group (47 patients) or the MIPO group (41 patients). Interlocking IMN was used for patient management in the IMN group. Patients in the MIPO group were cared for utilising the MIPO method. Depending on the severity of the multiple fibular fractures in both groups, supplementary fibular fixation was undertaken. So that no prejudice could creep in, all operations were carried out by an experienced surgeon. It was decided to use spinal anaesthetic for the procedures.

We took AP and lateral views of the fracture site prior to surgery to get a better look at the damage. The AO/OTA method was used to categorise fractures based on preoperative imaging studies like x-rays and CT scans. After reaming, members of the IMN group had their fractures stabilised using intramedullary nailing. For the MIPO procedure, a pre-contoured locking plate is introduced into the distal tibia through a 5-centimeter incision and then passed under the skin onto the surface of the bone. Fixation was accomplished with the bridging approach by using the right number of screws and leaving the right amount of fracture working space.

Both sets of patients had their procedures performed by the same team of seasoned doctors. The postoperative care for both

groups was exactly the same. In the first postoperative day, antibiotics were given as preventative measures (Cephalosporin every 6 hours, 1 gr). When the patient's postoperative pain subsided, foot and knee movement was initiated without the use of removable splints. We allowed toe-touch walking with crutches right after surgery, and full weight-bearing may be resumed once x-rays showed complete healing. Patients were checked on clinically and radiographically on the 15th day, 6th week, 3rd, 6th, and 12th months.

**RESULTS**

Of the 30 patients in the IMN group, 21(70%) were men. Patients, on average, were 46 years old when they were admitted. Similarities between the two groups in terms of patient demographics and fracture characteristics are presented in Table-1.

In the IMN group and the MIPO group, the time between the injury and the surgery was on average 2.8 days and 2.4 days, respectively; this difference was statistically significant (p 0.05). The mean operation time in the IMN group was 91 minutes, but the MIPO group's was 71 minutes (P<0.005). Additionally, the difference between the mean postoperative hospitalisation times for the IMN group and the MIPO group (3.7 vs. 4.5 days) was statistically significant (p<0.05). The average duration to union was 21.9 weeks in the IMN group and 19.9 weeks in the MIPO group, and all of the examined patients eventually recovered. In the IMN group, the time to union was substantially greater (p<0.001).

Table-1: Demographics of the patients enrolled in this study

Characteristics		IMLNG Nailing	MIPO
Age	Years	40.9 ±13.2	41.11 ±10.52
Gender	Male	21 (7)	17 (55)
	Female	9 (30.0)	14 (48.27)
Trauma mechanism	Fall from height	2 (6.0)	4 (14.0)
	Simple fall	14 (47)	15 (52.0)
	Road Traffic accident	14 (47)	10 (36.0)
Side	Right	12(40.0)	21(72.41)
	Left	18(60.0)	8(27.58)
Fracture Type	Open Fracture	8(26.66)	4(13.79)
	Closed Fracture	22(73.33)	25(86.20)
Fracture Type (OTA Type)	A1	16(53.33)	13(44.82)
	A2	8(26.66)	11(37.93)
	A3	6(20.0)	5(17.24)

\*OTA: Orthopaedic Trauma Association

Table-2: Outcome of different variables

Characteristics	IMLNG Nailing	MIPO	p-value
Union time in weeks	21.9±3.1	19.9±2.9	<0.001
Preoperative hospitalization in day	2.8±1.5	2.4±2.7	0.011
Surgery time in minute	91.0±9.10	70.9±9.9	<0.001
Hospital stay in day	3.7±1.1	4.5±1.1	<0.001

**DISCUSSION**

The selection of an implant for the treatment of distal third tibia fractures is always a challenge. Time spent in surgery, size of incision, need for fluoroscopy, risk of blood loss, difficulty in distal locking, need for indirect reduction, and other factors all factor into the pros and cons of each treatment option (IMIL vs. MIPO).<sup>9,10</sup>

The goal of treatment for distal tibial fractures is an acceptable and near anatomic reduction. Ankle and knee osteoarthritis may develop as a result of improper alignment. Although more occurrences of malalignment were seen in the nailing group, reducing the fracture indirectly is challenging in both treatment groups. Open reduction and internal fixation can accomplish anatomical alignment, but it has drawbacks that slow fracture healing.<sup>11</sup>

Studies comparing the efficacy of plate osteosynthesis versus intramedullary nailing for the treatment of distal tibia fractures may be found in the medical literature.<sup>13,14</sup> Functional

outcomes from therapy with MIPO or IMN have not been found to be superior to those with the other in a large number of studies.<sup>15,16</sup>

The average duration of operation was 56 minutes in the MIPO group and 85 minutes in the IMN group, according to a study by Shen et al. 17 Surgical times were much lower in the IMN group compared to the MIPO group, according to the research of Li et al (87.5 minutes vs. 114.4 minutes; p 0.05). 18 The MIPO group required less time under anaesthesia during surgery compared to the IMN group (71 minutes versus 91 minutes; p0.001). According to a recent meta-analysis, the MIPO approach is linked to a higher risk of wound complications and a longer time to union. 16 In this study, we found that the MIPO group had a higher rate of wound complication and infection than the IMN group, but this difference was not statistically significant.<sup>19</sup>

In conclusion, this research has a number of limitations. The study's findings were restricted by a lack of statistical significance and the small number of patients followed. Another limitation this study that it is a retrospective study. MIPO's benefits include a shorter recovery period, shorter operating time, and no knee joint damage. However, IMN's advantages include earlier full load bearing, shorter hospital stays, and improved functional outcomes.

**CONCLUSION**

Low operating, union, and hospitalisation times make MIPO advantageous. In order to lessen the morbidity of these patients, we advise using the minimally invasive plate osteosynthesis (MIPO) procedure as the first line of treatment for distal tibia fractures.

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