

Functional Outcome of Closed Static Intramedullary Nailing with Distal two Plane Locking Versus Percutaneous MIPPO Distal Tibial Locking Plate in Distal 3rd Tibia Metaphyseal Fractures

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ABSTRACT

Objective: Aim of current study was to determine the functional outcomes of closed static intramedullary nailing with distal two plane locking versus percutaneous MIPPO distal tibial locking plate in distal 3rd tibia metaphyseal fractures.

Study Design: Randomized clinical trial

Place and Duration: Nishtar Hospital Multan/Qaisrani Medical Center Multan. Jan 2021-March 2022

Methods: There were 76 patients of both genders with age 15-60 years presented. All the patients had 3rd tibia metaphyseal fracture were admitted to hospital for surgery. Following the collection of informed written consent from enrolled patients, complete demographic information was gathered. Patients were equally divided into two groups. Group I received intramedullary nailing with distal two plane locking and group II received percutaneous MIPPO distal locking plate. Favorable and unfavorable outcomes among enrolled cases were compared. SPSS 22.0 was used to analyze all data.

Results: There were majority males 22 (60.5%) in group I and 20 (52.6%) in group II. In group I mean age was 30.8±6.42 years with mean BMI 24.71±3.19 kg/m² and in group II mean age was 31.14±3.58 years and had mean BMI 25.7±7.17 kg/m². Falling, accidents, sports and lifting of heavy object was the most common cause of fractures. We found that intramedullary nailing was more effective as compared to MIPPO distal locking plate in terms of functional outcomes but difference was insignificant. Frequency of complications were higher in group II found in 14 (36.8%) as compared to group I in 4 (10.4%) cases.

Conclusion: We concluded in this study that distal third tibial metaphyseal fractures were effectively operated by intramedullary nailing distal two plane locking and MIPPO distal locking plate but frequency of complications were higher in MIPPO group as compared to intramedullary nailing.

Keywords: Metaphyseal Fractures, MIPPO Distal Plating, Intramedullary Nailing, Functional Outcomes, Complications

INTRODUCTION

Distal tibial fractures account for approximately 7% of all tibial fractures [1,] making them one of the most challenging injuries to the ankle joint. [Citation needed] Regardless of whether or not they extend intra-articularly, the difficulty of treating distal tibial metaphyseal fractures is contributed by a number of factors, including instability, the absence of soft tissues, the subcutaneous nature of the fracture, and the low vascularity of the bone. Displacement of the fracture, comminution of the fracture, intra-articular extension of the fracture, and injury to the soft-tissue envelope are all factors that have a substantial influence on the therapeutic strategy [2]. In addition to the repair of the bone [3], it has been proven that therapy of the soft tissues plays an important role in the overall management of the condition]. The use of open reduction and plating is a standard procedure that frequently results in dependable fixing. Although it is widely used, the approach can made more difficult since it requires a significant amount of wound exposure and soft-tissue dissection. Furthermore, there is a possibility that it can lead to issues with the healing process, infection, and hardware [4]. The use of percutaneous medial locked plating as an alternative to the more conventional method of open surgery has been described in a number of recent papers that have been published in the medical literature. Because of the technological constraints involved, attaining anatomical reduction with this method might be difficult [5, 6].

Open reduction and platescrew internal fixation is a common method used in the surgical treatment of distal tibia metaphyseal fractures. Despite the fact that this method carries a higher risk of wound complications and infection, it is the most common method used because of the inadequate soft tissue covering of the anteromedial aspect of the tibia [7]. When it did come to distal tibia fissures, intramedullary nailing offers the benefits of minimally invasive application as well as the possibility of biological, stable

fixation [9]. Union can be achieved with secure fracture repair using localized plate osteosynthesis (MIPO), regardless of soft tissue covering [8].

On the other hand, therapy with intramedullary nailing makes it possible to accomplish and maintain reduction even in the most difficult direction. Polar screws are one option for narrowing the diameter of the canal, and various distal locking mechanisms are one way to achieve more stability along a number of axes [10]. However, only two studies [11,12] have evaluated IMLN to MIPO for distal tibia metaphyseal fracture. Both of these investigations were conducted in the United States. Both methods of treating distal tibia fractures have both advantages and disadvantages, and medical professionals are unable to come to a consensus over which method should be used. The objective of this study was to compare the effectiveness and safety of intramedullary nailing to the minimally invasive partial osteosynthesis (MIPO) procedure for the repair of distal tibial injuries.

MATERIAL AND METHODS

This randomized clinical trial was conducted at Nishtar Hospital Multan/Qaisrani Medical Center Multan from Jan 2021-March 2022 and comprised of 76 patients. Following the collection of informed written consent from enrolled patients, complete demographic information was gathered. The study excluded patients with skeletal immaturity, Pilon fractures (AO type B, C), all open injuries, associated fractures in the ipsilateral limb except the fibula, and patients who were mentally unwell.

The research comprised skeletally mature individuals (AO class A1, A2, A3) with fractures involving the distal third of the tibia. At the time of admission, the patients were given sequential numbers and divided randomly into two groups. Group I had expert tibial nail procedures and group II had percutaneous MIPPO distal locking plate. Before each group underwent surgery, the costs, benefits, and drawbacks of each operation were discussed. The

patients were randomly assigned using computer-generated random numbers.

Similar to the patient in the plating group, the patient in the nailing group was made to bear their entire weight as quickly as feasible. After the operation, clinical and radiological follow-ups were performed 1 month, 3 months, 6 months, and 8 months later. Standard radiographs of the leg with the knee and ankle joint were obtained from the antero-posterior and lateral views. Three doses of intravenous wide spectrum antibiotics were administered to all patients. On the second and fifth post-operative days, the dressing was taken off, the wound was examined, and the sutures were then taken out at 6th post-operative day. The Olrud Molander Ankle Scores (OMAS) and the X - ray Union Scale in Tibial Fractures (RUST) rating were used to evaluate the functional result.

Version 22 of the Statistical Package for Social Sciences (SPSS). Age, the time of operation, and the time of union are examples of continuous variables that may be summarised using mean and standard deviation. The RUST scores were presented as the Mean and Standard deviation whereas the Olerud, Molander ankle scores were summarized as numbers and percentages. The existence of significant variations in RUST scores between the two procedure groups was determined using an independent t test.

RESULTS

In group I mean age was 30.8±6.42 years with mean BMI 24.71±3.19 kg/m² and in group II mean age was 31.14±3.58 years and had mean BMI 25.7±7.17 kg/m². Falling, accidents, sports and lifting of heavy object was the most common cause of fractures.(table-1)

Table-1: Detailed demographics of enrolled cases

Variables	Group I (n=38)	Group II (n=38)
Mean age (years)	30.8±6.42	31.14±3.58
Mean BMI (kg/m ²)	24.71±3.19	25.7±7.17
Cause of Fracture		
Fall	15 (39.5%)	13 (34.2%)
Accident	10 (26.3%)	8 (21.05%)
Sports	12 (31.6%)	15 (39.5%)
Lift of Heavy Object	1 (2.6%)	2 (5.3%)

There were majority males 22 (60.5%) in group I and 20 (52.6%) in group II.(figure-1)

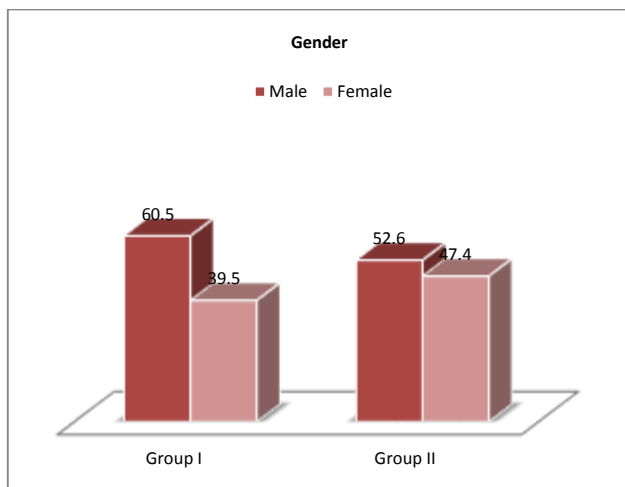


Figure-1: Among both groups sex distribution

We found that 7 (18.4%) patients had diabetes mellitus in group I and 6 (15.8%) patients in group II had DM. Frequency of smokers in group I was 4 (10.5%) and in group II was 5 (13.2%).(table-2)

Table-2: Frequency of co-morbidities and smokers among both groups

Variables	Group I	Group II
DM		
Yes	7 (18.4%)	6 (15.8%)
No	31 (81.6%)	32 (84.2%)
Smokers		
Yes	4 (10.5%)	5 (13.2%)
No	34 (89.5%)	33 (86.8%)

Mean surgery time in group I was higher 88.4±12.50 minutes as compared to group II 50.17±8.71 minutes with p value <0.003. Mean union time in group I was 18.9±10.34 weeks and in group II was 20.8±11.26 weeks.(table-3)

Table-3: Surgery time and union time among both groups

Variables	Group I	Group II	P value
Mean Surgery time (minutes)	88.4±12.50	50.17±8.71	0.003
Mean Union Time (weeks)	18.9±10.34	20.8±11.26	N/S

In group I frequency of excellent outcomes were found in 31 (81.6%) cases and in group II 27 (71.1%) patients showed excellent results by using Olrud-Molander Ankle score.(table-4)

Table-4: Functional Outcomes among enrolled cases

Variables	Group I	Group II
Functional Outcomes		
Excellent	31 (81.6%)	27 (71.1%)
Good	5 (13.2%)	4 (10.5%)
Poor	2 (5.3%)	7 (18.4%)

Frequency of complications was higher in group II found in 14 (36.8%) as compared to group I in 4 (10.4%) cases.(table-5)

Table-5: Comparison of complications

Variables	Group I	Group II
Complications		
Yes	4 (10.4%)	14 (36.8%)
No	34 (89.6%)	24 (63.2%)
Type of Complications		
Deformity	2 (5.3%)	3 (7.9%)
Infection	1 (2.6%)	2 (5.3%)
Delayed Union	0	1 (2.6%)
Non-union	1 (2.6%)	3 (7.9%)

DISCUSSION

Distal tibia metaphyseal fractures are best treated surgically if the patient has a favourable fracture configuration, fracture displacement, bone quality, level of soft tissue injury, and the surgeon has sufficient expertise and equipment. If the surgeon follows the fundamental principles of orthopaedic trauma surgery, the fracture will heal in a way that prevents soft tissue damage, maintains the fracture's blood supply, and allows for secure fixing, regardless of the procedure used. These fractures may now be treated with a variety of methods, the most common of which being intramedullary nailing and minimally invasive partial occlusion.[13] The purpose of this research was to evaluate the efficacy of MIPO in treating distal tibia metaphyseal fractures compared to intramedullary nailing. In this research, researchers discovered that the clinical and functional outcomes from both approaches were comparable.

In our study 76 patients were presented. Majority of the patients were males and all patients were older than 18 years. Mean age was 30.8±6.42 years. Age distributions of patients with distal tibial fractures were comparable to those of similar populations in studies by Kumar YC et al. [14] and Natarajan et al. [15]. For a long time, IMLN has been preferred to alternative procedures because of the high rate of early weight - bearing activities and union it achieves as well as the low risk of infection it often causes. With the development of minimally invasive surgery, percutaneous plating has cast doubt on interlocking nailing as a repaired device since it relies on axisymmetric and angular stability

at the lock interface instead of the frictional force between both the plate and bone. This is significant because it is believed that a higher friction factor between the plates and bone would help maintain periosteal blood flow in the region around the fracture. [16]

In our study, mean surgery time in group IMLN was higher 88.4±12.50 minutes as compared to group MIPPO 50.17±8.71 minutes with p value <0.003. Mean union time in group IMLN was 18.9±10.34 weeks and in group MIPPO was 20.8±11.26 weeks. In group IMLN frequency of excellent outcomes were found in 31 (81.6%) cases and in group MIPPO 27 (71.1%) patients showed excellent results by using Olreud-Molander Ankle score. Results were comparable to the previous studies.[17] For distal metaphyseal tibial fractures, Nandakumar et al. found that intramedullary interlocking nailing is an effective therapeutic option with a high union rate and low risk of complications. [18] In our study, frequency of complications was higher in group MIPPO found in 14 (36.8%) as compared to group IMLN in 4 (10.4%) cases.

As the previous study found that RTA was the most prevalent cause, it is possible that in addition to creating the fracture, it also affects the soft tissue. This might result in the breakdown of soft tissue as well as infections.[19] Falling, accidents, sports and lifting of heavy object was the most common cause of fractures in our study.

Non-union and delayed union were more common among smokers than among non-smokers. Patients who had diabetes also had a greater chance of non-union and infections than those without the disease. The findings of our research indicate that the rate of fracture union is quicker in the group that received the nail, whereas the rate of infection is higher in the group that received the plate. This, in turn, causes complications such as wound dehiscence, tendon exposure, implant exposure, implant failure, and non-union.

CONCLUSION

We concluded in this study that distal third tibial metaphyseal fractures were effectively operated by intramedullary nailing distal two plane locking and MIPPO distal locking plate but frequency of complications were higher in MIPPO group as compared to intramedullary nailing.

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