

Original Research Article

Patient outcomes following minimally invasive plate osteosynthesis for fractures of the distal tibia

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ABSTRACT

Background: Minimally invasive plate osteosynthesis (MIPO) has become the go-to method for treating fractures of distal tibia because of its several benefits over open procedures. Assessing the radiological and clinical results of participants undergoing MIPO to treat fractures of distal tibia was the main goal of this study.

Methods: The study was prospective-observational. It was conducted at Srirama Chandra Bhanja (S.C.B.) medical college and hospital, Cuttack, India for one year, i.e., from February 2024 to January 2025. This study included fifty-two individuals who had received MIPO for fractures of the distal tibia.

Results: Among all the 52 patients who participated in the study, 33 (63.4%) were men and 19 (36.5%) were women. A mean age of 52.3 ± 6.5 years was found. Most of the patients, i.e., 38 (73.1%) of patients took 20-24 weeks. Six (11.5%) of patients took >24 weeks. And, lastly, 08 (15.4%) of patients took <20 weeks.

Conclusions: According to the study's findings, MIPO for distal tibia fractures produces good radiological and clinical outcomes, with the majority of patients having a strong functional recovery and union within 24 weeks.

Keywords: Fracture healing, MIPO, Functional outcomes, Minimally invasive plate osteosynthesis, Distal tibia fractures

INTRODUCTION

Minimally invasive plate osteosynthesis (MIPO) has become the go-to method for treating distal tibia fractures because of its several benefits over open procedures.¹ This surgical technique aims to prevent damage to the soft tissues, lower the complications during the treatment, and promote recovery by protecting the blood flow surrounding the fracture.² Fractures of distal tibia are generally difficult to treat due to their intricacy and proximity to the ankle joint. These fractures are particularly difficult due to the presence of limited soft tissue coverage and the high likelihood of serious consequences after surgery.³

Although they have been used extensively, traditional fixation techniques including intramedullary nailing (IMN) and open reduction and internal fixation (ORIF) are linked to several issues, especially about maintaining the

blood supply and managing soft tissues. These techniques frequently entail a large amount of surgical dissection, which may jeopardize the fracture site's vascular integrity and cause infection and delayed healing. As a result, minimally invasive methods that seek to address these problems and improve therapeutic results have gained popularity.⁴

For these injuries to be effectively treated, MIPO offers a reliable internal fixing method through tiny incisions employing locking plate technology.⁵ The advantages of less soft tissue injury, decreased infection rates, and quicker healing times are highlighted in contrast to traditional surgical methods.^{6,7}

In several trials, the application of MIPO for distal tibia fractures has demonstrated promise, highlighting its advantages in terms of less surgical trauma, lower infection rates, and improved functional outcomes.

To properly demonstrate its efficacy, however, thorough assessments of clinical and radiological outcomes are still required in spite of these encouraging results. These assessments are essential for establishing evidence-based recommendations for the management of these intricate fractures.

Assessing the radiological and clinical results of patients undergoing MIPO for the cases of fractures of the distal tibia is the main goal of this study. According to the American orthopedic foot and ankle society (AOFAS) score, this comprises assessing the frequency of problems, union times, and functional outcomes. This study aims to add to the increasing amount of data demonstrating the effectiveness of MIPO and offer suggestions for its usage in clinical practice by methodically examining these variables.

METHODS

Study design

The study was prospective-observational. It was conducted at S. C. B. Medical College and Hospital, Cuttack, India for one year, i.e., from February 2024 to January 2025.

Study population

This study included fifty-two individuals who had received MIPO for fractures of the distal tibia. Patients with closed distal tibia fractures treated with MIPO who were between the ages of 18 and 65 met the inclusion criteria. Additionally excluded were patients who had undergone previous surgery on the affected limb, had open fractures, pathological fractures, or fractures with substantial soft tissue damage.

Data collection

Patient information was gathered, including preoperative, intraoperative, and postoperative details. At follow-up visits, functional outcomes were evaluated using the AOFAS score. Union time, complication rates, and functional results (AOFAS score) were the main variables. Demographic information was among the secondary variables.

Statistical analysis

Data were recorded in Microsoft Excel sheets. Data were presented as either mean±SD or N (%).

RESULTS

Among the fifty-two patients enrolled in the study, 33 (63.4%) were men and 19 (36.5%) were women. A mean age of 52.3±6.5 years was found. Table 1 depicts the demographics of participants enrolled in the study.

Table 1: Patient demographics.

Characteristics	Value
Age (in years)	52.3±6.5
Male participants	33 (63.4%)
Female participants	19 (36.5%)

Data was presented as either mean±SD or N (%)

Table 2 represents the time taken for union in weeks for the fractures. Most of the patients, i.e., 38 (73.1%) of patients took 20-24 weeks. 06 (11.5%) of patients took >24 weeks. And, lastly, 08 (15.4%) of patients took <20 weeks.

Table 2: Time to union.

Union time (in weeks)	N	Percentages (%)
<20	08	15.4
20-24	38	73.1
>24	06	11.5

Table 3 shows AOFAS scoring among participants. Eleven patients (21.2%) had excellent outcomes with AOFAS score >90, 31 patients (59.5%) possessed good outcomes with AOFAS score 80-90, and other 10 patients (19.2%) possessed fair outcomes with AOFAS score 70-80.

Table 3: AOFAS scores among patients.

AOFAS scores	N	Percentages (%)
Excellent (>90)	11	21.2
Good (80-90)	31	59.6
Fair (70-80)	10	19.2

Table 4 depicts complications among participants. Among the complications were plate irritation in five individuals (9.6%), deep infections in one patient (1.9%), and surface infections in four patients (7.7%). Because to their non-union, three patients (5.8%) needed revision surgery.

Table 4: Complications among participants.

Complications	N	Percentages (%)
Superficial infection	04	7.7
Deep infection	01	1.9
Plate irritation	05	9.6
Non-union	03	5.8

DISCUSSION

Over a 12 month period, 52 patients who received MIPO for distal tibia fractures had their clinical and radiological results assessed in this study. According to the results, 88.4% of fractures united within 46 weeks, with average union time of 23 weeks.

In prospective research with 50 patients, Singh et al found that the average AOFAS score was 90 and the mean union

time was 19.13 weeks. The study demonstrated how well MIPO works to provide early mobilization and lower infection rates.⁸ Similarly, to evaluate the effect of utilizing a lag screw in MIPO, Vicenti et al conducted a randomized clinical experiment. They discovered that the time required to attain painless complete weight-bearing was much shortened by the inclusion of a lag screw, proving that technique improvements might further increase results.⁹ When treating extra-articular distal tibia fractures, Khan et al contrasted MIPO with intramedullary nailing (IMN). Although both approaches are successful, their research revealed that MIPO was a better choice for some patients due to its shorter recovery and hospitalization periods.¹⁰

For Gustilo type III open distal tibial fractures, He et al evaluated the use of a posterolateral MIPO approach. The study demonstrated the adaptability of MIPO in treating complicated fractures by reporting union of fracture successfully in every instance with score of AOFAS as 90.¹¹

Both these researches along with our own results shows that MIPO is a useful method for treating fractures of distal tibia. Minimal disturbances in soft tissues, preservation of fractures, and excellent outcomes are only a few of its benefits. According to the average union times and AOFAS scores from several studies, MIPO yields consistent and dependable outcomes. The capacity to handle intricate fracture patterns and reduced complication rates also support the application of this approach.

Limitations

There are various limitations to this study that need to be taken into account. A significant constraint is the comparatively small sample size, which could restrict the findings' generalizability. Validating these findings and offering a more thorough knowledge of the functional outcomes linked to MIPO would require a bigger, multi-center investigation with a more varied patient population. Also, because the hospital patient population might not be representative of the general population, the study's unique hospital setting might have introduced Berksonian bias. Our findings cannot be broadly applied since patients treated in various healthcare settings, such as outpatient clinics or rural areas, may have distinct traits and results.

CONCLUSION

According to the study's findings, MIPO for distal tibia fractures produces good clinical and radiological results, with the majority of patients having a strong functional recovery and union within 24 weeks. Specifically in maintaining the integrity of soft tissues and encouraging mobilization earlier, the technique has advantages over conventional approaches and is linked to few problems. Furthermore, the study's low rate of unfavorable consequences highlights MIPO's dependability as a recommended course of treatment.

Recommendations

To improve patient outcomes and further the method, more number of patients along with longer follow-up times are advised for future research. To fully establish the long-term benefits and improve treatment protocols, it is still recommended to carry out more research and prolong the follow-up period.

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