

Minimal Invasive Plate Osteosynthesis for Distal Tibia Fractures

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Abstract: Background: Distal tibia fractures, challenging for surgeons due to unique anatomy, often result from high-energy trauma. Traditional treatments like ORIF entail significant soft tissue dissection. MIPO, a promising alternative, lacks sufficient empirical support for treating distal tibia fractures, warranting further study.

Materials and Methods: This Prospective case series study was conducted on 36 consecutive patients of either sex having age range of 18 and above seen between May 2017 and December 2020 at the Department of Orthopedic and Trauma, Government Lady Reading Hospital Medical Teaching Institute, Peshawar. The Effectiveness of the MIPO was assessed radiographically and functionally. Healing in bone as seen in three cortices out of four is called radiographic healing and pain free full weight bearing is called functional healing.

Result: A total of 36 individuals were investigated for this investigation. 27 men and 9 women, or a 75% to 25% gender split. The patients ranged in age from 18 to 60, with an average age of 36.36. The standard deviation of 13.749 indicates that the patients' ages varied, but the results were usually reliable. Thirteen (36.1%) of the instances were falls, whereas 23 (63.9%) of the cases involved high-velocity trauma such automobile collisions. The AO/OTA categorization system allowed for the identification of several fracture forms. Type A fractures were recorded in 17 instances (47.25%) of all reported fractures. Type B fractures were found in 13 cases (36.15%), while Type C fractures were documented in 6 cases (16.7%). Of the patients who got treatment, thirty (83.3%) experienced no complications at all. Six patients experience rare problems. It's noteworthy that conservative approaches were used to solve every one of these problems.

Conclusion: MIPO is a safe and effective treatment option for distal tibia fractures, providing adequate fracture reduction and favorable functional results. Because there is less soft tissue injury, patients heal more quickly and have fewer complications.

Keywords: Fractures, MIPO, Outcomes, Osteosynthesis, Trauma, Tibia.

INTRODUCTION

Common orthopedic injuries, such as distal tibia fractures, may be caused by high-energy trauma, falls, sports-related accidents, or other mishaps [1]. Due to their distinctive anatomical characteristics, restricted soft tissue covering, and propensity for sequelae, these fractures often provide a substantial challenge for orthopedic surgeons [2]. Open reduction and internal fixation (ORIF) procedures have been used as standard treatments for distal tibia fractures; however, these procedures need substantial soft tissue dissection, increase the risk of wound complications, and prolong the healing process of the fracture [3]. A new surgical approach for treating distal tibia fractures has evolved in recent years called minimally invasive plate osteosynthesis (MIPO) [4, 5]. MIPO uses percutaneous fixation techniques and short incisions to minimize soft tissue dissection and lower the chance of wound-related problems. Due to its potential advantages, such as accelerated healing, greater functional results, and faster fracture healing, this strategy has grown in favor in orthopedic practice [6-8].

MIPO has been used successfully to treat a number of long bone

fractures, including those of the femur and humerus, which has promoted its use in treating distal tibia fractures [9,10]. However, there is currently a dearth of concrete data supporting its usefulness in treating this particular fracture, particularly when considering the demographic that our medical facility serves. The objective of this study is to evaluate the effectiveness of minimally invasive plate osteosynthesis (MIPO) for fracture distal tibia.

MATERIALS AND METHODS

The Department of Orthopedic and Trauma, Lady Reading Hospital Medical Teaching Institute, Peshawar, undertook this research, which is a prospective case series study that started in May 2017 and ended in December 2020 on total of 36 patient of either sex, age 18 and above having closed fracture of the tibia.

All the patients who have closed fracture of the tibia with no other fracture were admitted either from outpatient department or from emergency. The purpose of the study was explained to them and written informed consent was taken. Patient was prepared for surgery after doing all necessary investigation for anesthesia and surgery. Pre-Operative Co Amoxiclav 1.2 gram was used 20 minutes before incision and then incision give after apply tourniquet. Small transverse incision of two centimeters

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were given above the medial malleolus to introduce plates with a jig and then with the help of jig screw were put in without opening the fracture site. Then wound closed with polypropylene suture and dressing applied. All the patients were operated by the same Experienced orthopedic surgeon. Dressing was changed after three days, anteroposterior and lateral radiographs were taken and stitches removed after two weeks. First follow up was done at 4 weeks from the day of removing the stitches and anteroposterior and lateral radiographs were taken to see callus. Then follow up was done at every 4 weeks for four months and healing was observed on radiograph. The Effectiveness of the MIPO was assessed radiographically and functionally. Healing in bone as seen in three cortices out of four is called radiographic healing [11] and pain free full weight bearing is called functional healing [12].

STATISTICAL ANALYSIS

All the data was collected with help of a proforma that was then entered and analyzed by SPSS version 20. Frequencies and percentages were computed for categorical variables. Numerical variables were presented as mean ± standard deviation.

RESULT

The research covered 36 patients in total. Nine women and 27 men, or 75% and 25% respectively. The increased frequency of distal tibia fractures in men is seen in this research. The patients' average age was 36.36 years, with a range of ages from 18 to 60. The mode and median ages of 25 and 33.50 years, respectively, indicate that the majority of patients were between the ages of 25 and 35. The age of the patients varied, as shown by the standard deviation of 13.749, but the statistics were generally consistent. There were 18 patients (50%) with fractures on the right side, and the same number (50%) on the left (Table 1). 23 (63.9%) fractures were due to high-velocity trauma, such as car accidents, whereas 13 (36.1%) cases were due to falls (Table 2). This suggests that the majority of the patients had distal tibia fractures as a result of strong external pressures, which are often linked to traumatic events. Based on the AO/OTA categorization system, many kinds of fractures were identified. The most frequent fracture type was Type A, which was detected in 17 instances (47.25%), then Type B (13 cases (36.15%), and Type C (6 cases (16.7%), (Fig. 1).

Thirty-six (83.3%) of the patients who received therapy had no problems at all. Rare complications affect six patients. One patient (2.8%), a delayed union (2.8%), a patient with superficial wound infections (2.8%), a patient with fractured plates (2.8%), a patient with broken proximal one screw (2.8%), and a patient with stiffness in the ankle joint (2.8%) were among the problems. It is interesting that all of these problems, as shown in Table 3, were successfully addressed using precautionary measures.

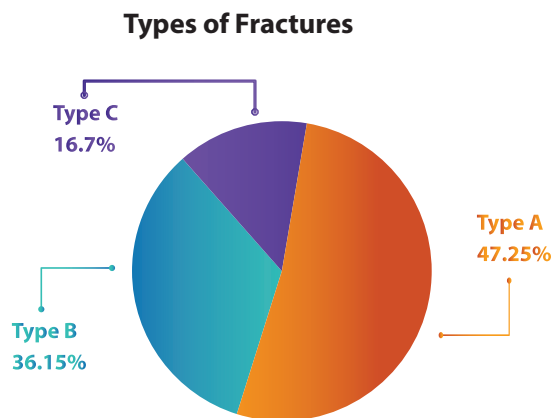


Fig. (1). Type of Fracture according to Orthopedic Trauma Association Classification (n=36).

Table 1. Characteristics of Gender, Age, and Site of Injury (n=36).

Characteristic	Number of Patients	Percentage	Valid percentage	Cum (% age)
Gender				
Male	27	75.0%	75.0%	75.0%
Female	9	25.0%	25.0%	25.0%
Total	36	100%		
Age Range	18 to 60 years			
Mean Age	36.36 years			
Mode Age	25			
Median Age	33.50			
Standard Deviation	13.749			
Side of Injury				
Right	18	50.0%	50.0%	50.0%
Left	18	50.0%	50.0%	50.0%
Total	36	100%		

Table 2. Variable of Mechanism of Injury, and Type of Fractures (n=36).

Variable	Number of Cases	Percentage	Valid percentage	Cum (% age)
Mechanism of Injury				
RTA	23	63.9%	63.9%	63.9%
Falls	13	36.1%	36.1%	36.1%
Total	36	100%		

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Type of Fracture				
Type A	17	47.25%	47.25%	47.25%
Type B	13	36.15%	36.15%	36.15%
Type C	6	16.7%	16.7%	16.7%
Total	36	100%		

Table 3. Complications of Patients (n=36).

Complication	Number of Patients	Percentage	Valid percentage	Cum (% age)
No Complications	30	83.3%	83.3%	83.3%
Rare Complications				
Delayed Union	1	2.8%	2.8%	2.8%
Superficial Wound Infections	1	2.8%	2.8%	2.8%
Broken Plates	1	2.8%	2.8%	2.8%
Broken Proximal 1 Screws	1	2.8%	2.8%	2.8%
Stiffness in Ankle Joint	1	2.8%	2.8%	2.8%
Total	36	100%		

DISCUSSION

It has been showed in many studies that minimally invasive plate osteosynthesis (MIPO) is superior to open reduction and internal fixation (ORIF) for the management of distal tibia fractures [13]. In spite some loopholes, such as manipulation of the fracture under direct vision, current literature favors the closed reduction and submuscular plate insertion through percutaneous technique has higher healing rates than ORIF [14]. The results of this research on the effectiveness and outcomes of minimally invasive plate osteosynthesis (MIPO) for distal tibia fractures in a cohort of 36 patients provide important new information. According to the mean age of 36.36 years, young to middle-aged persons are more likely than older adults to sustain distal tibia fractures. This is in line with the idea that younger people have a propensity for being more active and participating in activities that increase their risk of fractures [15].

The study's 75% male patient population is in line with other studies that have shown that men are more likely than women to suffer fractures. Males suffered the majority of distal tibia fractures, according to studies by Wang *et al.* [16] and Li *et al.* [17], whereas females suffered the most of these injuries. According to these results, men are more likely than women to get distal tibia fractures. High-velocity trauma, including car collisions, was blamed for the majority of distal tibia fractures. This emphasizes how important it is to focus on improving road safety measures to lower the frequency of serious fractures brought on by such

accidents [18]. According to a research, individuals with distal tibia fractures who had minimally invasive plate osteosynthesis had a low risk of complications and positive clinical results. According to these results, minimally invasive plate osteosynthesis is a secure and reliable method of treating distal tibia fractures [4,19]. Additionally, the findings of this research are in line with those of other studies, which found that Type A fractures are the most typical kind of distal tibia fracture. According to a research, Type A fractures, followed by Type B and Type C fractures, made up the majority of distal tibia fractures. These results imply that Type A distal tibia fractures are the most common type [20]. Overall, this study's findings point to minimally invasive plate osteosynthesis as a safe and successful method of treating distal tibia fractures.

LIMITATIONS

This study has certain limitations. It is a prospective study and having possible selection bias. The sample size is small which may restrict the findings to be generalized. Therefore, a large sample size, multicenter with a long follow up is needed to support our results.

CONCLUSION

MIPO is a good technique in fractures of the distal tibia in terms of healing and complication as this place is very notorious for non union and infection. As MIPO is used to avoid the opening of fracture site so the hematoma remains in place and aid in early bone healing without introducing the infection.

AUTHORS' CONTRIBUTION

- **Muhammad Inam:** Proposed topic, Manuscript and Quality Insurer.
- **Mian Asadullah:** Statistical analysis, Interpretation of results, and Referencing.
- **Suliaman Dawood:** Data collection, Literature review.
- **Waseeq Ur Rahman:** Basic study design, Methodology.

CONFLICT OF INTEREST

Declared none.

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