
UNSTABLE DISTAL TIBIA FRACTURE MANAGEMENT BY ANATOMICALLY CONTOURED PLATE WITH MIPO TECHNIQUE

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ABSTRACT

Background: Fracture at distal tibia is a notorious fracture and difficult to manage. This fracture can be managed conservatively or operatively. Minimally invasive percutaneous osteosynthesis (MIPO) technique can be applied in distal tibia fracture and it usually provides better outcome. This technique ensures minimal soft tissue damage, preserves periosteum and hematoma of the fracture. As the fracture site is not opened, indirect fracture reduction technique is applied. This study tries to evaluate the outcome of MIPO technique application in distal tibia fracture management.

Methods: The study was cross sectional study and was carried out on 20 patients during the period of January 2019 to July 2021 in orthopaedic department of Combined Military Hospital (CMH), Dhaka. During this tenure all patients who fulfilled the inclusion and exclusion criteria was included in the study. All had close fracture. Follow up interval was at 2 weeks then 06 weeks, thereafter at 3 months, 6 month and 12 months' time from the date of operation. Data were collected and evaluated in terms of bony union and postoperative complications.

Results: 12 patients i.e. 60% were male and same percentage of patient had fracture at right lower limb. Mode of trauma was mostly road traffic accidents (RTA) and fall from height. 40 years was mean age of the patients. It was 07 weeks mean partial weight bearing time and 14 weeks mean full weight bearing time. Mean radiological union time was seen at 18 weeks. Non union or delayed union did not happen in any case. But ankle stiffness (3/20) was most commonly found postoperative complications.

Conclusion: For distal tibia fracture MIPO technique is a better treatment option as it gives good outcome and fewer complications.

Keywords: MIPO, Distal Tibia fracture, anatomical contoured distal tibial plate.

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INTRODUCTION

The incidence of fracture of distal tibia is 0.6% and it constitutes about 10-15% of all tibia fracture cases.¹ The incidence has increased due to road traffic accidents. This fracture can be treated in various ways. Conservative treatment by cast in distal tibia fracture is usually for younger people and when the fracture is stable with minimal shortening. But this conservative treatment method has some complications due to prolonged immobilization. These are stiffness of ankle joint and disuse osteoporosis. Moreover there may be malunion and limb length discrepancy due to failure in accurate reduction.²⁻⁴ ORIF i.e. Open reduction and internal fixation by plating usually provides most accurate anatomical reduction but this leads to extensive soft tissue damage which ultimately damage the precarious blood supply of distal tibia. As a result there is increased chance of infection, delayed union, nonunion and sometimes implant comes out from wound which leads to implant failure and chronic osteomyelitis. Cosmetically non-soothing long scar mark is the usual outcome.^{5,6} In case of open fracture and where there is severe intraarticular comminution, external fixators and ring fixators are the applicable option. But these methods also have some complications like infection in pin track, framing difficulty, delayed union, malunion and non-union.⁷

In case of fracture shaft of tibia, interlocking intramedullary nailing is the best treatment option. But for distal tibia fracture this method is technically difficult specially in fractures with intra articular extension.^{8,9} Distal tibia is wider than the shaft. For this reason, nailing usually does not provide optimum angular and rotational stability.^{10,11}

MIPO technique has many advantages like minimum soft tissue stripping, keeping

periosteum intact and fracture hematoma may remain undisturbed. Fracture can be fixed with stable fixation and early mobilization usually possible due to early recovery from small wound.¹² In this method fracture heals with callus formation.¹³ By this method outcome was tried to evaluate both functionally and radiologically.

MATERIALS AND METHODS

It was a cross sectional variant of study. The study was done on 20 patients during the period of January 2019 to July 2021 in Orthopaedics department, CMH, Dhaka. Those who had distal tibia fracture and could fulfil the inclusion and exclusion criteria and treated by MIPO technique were included in this study.

Following criteria were set as inclusion criteria like a. Distal tibia fracture which had no intraarticular extension or simple intraarticular extension, b. 18 years or older age, c. polytrauma patients who did not require neurosurgical intervention and d. Duration of injury less than 2 weeks.

Fractures with skin breach, bad skin status, pathological fracture, Gustillo Type IIIC, paediatric cases, complex articular fracture were set as exclusion criteria.

Initially patients with distal tibia fractures were assessed and managed as per ATLS guideline. Long leg back slab was given. Surgery was planned usually after 5 to 7 days when oedema subsided and wrinkle sign appeared, as an elective case after proper preoperative preparation and preanesthetic evaluation.

Operative procedure

All the patients were anesthetized by subarachnoid block. Patient position was supine. To achieve bloodless field, tourniquet

was applied in all patients. The affected limb was painted and draped as per standard protocol. A mini incision was made to pass the plate over medial malleolus. We tried our best to safeguard saphenous nerve and vein. Distal tibial plate which anatomically contoured was passed through the incision and the position was ascertained with fluoroscopic guidance. Indirect reduction of fracture was done with traction and manipulation. Plate fixation was done both proximally and distally. At least 04 screws were applied on both side-proximal and distal. Fibula was fixed with one third tubular plate when fracture was within 06 cm of syndesmosis.

postoperative day and postoperative cast was not routine practice. But leg was kept elevated. Patients were encouraged for toe touch walk from the 1st week. They were encouraged to walk with partial weight bearing after 6 to 8 weeks. Then patients were instructed to increase gradually towards full weight bearing. Follow up was done at 2 weeks, 6 weeks, 3 months, 6 months, and 12 months. Complete healing of fracture was marked at full bridging of fracture site by callus radiologically and patient is asymptomatic on full weight bearing.

Data were compiled and analysed with the help of SPSS 25.0.



Fig-1(a)



Fig-1(b)

Fig-1(c)

Fig-1: Preoperative (a) and postoperative (b) view of distal tibia fracture treated by MIPO technique and fracture after union (c)

Postoperative care

Dressing was changed at 3rd postoperative day and then at 8th postoperative day. Knee and ankle mobilization was done from the very first

RESULTS

Population size of the study was 20. Male were 12 and female 08 i.e. 60% and 40% respectively.

Mean(\pm SD) age of the patients was found 40(\pm 16) years and range was between 25-75 years (Table-I). Right side was involved in 12(60%) cases. Injury mechanism was road traffic accident in 65% cases i.e. 13 patients (Fig-2). Rest of the patients had history of fall i.e. 7 patients (35%). Fibular plating was required in 06 patients (30%) as shown in (Fig-3).

Table-I: Distribution of the patients according to age and sex (n=20)

Age group (years)	Male	Female	Total (%)
21-30	3	2	5(25)
31-40	4	3	7(35)
41-50	2	2	4(20)
51-60	1	0	1(5)
61-70	1	0	1(5)
71-80	1	1	2(10)
Total	12(60)	8(40)	20(100)

Table-I shows that most of the patients were young.

The mode of injury was either RTA or fall, is depicted in the following diagram.

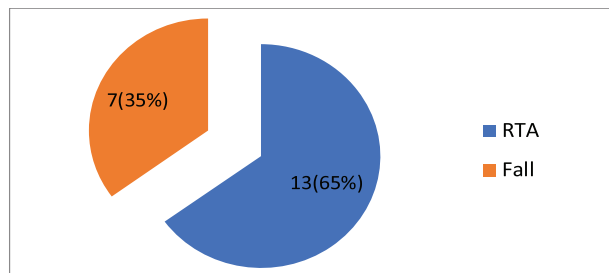


Fig-2: Distribution of the patients by mode of injury (n=20)

Usually fracture within 06 cm of syndesmosis is treated by fibular plating.

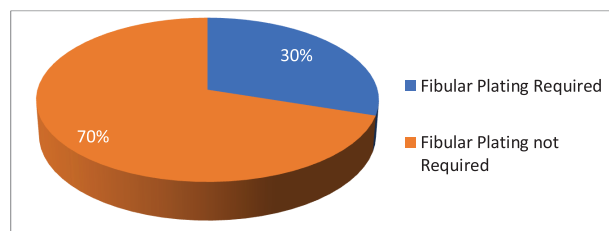


Fig-3: Distribution of the patients by requirement of fibular plating (n=20).

Most of the patients could start partial weight bearing at 06 weeks and full weight bearing at 12-14 weeks. It took 16-18 weeks for radiological union in maximum cases. This information is depicted as tabulated form in table II, III and IV.

Table-II: Distribution of the patients by partial weight bearing time

Time of partial weight bearing (weeks)	Frequency	Percent
6	8	40
7	7	35
8	2	10
9	2	10
10	1	5
Mean(\pm SD): 7 \pm 1.93 weeks		

Table-II shows that maximum patients could start partial weight bearing at 06 weeks.

Table-III: Distribution of the patients by full weight bearing time

Time of full weight bearing (weeks)	Frequency	Percent
12-14	11	55
15-17	6	30
18-20	3	15
Mean(\pm SD): 14.65 \pm 3.16 weeks		

Table-III depicts that 12-14 weeks' time required for full weight bearing in maximum cases.

Table-IV: Distribution of the patients by time of radiological union

Time of radiological union (weeks)	Frequency	Percent
16-18	14	70
18-20	3	15
21-23	3	15
>23	1	1
Mean(\pm SD): 18 \pm 2.56 weeks		

Table-IV shows that maximum cases were radiologically united within 16-18 weeks.

Mean (\pm SD) time for partial weight bearing was 7(\pm 1.93) weeks and range was 6-10 weeks. And the time required for full weight bearing was mean(\pm SD): 14.65(\pm 3.16) weeks and range was 12-20 weeks. Regarding radiological union, mean(\pm SD) was 18(\pm 2.56) weeks and range was 16-24 weeks. Ankle stiffness in 3 patients was (15%). 01 patient found uncomfortable due to hardware prominence (5%). One patient (5%) had superficial wound infection that was treated by antibiotic and regular dressing and ultimately wound healed.

DISCUSSION

Hasenboehler et al in their study found MIPO may lead to delayed union when used bridging plated according to the fracture pattern.¹⁴ In this study no case of non-union or delayed union was found.

All the fractures were united clinically and radiologically irrespective of the pattern of fracture. Around 18 weeks time required for fractures to be radiologically united. This study commensurate with the study done by Guo JJ et al (17.6 weeks), Hazarika S et al (18 weeks), Senthilkumar M et al (18 weeks), Kumar VK et al (16.1 weeks), Lau et al (18.7 weeks) and Gupta RK et al (19 weeks).¹⁵⁻²⁰

Various literature shows wound infection is 2.6% to 14.6%¹⁹⁻²⁰ but if open fracture is included in the study the rate is usually higher. This study excluded open fracture and only one (5%) patient had superficial wound infection which ultimately healed with conservative treatment. Some study depicts incidence of saphenous nerve and vein injury, but we did not notice this sort of injury.^{21, 22}

CONCLUSION

MIPO technique is a good option for distal tibia fracture without complex intra articular extension. It results in good outcome with fewer complication. But reduction is difficult and fluoroscopic guidance is required for anatomical reduction. Along with that good postoperative rehabilitation is required for optimum outcome.

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