

ORIGINAL RESEARCH

Prospective study on distal tibial locking plating vs inter lock nailing in the management of distal tibia shaft fracture

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ABSTRACT

Introduction: Distal tibia metaphyseal fractures can be managed with open reduction and plate fixation. This approach often necessitates extensive soft tissue dissection and devitalisation, creating an environment, less favorable for fracture healing and more prone to infection and postoperative ankle stiffness. As a result other methods such as intramedullary nailing, percutaneous plating have become the standard treatment for distal tibia fractures. **Aims and objectives:** To compare the treatment result of intramedullary nailing and locking plating in terms of rate of healing and functional outcomes in patients with distal tibia shaft fracture. **Materials and method:** This was a prospective study conducted on 30 patients were divided into two groups of 15 patients each, Group A (interlock nailing) and Group B (distal tibial locking plating). Fractures were classified according to AO classification system. Post-operative X-ray was done, static exercises were advised on the second day. The patient was allowed progressive walking with walker on 5th day of operation. Regular follow up of the patient in OPD done with X-rays and functional outcome evaluated after 3 weeks, 6 weeks, 12 weeks and 24 weeks as per Ankle Hindfoot Scoring System (AOFAS Score) was done. **Results:** The mean age in group A was 45 years whereas in group B mean age was 49 years. Among group A, 3(20%) patients were female and 12(80%) patients were found to be male. Similarly in group B, 3(20%) patients were female and 12 (80%) patients were male. Among group A, 2 (13.33%) patients had AOFAS score between 70 to 79, 5 (13.33%) patients had score 80 to 89 and 8 (53.34%) patients had score between 90 to 99. Among group B, 11 (73.33%) patients had AOFAS score 70 to 79, 3 (20%) patients had score 80 to 89 and 1 (6.67%) patient had 90 to 99. **Conclusion:** In the present study interlock nailing showed favorable outcome and hence it was concluded that interlock nailing is optimal method for treating distal 1/3 rd fractures of tibia as compared to distal tibial locking plating.

Keywords: distal tibial locking plating, inter lock nailing, distal tibia shaft fracture

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INTRODUCTION

Distal tibial fractures constitute 5-10% of all tibial fractures. The factors contributing to difficulties in management of fractures of shaft of tibia include, a high incidence of open and infected fractures, as tibia lies superficially just beneath the skin; tendency for redisplacement of fragments when swelling subsides, particularly in comminuted, oblique and spiral fractures. Fractures of distal tibia occur typically as a result of axial and rotational forces on lower extremity and represents approximately 10% of the fractures of distal end of tibia.¹⁻³ The degree of associated soft tissue injury is higher in distal fractures than with shaft fractures.⁴

Closed fractures of the tibial shaft traditionally have been treated with closed reduction and a cast. Since the late 1950s, open reduction and internal fixation

(ORIF) was reserved for situations in which an adequate reduction could not be obtained or maintained by conservative means. ORIF often necessitates extensive soft tissue dissection. As a result, other, less invasive methods were developed to treat diaphyseal fractures of the tibia.⁵

Distal tibia metaphyseal fractures can be managed with open reduction and plate fixation. This approach often necessitates extensive soft tissue dissection and devitalisation, creating an environment, less favorable for fracture healing and more prone to infection and postoperative ankle stiffness.^{6,7} As a result other methods such as intramedullary nailing, percutaneous plating have become the standard treatment for distal tibia fractures. Fracture fixation with intramedullary nails was developed in an effort to limit these potential operative complications.

Due to absence of defined criteria for the surgical treatment of distal tibia shaft fractures, this study is conducted to compare the treatment results of intramedullary nailing & locking plate in term of rate of healing and functional outcome.

METHODOLOGY

This was prospective study of 30 cases of fractures of distal tibia, conducted at Department of Orthopaedics at Govt. Medical College/Guru Nanak Dev Hospital, Amritsar to compare the treatment result of intramedullary nailing and locking plating in terms of rate of healing and functional outcomes. Patients were divided into two group, Group A (interlock nailing) and Group B (distal tibial locking plating).

INCLUSION CRITERIA

- Fracture distal tibia (open/closed type A and type B) with or without intra articular involvement above 17 years of age.

EXCLUSION CRITERIA

- Previous or existing infection in the involved leg
- Gross comminution of the involved bone which cannot be stabilized using a distal tibial locking plate/intramedullary nailing.
- Compound grade III fractures where soft tissue cover to the implant is not possible.
- Pathological fracture.
- Patients below 17 years of age.

Fractures were classified according to AO classification system. All life threatening injuries were evaluated and managed on priority basis before fixing the fractures. Preoperative x-ray were taken in both AP and lateral view to classify the fractures. Wherever required, CT-scan carried out to know exact pattern of fracture.

Post-operative X-ray was done, static exercises were advised on the second day. The patient was allowed progressive walking with walker on 5th day of

operation. Regular follow up of the patient in OPD done with X-rays and functional outcome evaluated after 3 weeks, 6 weeks, 12 weeks and 24 weeks as per Ankle Hindfoot Scoring System (AOFAS Score) was done.

AOFAS score include three dimensions:

1. Pain – 0 to 40 points
2. Function-0 to 50 points
3. Alignment-0 to 10 points

All the data was tabulated and subjected to appropriate statistical analysis.

RESULTS

Among group A (interlock nailing), 6(40%) patients belonged to age group 21-30years, 5 (33%) belong to age group 31-40 years, 3 (20%) patient were in age group 41-50 years and 1 (7%) patient belonged to age group of 51-60 years. Similarly in group B, 3 (20%) patients belonged to age group 21-30 years, 7 (47%) patients belonged to age group 31-40 years, 4 (27%) patients were in the age group of 41-50 year and 1 (6%) patient belonged to age group of 51-60 years.

The mean age in group A was 45 years whereas in group B mean age was 49 years.

Among group A, 3(20%) patients were female and 12(80%) patients were found to be male. Similarly in group B, 3(20%) patients were female and 12 (80%) patients were male. So in male there was higher incidence of these injuries as they are indulged more in outdoor activities.

Among group A, 3 (20%) patients had fall and 12 (80%) patients had road side accident. Similarly among group B, 15(100%) patients had road side accident. Thus in majority of cases mode of injury was road side accident.

Among group A, 11 (73%) patients had closed fractures and 4 (27%) patients had open fractures. Similarly in group B, 12 (80%) had closed injuries and 3 (20%) patients were having open injuries.

Table 1: Distribution of subjects according to type of fracture – ao/ota classification

AO Classification	Group A		Group B		Total
	No. of Patients	%age	No. of Patients	%age	
43-A1	10	67%	4	27%	14(46.8%)
43-A2	2	13%	6	40%	8(26.6%)
43-A3	3	20%	5	33%	8(26.6%)
Total	15	100%	15	100%	30(100%)

Among group A, it was observed that 10 (67%) patients were having grade AO type 43 A1, 2 (13%) patients were 43 A2 and 3 (20%) patients were grade 43 A3 distal tibia fractures. Similarly in group B, 4 (27%) patients were having grade 43 A1, 6 (40%) patients were 43 A2 and 5 (33%) patients were grade 43 A3 distal tibia fractures.

Among group A, 8 (53%) patients were operated within 7 days, 5 (33%) patients were operated in 8 – 14 days, 1 (7%) patient was operated within 15-21 days and 1 (7%) patient was operated within 21-27

days..Among group B 8(53%) patients were operated within 1-7 days, 5(33%) patients were operated in 8-14 days, 2(14%) patients were operated with in 15-21 days.The mean of injury -surgery interval in group A was found to be 8.56 days whereas mean injury -surgery interval in group B was 6.89 days.

Associated fracture fibula was present in 13 patients in interlock nailing group and 15 patients in plating group.The mean time taken for surgery in group A was 46 minutes whereas in group B, it was 63 minutes.Among group A, mean hospital stay was

11.93 days whereas in group B, mean hospital stay was 1.20 days.

Out of total 30 patients, in group A partial weight bearing was started in mean duration of 10.27 days, Whereas in group B, partial weight bearing was started in 18.53 days which was significant.

Out of total 30 patients, in group A full weight bearing was started in mean duration of 2.87 weeks,

Whereas in group B, full weight bearing was started in 6.07 weeks which was significant. Among group A, 2 (13%) patient had ankle range of motion $<13^\circ$ and 13 (87%) had ankle range of motion $>30^\circ$. Among group B, 5 (33%) patient had ankle range of motion $<13^\circ$ and 10 (67%) had ankle range of motion $>30^\circ$. Among group A, time of bony union was 14.93 weeks and among group B time of bony union was 18 weeks.

Table 2: Distribution of patients according to aofas scoring system

AOFAS SCORE	Group A		Group B		Total
	No. of patients	%age	No. of patients	%age	
70-79	2	13.33	11	73.33	13(43%)
80-89	5	33.33	3	20.00	8(27%)
90-99	8	53.34	1	6.67	9(30%)
Total	15	100.00	15	100.00	30(100%)

Among group A, 2 (13.33%) patients had AOFAS score between 70 to 79, 5 (33.33%) patients had score 80 to 89 and 8 (53.34%) patients had score between 90 to 99. Among group B, 11 (73.33%) patients had AOFAS score 70 to 79, 3 (20%) patients had score 80 to 89 and 1 (6.67%) patient had 90 to 99.

DISCUSSION

In our study the mean age in group A was 45 years whereas in group B mean age was 49 years. It was observed that comminuted fractures of distal end tibia were common in young and middle age groups. In a comparative study of plating v/s nailing in distal tibialmetaphyseal fractures, mean age in interlocking group was 40 years as compared to 42 years in plating group.⁸In our study, out of total 30 cases 6 patients were female and 24 patients were male. So in male there was higher incidence of these injuries. In another study, out of total 30 patients, 27 (90%) were male and 3 (10%) were females.⁹

Similar to our study, the most common mode of injury in both the groups was road side accidents in study by.⁹In a randomized, prospective comparison of plate versus intramedullary nail fixation for distal tibia fractures, it is observed that 36 (34.61%) patients sustained injury in RTA, 38 (36.53%) patients sustained it in fall while 17 (16.34%) patients sustained crush injuries.¹⁰Hence distal tibia fracture most commonly occur after high energy trauma especially motor vehicular accidents in developing nation like India. As a result of high energy fracture soft tissue insult is also quite high and here lies importance of appropriate management of such fractures. In an osteoporotic bone, these fractures can result even after trivial injury.

In another comparative study there were 7 AO type 43 A1, 543 A2 and 343 A3 type fracture in interlocking group as compare to 7 AO type 43 A1, 343 A2 and 543 A3 type fracture in plating group, which was not significant.⁹In our study, similar ratios were observed between interlock nailing and plating group.

In our study, partial weight bearing was starting within 10-12 days in group A as compared to 15-21 days of partial weight bearing started in group B, which was significant. In another comparative study of partial weight bearing was started. In another comparative study average time required for partial

weight bearing was 7.6 weeks in nailing group as compared to 9.5 weeks in plating group.⁹ In another study time after which partial weight bearing and full weight bearing was started were significantly shorter in interlocking nail group.⁸

In our study, average time taken to start full weight bearing in group A was 2.87 weeks and average time taken to start full weight bearing in group B was 6 weeks which was highly significant. In another comparative study average time taken for full weight bearing in nailing group was 14 weeks as compared to 17 weeks in plating group ($p < 0.001$), which was significant.⁸In another comparative study average time taken for full weight bearing in nailing group was 13.6 weeks as compared to 15.8 weeks in plating group ($p < 0.001$), which was significant.¹¹

Among group A, 2 (13%) patient had ankle range of motion $<13^\circ$ and 13 (87%) had ankle range of motion $>30^\circ$. Among group B, 5 (33%) patient had ankle range of motion $<30^\circ$ and 10 (67%) had ankle range of motion $>30^\circ$. In our study ankle range of motion had good outcome in interlock nailing group as compared to plating group because of non compliance of patients. In another comparative study patient treated with intramedullary nailing have statistically better ankle range of motion.⁸

Among group A, time of bony union was 14.93 weeks and among group B time of bony union was 18 weeks ($p < 0.001$), it was highly significant. In another comparative study time of bony union in nailing group was 17 weeks and among plating group time of bony union was 21 weeks.⁹In another comparative study time of bony union in nailing group was 18 weeks and among plating group time of bony union was 19 weeks.¹¹

Among group A, 2 (13.33%) had fair AOFAS score, 5 (33.33%) patients had good and 8 (53.34%) patients had excellent. Among group B, 11 (73.33%) patients had fair, 3 (20%) had good and 1 (6.67%) had excellent results. In another comparative study

between 2005 and 2011, no statistically significant difference was found between the two surgical method w.r.t. AOFAS score.¹²

CONCLUSION

The results showed that both closed intramedullary nailing and plating can be used safely in distal 1/3rd fractures of tibia. Closed nailing has the advantage of shortened operating time, early weight bearing, decreased wound problems, early union of fractures, decreased implant related problem and over all reduced morbidity. For fractures of distal tibia and fibula the proportion of patients with mal-alignment was significantly greater without fixation of fibula after intramedullary nailing or locking plate fixation. Thus we recommend fibular fixation whenever intramedullary nailing or locking plate fixation is used in distal tibia fibula fractures. In brief, management of distal 1/3rd fracture of tibia as both intramedullary nailing and plating procedures were found to have merits and demerits, the choice of surgical procedure should be based on individual patient requirement, availability of equipments and expertise.

In the present study interlock nailing showed favorable outcome and hence it was concluded that interlock nailing is optimal method for treating distal 1/3 rd fractures of tibia as compared to distal tibial locking plating.

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