



A COMPARATIVE STUDY OF FUNCTIONAL OUT COME OF DISTAL TIBIAL FRACTURE MANAGED BY IM NAIL VERSUS PLATE FIXATION :

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ABSTRACT

INTRODUCTION: Distal tibia fractures have historically been treated with open reduction internal fixation. Due to the high rate of complications with this technique, alternative fixation strategies including plating and intramedullary nailing (IMN) have become common fixation methods to address this injury pattern.

AIM AND OBJECTIVE: To compare the functional and radiological results of locking plate versus shortened interlocking nail for treating extra-articular distal tibia fractures.

METHODOLOGY: This is a prospective study conducted at RMLIMS, LUCKNOW from 2019 to 2020. The study consisted of 40 patients distal tibia fracture with intramedullary nailing or locked plating with minimally invasive techniques. skeletally matured patients with extra articular distal tibial fractures AO Type 43A1, 43A2, 43A3, attending our OPD or emergency Department were randomly selected and allocated into two groups

RESULTS: 100% subjects from the plating group whereas 65% subjects from nailing group had full Range of movement. There is significant difference in time of union for both the group, for nailing it is 3.50 month with SD 0.54 month whereas for plating it was 5.86 with SD 2.11 month. There is significant difference between complications in the two group. In plating group 55% subjects had some sort of complications whereas 25% study subjects had complications in nailing group with P value 0.03.

CONCLUSION: Among these two modalities of treatment, intramedullary nail with multidirectional locking option giving excellent result in treating distal tibia fracture in view of the low complication rate, operating time, hospital stay, economic burden, early rehabilitation and fracture union.

KEYWORDS :

INTRODUCTION:

In modern era, with the advent of high speed vehicle, it has been observed that there has been a drastic increase in the road traffic accidents. Out of which, distal tibia fracture is common and it accounts for less than 7% among all tibia fractures, and <10% all lower extremity fractures. It is age and gender dependent, common in males in the age group of 30-50 years. The range of injury varies from low energy to high energy injuries.[1]

Due to the unprotected and subcutaneous location of tibia, these fractures are often associated with sever soft tissue damage and improper surgical intervention could lead to chronic osteomyelitis and useless limb. The first and conventional treatment option for close tibia fracture is plaster cast but the surgeon must be vigilant to see blisters and to note any impending compartment syndrome due to improper cast. Moreover prolonged immobilization in plaster cast leads to lower patient compliance for this option. The most frequently used surgical methods to treat closed tibia fractures are conventional dynamic plating, interlocking nailing, locking plates and anatomically contoured locking plating.[2]

Distal tibia fractures have historically been treated with open reduction internal fixation. Due to the high rate of complications with this technique, alternative fixation strategies including plating and intramedullary nailing (IMN) have become common fixation methods to address this injury pattern.[3]

The goal of the techniques is to apply stable fixation while maintaining the fracture biology and minimizing the soft tissue problems. Compared to conventional plates, locking plates impart a higher degree of stability and provides better protection against primary and secondary loss of reduction. Intramedullary nailing has the advantage of a shorter operating and radiation time and easier removal of the implant. But delayed union, malunion and secondary procedures were more frequent after nailing anterior knee pain is possible and malunions have been reported with distal tibial fractures[4].

The purpose of our study is to evaluate evidence on the superiority of PF over IMN fixation in the treatment of distal tibial fractures regarding functional outcomes and complication rates[5].

AIM:

1. To compare the functional and radiological results of locking plate versus shortened interlocking nail for treating extra-articular distal tibia fractures.
2. To study complication rates with different modalities of fixation.

Materials And Methods:

This is a prospective study conducted at RMLIMS, LUCKNOW from 2019 to 2020. The study consisted of 40 patients distal tibia fracture with intramedullary nailing or locked plating with minimally invasive techniques. skeletally matured patients with extra articular distal tibial fractures AO Type 43A1, 43A2, 43A3, attending our OPD or emergency Department were randomly selected and allocated into two groups: low multidirectional locked nail and Plate. Informed consent was obtained from each patient before participation in the study, after getting clearance from the ethical committee. After stabilization of the patient, the leg was immobilized in posterior splint till the surgery. Patients who presented within 6 h of injury without gross swelling of leg were operated on the same day or next day. Limbs with gross swelling were splinted and elevated till swelling subsided, and wrinkle sign. appeared over the ankle joint. Fractures associated with GA type-I open wounds were preliminary managed with swab for culture from the wound, iv antibiotics and no adhesive dressing and observed closely for any sign of infection

Radiographic Criteria		
Score per Cortex	Callus	Fracture Line
1	Absent	Visible
2	Present	Visible
3	Present	Invisible
A score is given to each cortex (anterior, posterior, medial and lateral) and the RUST score is the sum of all cortex scores.		

Inclusion Criteria:

The following criteria were included in the study:

- Skeletally mature patient.
- Age 20 - 60 years with closed fracture, unstable fractures of the distal tibia.
- Gustilo-Anderson Grade I compound distal tibial fractures.

- Fracture type: AO 43 - A1,A2,A3

Exclusion Criteria:

The following were excluded from the study:

- Irreducible fracture deformity.
- Pre existing co-morbid conditions eg. Diabetes/chronic smokers/DVT,mental illness
- Articular comminution was excluded from the study
- Compartment syndrome.
- Poor local skin conditions.
- Head injury

The eligible patients were randomly divided into two groups ,Group 1 includes patients managed with closed reduction and reamed nailing and

Group 2 includes patients treated with locked plating techniques either open reduction or minimally invasive method. The patients in both groups were matched for various confounding variables (age, sex, fracture types, comorbid condition, and associated fractures) and twenty Patients in each group were selected for final outcome study. Immediate post-operative complications like fat embolism, compartment syndrome, neurological damage and vascular injury is looked for. Intravenous antibiotic regimen was continued for 5-7 days after the surgery. Isometric quadriceps and knee and ankle exercise advised on day one. Partial weight bearing with the help of walker started on day two if fracture reduction was satisfactory. If fibula is fixed with plate non weight bearing was advised for one and half month, later weight bearing as tolerated advocated for next one and half months. Patient follow-up was done on 6th weeks, 3 months, and 6 months.

Modified O'leary's And Molander Score

Parameter	Degree	Score
Pain	None	25
	While walking on uneven surface	20
	While walking on surface outdoors	10
	While walking indoors constant and severe	5
Stiffness	None	10
	Stiffness	0
Swelling	None	10
	Only in evenings	5
	Constant	0
Stair climbing	No problems	10
	Impaired	5
	Impossible	0
Running	Possible	5
	Impossible	0
Jumping	Possible	5
	Impossible	0
Squatting	No Problems	5
	Impossible	0
Supports	None	10
	Taping, Wrapping	5
	Stick or Crutch	0
Work, Activities of daily life	Same as before injury	20
	Loss of Tempo	15
	Change to simpler job	15
	Severely impaired work capacity	0

RESULTS:

The present study was a randomized control trial to compare the functional outcome of tibial nail and distal tibial medial locking plate by MIPPO technique for the treatment of extra articular distal tibial fracture. 40 patients included in study and compared group1 (treated with interlock nailing) with group 2 (treated with distal tibia locked plate). fractures (articular comminution was excluded from the study).

Table 1 : Distribution Of Study Subjects As Per Age

Age group (In years)	Nailing		Plating	
	No of Patients (N)	Percentage (%)	No of patients (N)	Percentage (%)
20-30	5	25.00	2	10.00
31-40	7	35.00	6	30.00
41-50	8	40.00	8	40.00
>50	0	0	4	20.00
TOTAL	20	100	20	100

Table 1 shows distribution of study subjects as per age. 40% study subjects were in the age group 41-50 years in both the group, 35% were in the age group 31-40 year in nailing group whereas 30% were in the plating group. 20% subjects were in the plating group whereas none of them were in the nailing group.

Table 2: Sex Distribution Of The Study Subjects

Sex	Nailing		Plating	
	No of Patients (N)	Percentage (%)	No of Patients (N)	Percentage (%)
Male	12	60.00	15	75.00
Female	8	40.00	5	25.00
Total	20	100	20	100
RATIO	1.5: 1		3.: 1	

Table 2 shows sex Distribution of the study subjects. In nailing group the ratio is 1.5:1 whereas male female ratio is 3:1 in plating group.

Table 3: Distribution Of Study Subjects As Per Mode Of Injury

Mode of Injury	Nail		Plating	
	No of Patients (N)	Percentage (%)	No of Patients (N)	Percentage (%)
Road Traffic Accident	17	85.00	15	75.00
Fall From Height	3	15.00	2	10.00
Twisting of Ankle	0	0	3	15.00
Total	20	100	20	100

Table 3 shows Distribution of study subjects as per mode of Injury. In Majority of study subjects road traffic accidents is the mode of injury, 85% in nailing group whereas 75% in plating group. 15% (nailing) and 10%(plating) were due to fall from height.

Table 4 : Distribution Of Study Subjects As Per Range Of Movement Of Knee

ROM Knee	Nailing		Plating	
	No of Patients (N)	Percentage (%)	No of Patients (N)	Percentage (%)
Full	13	65.00	20	100
Near Normal	7	35.00	0	0
Total	20	100	20	100

Table 4 shows Distribution of study subjects as per Range of movement of knee. 100% subjects from the plating group whereas 65% subjects from nailing group had full Range of movement whereas 35% subjects from nailing group had near normal range of movement.

Table 5: Mean Time For Union In Both The Groups

Time for union (in months)	Nailing		Plating	
	Mean	SD	Mean	SD
	3.50	0.54	5.86	2.11
t-value	4.84			
p-value	< 0.001			
Significant	Significant			

Table 5 shows Mean Time for Union in both the groups. There is significant difference in time of union for both the group, for nailing it is 3.50 month with SD 0.54 month whereas for plating it was 5.86 with SD 2.11 month.

Table 6: Distribution Of Study Subjects As Per Complication

Complications	Nailing		Plating	
	No of Patients (N)	Percentage (%)	No of Patients (N)	Percentage (%)
Superficial infection	0	0	1	5.0
Malunion	3	15.00	3	15.00
Delayed union	2	10.00	4	20.00
Non union	0	0	1	5.0
Implant failure	0	0	1	5.0
Wound dehiscence	0	0	1	5.0
Total	5	25.00	11	55.00
p-value	0.03			
Significant	Significant			

Table 6 shows distribution of study subjects as per Complication. There is significant difference between complications in the two group. In plating group 55% subjects had some sort of complications whereas 25% study subjects had complications in nailing group with p value 0.03.



Fig 1:

DISCUSSION :

The treatment of a distal tibia fracture varies depending on the patient and the type of fracture. Recent advancements in intramedullary nail design have broadened the range of fractures that can be treated with this technique. In order to treat distal tibia fractures, a novel intramedullary nail with numerous locking multidirectional screws in the distal end of the nail was developed. This approach also improves

axial and lateral stability, reducing misalignment [6]. The changed design of the nail makes it preferable to traditional interlocking nails. Intramedullary Nailing allows for closed stabilisation while maintaining the soft-tissue integrity and vascularity of the fracture site. At this level, the Intramedullary canal precludes close contact between the nail and the endosteum [7], resulting in misalignment. The best way to treat these fractures is still up for debate. This is because to the severe soft tissue injuries and the distal tibia's tenuous blood supply. Because of its subcutaneous location, limited soft tissue, and poor vascularity, treating distal tibia fractures is difficult. With the latest innovation in plating technique known as "Minimally Invasive Percutaneous Plate Osteosynthesis" (MIPPO), iatrogenic soft tissue injury is reduced, bone vascularity is preserved, and osteogenic fracture hematoma is preserved. However, in other cases, such as significantly displaced fractures, this procedure is not viable, and we must open the fracture site with extensive soft tissue dissection, leading in dreaded plate-related complications such as surgical site infection, wound dehiscence, and delayed union. For treatment of these fractures, we used a low multidirectional locked nail and anterolateral or anteromedial locking compression plate in our study. The length and diameter of the multidirectional locked nailing varies from patient to patient, but for plating, the 3.5 mm locking compression plate is used for tibia fixation and the 1/3rd tubular plate or locking fibula plate is used to address fibula fracture.

Out of 20 cases of plating with a mean follow-up of 12 months, the superficial infection rate was 5 percent. Parenteral antibiotics were used to treat a superficial infection based on culture and sensitivity. The infection rates are similar to those seen in Barcak E et al study [8]. (3.6 percent). According to Daolagupu [9], There is significant difference in time of union for both the group, for nailing it was 3.50 month with SD 0.54 month, whereas for plating it was 5.86 month with SD 2.11 month, our findings are similar to those of FAN CY et al (10) and Mohammed et al (11).

In our comparison investigation, the majority of the patients had full range of motion, which is comparable to Paraschous S et al study [12]. 100% subjects from plating group and 65% subjects from nailing group had full range of movement, whereas 35% subjects from nailing group had near full range of movement. These findings are analogous to those of Shon OJ et al. [13]. As a result, the patients in our study had a satisfactory overall functional outcome.

There is significant difference between complications in the two group. In plating group 55% study subjects had some sort of complications whereas 25% study subjects had complications in nailing group with p value 0.03.

The nail group showed early union compared to the plate group in our comparative analysis, as shown by a significant p value. Low multidirectional intramedullary nails are now recommended because they have low lying distal screws, protect the periosteal blood supply, have a low rate of infection, cause minimal soft tissue dissection, and allow for early fracture healing and rehabilitation.

CONCLUSION

Among these two modalities of treatment, intramedullary nail with multidirectional locking option giving excellent result in treating distal tibia fracture in view of the low complication rate, operating time, hospital stay, economic burden, early rehabilitation and fracture union.

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