

Comparison of Closed Intramedullary Nailing and Percutaneous Plating in Distal Tibia Metaphyseal Fractures

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ABSTRACT

Objective: To compare the closed intramedullary nailing and percutaneous plating in distal tibial metaphyseal fractures.

Study Design: Retrospective study

Place and Duration of Study: Department of Orthopaedics, Sialkot Medical College, Sialkot from 1st July 2019 to 31st December 2021.

Methodology: One hundred patients who were suffering from distal metaphyseal fractures of the tibia bone were enrolled. Group A patients underwent closed intramedullary nails while group B were those who were treated through percutaneous plating. Prophylactic antibiotics were given to all enrolled patients until 24 hours' completion of the surgery. Follow-up of the wound was done from day fifth of the surgery and removal of sutures was performed by 15th day of surgery. Patients were followed up for one and a half year for their AOFAS scoring.

Results: There were 58.3% males in Group A presenting a majority while in Group B females were having a majority with 47.5%. There were more left side fractures such as 53% and treated with closed intramedullary nails than through percutaneous plating. There was not a significant difference in the pain, function or alignment in both groups. There were 87% patients in group A which requested implant removal after 15.5 months while 92% of patients from Group B demanded the same.

Conclusion: Intramedullary nailing is slightly superior that have reduced post-operative wound complications as compared to plate fixation.

Keywords: Nailing, Plating, Fractures, Surgical procedures

INTRODUCTION

Distal tibia fractures are comparatively rare with annual incidence of fracture is 9.1%. These can be occurred in both trauma situation; low and high energy trauma though simple falls can be the most common cause of injury.¹ Distal tibia fractures can only be treated surgically but sometime it can vary according to the situation of the person and underlying health condition.²⁻⁴ Suitable surgical method for distal tibia fracture fixation is still controversial. Operative method is used for bone fixation and both minimally invasive plate osteosynthesis and closed interlocking intramedullary nailing are two important techniques that are widely used for fixation.⁵⁻⁸

Exact definition of distal tibia fracture as defined by Association for the Study of Internal Fixation (ASIF) is the fracture within Muller square which is the area that surrounds the extensive portion of tibial plafond [9,10]. Common surgical method used for the treatment of distal tibia fractures are plate fixation (PF) and intramedullary nailing (IMN). Plate fixation involves slightly invasive procedure whereas, in IMN is less invasive but have extra advantage of small incision in skin, preservation of blood supply and minimal soft-tissue trauma.⁹ On the other hand, plate fixation is performed via open reduction and internal fixation (ORIF) or minimally-invasive percutaneous osteosynthesis (MIPO). It can lead to early mobilization and stable fixation however, knee pain can occur.¹⁰⁻¹³ On the other hand, ORIF involves few risks including longer time than usual for weight bearing and higher chances of severity of wound complication. Invasive percutaneous osteosynthesis is better and cause minimal damage thus lesser chances of wound complications.^{14,15}

Present study was designed for the comparative analysis of nailing and plating procedure for distal tibia fractures. Comparison was made on the basis of wound complications and functional outcomes.

MATERIALS AND METHODS

This retrospective study was conducted at Department of Orthopaedics, Sialkot Medical College, Sialkot from 1st July 2019 to 31st December 2021 and 100 patients were enrolled. The

patients who were suffering from distal metaphyseal fractures of the tibia bone were included. Patients suffering from pathological fractures, osteopathies which were non-osteoporotic, diabetes mellitus, renal or endocrinal disorders were excluded. Open fracture cases or with displaced intra-articular fragments were also placed in exclusion criteria. Fracture classification was followed in accordance with orthopedic traumatic-association. Patients having a distal fragment length of 3 cm having absence of articular-incongruity corresponding to OTA classification as 43-A type fracture were enrolled post their informed consent. Operation was done on injury day in majority of the cases. Patients were divided into two groups. Group A patients underwent closed intramedullary nails while group B were those who were treated through percutaneous plating. In cases of Group A, the reduction was carried out through standard protocol. In case of Group B an external frame was used for traction of the fracture through centrally threaded-pins which were in the calcis and used for reduction and stabilization of the fracture. Ball tip guide inside tibia metaphysis was inserted post confirmation of the reduction accuracy. Reaming was conducted to the 1-1.5mm levels greater than nail diameter. Prophylactic antibiotics were given to all enrolled patients until 24 hours' completion of the surgery. Follow-up of the wound was done from day fifth of the surgery and removal of sutures was performed by 15th day of surgery. Wound infection was considered positive in case of continuous drainage for two consecutive days or in cases where wound edges separated up to 1cm width and greater than 1 cm length. Information regarding surgery duration, demographic details and choice of the opted surgery were documented on a well-organized questionnaire. Ankle was kept immobilized for three weeks' post-surgery. Patients were followed up for one and a half year for their AOFAS scoring. Data was analyzed by SPSS where Chi square and fisher's exact test was used for the analysis and had a significance in case where p value was less than 0.05.

RESULTS

There were 58.3% males in Group A presenting a majority while in Group B females were having a majority with 47.5% than 41.6%

males respectively. There were more left side fractures such as 53% and treated with closed intramedullary nails than through percutaneous plating. The 43-A3 fractures were presented highest among all fracture classification types (Table 1).

The mean operating time of group B was higher than group A with higher chance of wound infection in group B. There was not a significant difference in the pain, function or alignment in both groups. However, the one-year scoring showed higher AOFAS core in group A than Group B (Table 2)

There were 87% patients in group A which requested implant removal after 15.5 months while 92% of patients from Group B demanded the same. The reason behind removal was discomfort or pain. Removal of implant in group A patients was performed without any inconvenience; however, some difficulties were faced while removing implant in group B due to the strip off of the hexagonal recess (Fig. 1).

Table 1: Clinical characteristics of group A and group B patients and operative choice (n=100)

Clinical characteristic	Group A	Group B
Gender		
Female (n=40)	21 (52.5%)	19(47.5%)
Male (n=60)	35 (58.35)	25(41.65)
Mean age (years)	45.1±2.5	44.6±4.3
Fracture on left side	27 (50.94%)	26(49.06)
Fracture on right side	24 (51.06%)	23 (48.93)
Fracture type		
43-A1 (n=30)	15 (50%)	15 (50%)
43-A2 (n=32)	17 (53.1%)	15 (46.87%)
43-A3 (n=38)	17 (44.7%)	20 (52.63%)

Table 2: Comparison of pre and post-operative parameters within group A and B

Variable	Group A	Group B	p-value
Mean operating time (minutes) 95% CI	81.22 (77.69-84.74)	98.1 (94.75-100.97)	0.001
Mean union time (weeks) 95% CI	17.8 (16.6-18.7)	17.6 (16.8-18.5)	0.54
Wound infection	3 (6%)	6 (12%)	0.002
One-year scoring 95% CI	86.2 (83.8-88.7)	84.1 (81.8-86.3)	0.56
Pain Scoring	32.6	31.6	0.35
Function Scoring	44.5	43.3	0.38
Alignment Scoring	9.4	9.4	0.66

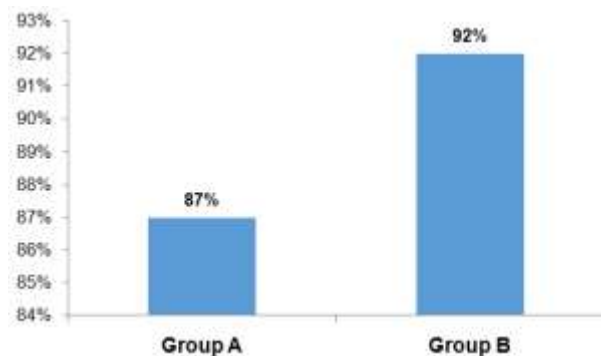


Fig. 1: Frequency of implant removed in group A and B within 15.5 months

DISCUSSION

Distal tibia fractures are although very rare but involve extremely excruciating pain while surgery and cause problem for weight bearing if not properly cured. Open reduction and internal fixation (ORIF) involves extensive dissection that is not suitable for malunion and increased chances of infections. Less invasive method should be used for faster healing and proper bone fixation. MIPO is less invasive with small skin incision and bone can be fixed with head locking screws. IMN is also less invasive that allows small tissue dissection.¹⁶⁻¹⁸ Present study was designed for the comparison of nailing and plating technique efficacy for distal tibia fractures.

Patients of IMN group showed that, relatively shorter length of operation also took shorter time for partial or full weight bearing after surgery. Lesser infections were involved in this technique and fewer post-operative complications was found. On the other hand, patients of group B also demonstrated more or less similar results. PF group showed less blood loss and less knee pain after surgery. Statistically less difference was observed in both of the study groups.

Both treatment plans are suitable for distal tibia fractures. However, IMN is more suitable in high risk patients as it involves fewer complications during and after surgery. Whereas, in patients that already have soft tissue complication then avoidance of knee pain after surgery is more important. More extensive research is required for finding fractures related factor that will prove useful for problem identification and complications involvement.^{19,20}

CONCLUSION

Intramedullary nailing is slightly superior that have reduced post-operative wound complications as compared to plate fixation.

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