Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15352
DOI URL: http://dx.doi.org/10.21474/IJAR01/15352

RESEARCH ARTICLE

COMPARATIVE VARIATION OF RESULTS IN MANAGEMENT OF EXTRAARTICULAR DISTAL TIBIAL FRACTURES BY INTRAMEDULLARY NAILING VS MINIMAL INVASIVE PLATE OSTEOSYNTHESIS

Dr. Gaurav Banoria
Assistant Professor, Department of Orthopaedics, Governement Medical College, Orai, Jalaun.

Manuscript Info

Manuscript History
Received: 10 July 2022
Final Accepted: 14 August 2022
Published: September 2022

Key words:-
Distal Tibial Fracture, Intramedullary Nail, Plate

Abstract

Background: Distal metadiaphysealtibial fractures are commonly seen lower limb fractures. Intramedullary nail fixation (IMN) and Minimal invasive plate Osteosynthesis (MIPO) are the two mainstay treatments for tibial fractures, but agreement on the best internal fxation for distal tibial fractures is still controversial. This meta-analysis was designed to compare the success of IMN and MIPO fxations in the treatment of distal metadiaphysealtibial fractures, in terms of complications and functional recovery

Aims: To evaluate the results of management of distal tibial fractures by Intramedullary nail and minimal invasive plate osteosynthesis

Methods: The present study will be conducted on patients attending Emergency and outpatient department of Orthopaedics, GovernmentMedical College, OrailJalaun, UttarPradseh for the period of January 2019 to July 2021. A minimum of 30 cases will be taken in the study those who are fracture distal tibia.

Result: In my thesis, we take total 60 patient which divided into two group of 30-30 patients. Group One for In Minimal invasive plate Osteosynthesis (MIPO) and Group Two for Intramedullary nail. Only signifcant difference seen in my study in length of incision in nailing length of incision is less as compare to plating group

Conclusion: The study of management of distal tibia fracture by MIPO and IMN. I found that no significant difference in final result. In MIPO group only 2 patient have superficial infection and IMN group only 1 patient has superficial infection that means the rate of infection more in plating as compare to nailing.

Introduction:-

Extraarticular distal tibial fractures are common in practice and are usually caused by road traffic accidents or other high-energy injuries. Fracture of the distal 1/3rd of the tibia, 4cms-11cms proximal to distal tibial plafond are called distal tibial fractures. These fractures differ from pilon fractures in terms of the mechanism of injury, management, and prognosis of the displaced bones. The proximity of these fractures to the ankle joint leads to more complications than are seen with diaphyseal or middle-third injuries. Thus, the treatment of distal tibial fractures remains problematic.

Corresponding Author:- Dr. Gaurav Banoria
Address:- Assistant Professor, Department of Orthopaedics, Governement Medical College, Orai, Jalaun.

Intramedullary (IM) nailing and plating are the two popular options for the treatment of distal tibial fractures. Each of these techniques has their own merits and demerits. IMIL nailing has been reported with higher rate of malunion because, marrow in distal tibia is roomy and is difficult to achieve stable fixation even by two distal locking screw. Wound infection, skin breakdown and delayed union or non union requiring secondary procedures like bone grafting are some of the complications encountered in these injuries.

Recently, technique of closed reduction and minimally invasive plate osteosynthesis (WPM with locking compression plate RCP) has emerged as an alternative treatment option for distal tibia fracture[1].

Indications of IM nailing are fractures in elderly people with thin parchment like skin or compromised soft tissue, patients with high risk of non-healing wound, and fractures with reduced distal bone mass allowing minimal purchase through two/three locking screws. Plating is indicated for fractures with risk of malalignment and both the procedure have their own advantages and disadvantages[2]. IM nailing frequently results in malunion, and knee pain. Tibia plating can achieve anatomic reduction, but it is associated with the higher risk of wound dehiscence and infection because of the minimal soft tissue cover over the anteromedialtibia[3].

Several previous randomized controlled trials (RCTs)[2,4,6-8] have reported the outcomes of nailing versus plating treatment modalities. The limitations of observational studies were overcome in these RCTs by decreasing the bias through randomization. However, all of the RCTs had low numbers of patients. In 2013, Xueal[9]. performed a meta-analysis and systematic review comparing nailing versus plating for the treatment of distal tibialmetaphyseal fracture. Higher functional score and lower risk of infection were found in the nailing group. However, different categories of functional score were compounded, and no subgroup analysis was made as both RCT and retrospective studies were included. In 2014, a meta-analysis made by Kwok et al[9] indicated that there was no significant difference between the use of a plate/nail regarding superficial infection and deep infection, but only four RCTs and four retrospective studies were included. Recently, some additional studies were reported[10-12], which will make the evidence more precise and reliable. As no consensus has been reached regarding the management of these fractures, the optimal treatment option for extra-articular distal tibia fractures remains controversial.

Aims And Objectives:-

1. To review the literature.
2. To evaluate the results of management of distal tibial fractures by Intramedullary nail.
3. To evaluate the results of management of distal tibial fractures by Minimal invasive plate osteosynthesis.
4. To compare the results of these two procedures in management of extraarticular distal tibial fractures.

Material And Methods:-

The present study will be conducted on patients attending Emergency and outpatient department of Orthopaedics, Government Medial College,Orai, Jalaun, Uttar Pradesh for the period of January 2019 to July 2021. A minimum of 30 cases will be taken in the study those who are fracture distal tibia.

Inclusion criteria:

1. Age more than 18 years and less than 60 years both male and females.
2. AO classification –Distal Tibial fractures type 43A with intact fibula.

Exclusion criteria:

1. Polytrauma patients
2. Associated ipsilateral limb injury.
3. Associated neuro vascular injury
4. Gustillo Anderson Type-III B & C open fractures

A detail history of patient regarding, Age, sex, Mode of injury, Duration, Associated injuries, Past history, Clinical examination and radiological examination will be noted in proforma. Management will be done according to grading of fracture.

Patients will be randomly divided into two groups: Group A & group B.
Group A: Patient will treated CRIF by internal fixation by using MIPO technique.

Group B: Patient will be treated by CRIF by using tiplock tibia interlocking nailing.

The clinical data will be recorded in the predesigned proforma attached and results will be evaluated and compared.

Clinical and radiological evaluation using modified Klemn and borner scoring system (1986) at 6 weeks, 3 months, 6 months, 1 year, and 2 years.

Final score	R.O.M of ankle	Muscle atrophy (calf muscle)	Alignment	Pain (at fracture site)	Union (in week)
Excellent	4	3	4	4	4
Good	3	2	3	3	3
Fair	2	1	2	2	2
Poor	1	0	1	1	1

R.O.M. ankle

- No restriction
  - <25% 4
  - 25-50% 3
  - 50-75% 2
- Muscle atrophy (calf) 1
  - No atrophy 3
  - <2 cm 2
  - 2-3 cm 1
  - >3 cm 0
- Alignment
  - Normal 4
  - Angular deformity 3
  - 5-10^0 2
  - <10^0 1
- Pain (at the fracture site)
  - Absent 4
  - On prolonged 3
  - On weight bearing 2
  - At rest 1
- Union (weeks)
  - <12 4
  - 13-34 3
  - 25-36 2
  - >36 1

The final evaluation criteria as laid by Modified Klemn and Borner scoring system (1986) used for clinical assessment for return to work and infection were defined as given below.

Return to work:
Six months was chosen as the point at which the patient making an uncomplicated recovery would be expected to return to their normal daily activities.

Infection:
Infection was defined as superficial if does not require any secondary procedures and settles with oral antibiotics for 5 days upto 2 weeks. Defined as deep if requires any secondary procedures like debridement or screw removal and not settling with antibiotics for more than two weeks.

Result:-

Table 1:- Age distribution in study group.

Age (in years)	Group I (MIPO)		Group II (IMN)	
	Number of patients	Percentage	Number of patients	Percentage
20-40	20	66.67%	22	73.33%
41-60	10	33.33%	08	26.66%

Table 3:- Sex distribution in study group.

Sex	Group I (MIPO)		Group II (IMN)	
	Number of patients	Percentage	Number of patients	Percentage
Male	19	63.33%	20	66.67%
Female	11	36.67%	10	33.33%

Table 4:- Fracture site (right/ left) distribution in study group.

Fracture site	Group I (MIPO)		Group II (IMN)	
	Number of patients	Percentage	Number of patients	Percentage
Right	16	53.33%	17	56.67%
Left	14	46.66%	13	43.33%

Table 5:- Mean duration of operation (min) distribution in study group.

	Group I (MIPO)	Group II (IMN)	P value
Mean Age (in years)	37.87±10.371	36.80±9.732	0.6818
Mean fracture and plafond (cm)	5.73±1.015	6.47±0.507	0.0007
Mea duration of operation (min)	37.88±12.435	45.00±13.455	0.6990
Mean blood loss (ML)	107.33±33.651	118±25.200	0.1698
Mean length of incision (CM)	6.0±0.743	5.2±0.568	0.0001
Mean hospital stay (days)	8.63+1.245	8.73+1.311	0.9561
Range of motion (Rating)	3.12±0.681	3.40±0.675	0.1152
Muscle atrophy (Rating)	2.13±0.681	2.40±0.675	0.1284
Alignment (Rating)	3.13±0.681	3.40±0.675	0.1284
Pain (Rating)	3.13±0.681	3.40±0.675	0.1284
Union (Rating)	3.13±0.681	3.40±0.675	0.1284

Discussion:-

In my thesis, we take total 60 patient which divided into two group of 30-30 patients. One group for MIPO and one group for IMN.

I compare the results of both MIPO and IMN group in following parameters.

Age:

In both group the patient divided into two age group, 20 to 40 years and 41 to 60 years. IN MIPO between 20-40 years age group. Total 20 patient present and between 41 to 60 year age group 10 patient present (percentage 66.67% and 33.33% respectively). IN IMN 22 patient are between 20 to 40 year of age group (73.33%) and 8 patient between 41 to 60 years age group (26.66%). after comparison of both group in term of mean age distribution with standard deviation MIPO group have 37.87±10.37 years and IMN group have 36.80±9.732 year with p value is 0.6818 and there is no significant difference in mean age distribution. In our study mean year of age match with AtillaPola et al[13] (2015) with mean year of age 36.4±10.7 for MIPO and 34.0±9.7 for IMN.

Sex:
MIPO group have 19 male (63.33%) and 11 females (36.67%) and IMN group have 20 male (66.67%) and 10 females (33.33%)>

Fracture Side:
MIPO group 16 patient with right side fracture (53.33%) and 14 patient with left side fracture (46.66%). IMN group have 17 patient with right side fracture (56.67%) and 13 patient with left side fracture (43.33%).

Fracture and plafond distance (in cm):
Mean fracture and plafond distance in MIPO group is 5.73±1.015cm and in IMN group is 6.47±0.507 with p value is 0.0007 and there is no significant difference in mean fracture and plafond distance distribution. In our study mean distance (cm) match with AtillaPola et al[13] (2015) with mean year of age 8.0±2.2 for MIPO and 8.7±1.7 for IMN.

Duration of Operation (IN DAYS):
MIPO group have mean duration of operation with standard deviation is 37.88±12.435 min IMN group have mean duration of operation with standard deviation is 45.00±13.455 and p value is 0.6990 and there is no significance in mean duration of operation.

Blood Loss (in ml):
MIPO group have mean blood loss distribution with standard deviation is 107.33±33.651. IMN group have mean blood loss distribution with standard deviation is 118±25.200 and have p value 0.1698 there is no significance in mean blood loss distribution.

Length of Incision (in cm):
MIPO group have mean length of incision distribution with standard deviation is 6.0±0.743. IMN group have mean length of incision distribution with standard division is 5.2±0.568 and p value is 0.0001 there is significance in difference in mean length of incision distribution. That means in our study length of incision in MIPO is more than as compared with length of incision in IMN group.

Hospital Stay (in days):
MIPO group have mean hospital stay distribution with standard deviation is 8.63±1.246 day IMN group have mean hospital stay distribution with standard deviation is 8.73±1.311 and p value is 0.9561 there is no significant difference in mean Hospital stay.

Final Outcome:
Comparison of final outcome of MIPO and IMN Is on the basis of Klemn and Borner scoring system. Mean rating of range of motion of MIPO group has 2.12±0.681 and mean rating of range of motion of IMN group in 3.40±0.675 with p value 0.1152 there is no significant difference. Mean rating of muscle atrophy in MIPO group is 2.13±0.681 and mean rating of muscle atrophy in IMN group is 2.40±0.675 with p value 0.1284. there is no significant difference. Mean rating of aliment in MIPO group is 3.13±0.681 and mean rating of IMN group is 3.40±0.675 with p value 0.1284 there is no significant difference.Mean rating of pain in MIPO group is 3.13±0.681 and mean rating of pain in IMN group is 3.40±0.675 with p value 0.1284 and there is no significant difference.Mean rating of union in MIPO group is 3.13±0.681 and mean rating of union in IMN group is 3.40±0.675 with p value 0.1284 and there is no significant difference. In our study no patient undergoes in non union and my study match with Guo et al[6] reported no patient with non union in their series. In our study all patient of MIPO and IMN group in the category of good to excitant final score on the basis of Klemn and Borner scoring system and this study match with Im GI et al[14].

Infection:
Only two patient in MIPO group have superficial infection after suture removal due to unhygienic of patient and this infection treated successfully by antibiotic. No secondary intervention done, only one patient in IMN group undergoes for superficial infection after 7 days of operation which is managed by antibiotic only and no secondary intervention done for control the infection. In our study in the respect of Age, Sex, Fracture site, Distance of fracture and playfond, mean duration of operation, mean blood loss and mean hospital stay have no significant difference in MIPO group versus IMN group. The only significant difference seen in length of incision which is more in MIPO than IMN group.

Conclusion:-

1. The study of management of distal tibia fracture by MIPO and IMN. I found that no significant difference in final result. In MIPO group only 2 patient have superficial infection and IMN group only 1 patient has superficial infection that means the rate of infection more in plating as compare to nailing.
2. In IMN the only 2 patient undergoes in malunion and in MIPO group no patient undergoes in malunion that mean malunion is more in nailing as compare with plating.
3. Only significant difference seen in my study in length of incision in nailing length of incision is less as compare to plating group.
4. Range of motion is good to excellent in both group.

References:-

1. Shrestha D, Acharya BM, Shrestha PM. Minimally invasive plate osteosynthesis with locking compression plate for distal diametaphyseal tibia fracture. Kathmandu Univ Med J (KUMJ). 2011 Apr-Jun;9(34):62-8. PubMed PMID: 22610872.
2. Richard RD, Kubiak E, Horwitz DS. Techniques for the surgical treatment of distal tibia fractures. OrthopClin North Am. 2014;45:295–312. doi: 10.1016/j.ocl.2014.04.001.
3. Newman SD, Mauffrey CP, Krikler S. Distal metadiaphysealtibial fractures. Injury. 2011;42:975–84. doi: 10.1016/j.injury.2010.02.019.
4. Im GI, Tae SK. Distal metaphyseal fractures of tibia: a prospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screws fixation. J Trauma. 2005;59(5):1219–23. doi: 10.1097/01.ta.0000188936.79798.4e.
5. Mauffrey C, McGuinness K, Parsons N, Achten J, Costa ML. A randomised pilot trial of "locking plate" fixation versus intramedullary nailing for extra-articular fractures of the distal tibia. J Bone Joint Surg (Br) 2012;94:704–8. doi: 10.1302/0301-620X.94B5.28498.
6. Guo JJ, Tang N, Yang HL, Tang TS. A prospective, randomised trial comparing closed intramedullary nailing with percutaneous plating in the treatment of distal metaphyseal fractures of the tibia. J Bone Joint Surg (Br) 2010;92:984–8. doi: 10.1302/0301-620X.92B7.22959.
7. Vallier HA, Cureton BA, Patterson BM. Randomized, prospective comparison of plate versus intramedullary nail fixation for distal tibia shaft fractures. J Orthop Trauma. 2011;25:736–41. doi: 10.1097/BOT.0b013e318213f709.
8. allier HA, Cureton BA, Patterson BM. Factors influencing functional outcomes after distal tibia shaft fractures. J Orthop Trauma. 2012;26:178–83. doi: 10.1097/BOT.0b013e31823924df.
9. Xue XH, Yan SG, Cai XZ, Shi MM, Lin T. Intramedullary nailing versus plating for extra-articular distal tibialmetaphyseal fracture: a systematic review and meta-analysis. Injury. 2014;45:667–76. doi: 10.1016/j.injury.2013.10.024.
10. Yavuz U, Sokucu S, Demir B, Yildirim T, Ozcan C, et al. Comparison of intramedullary nail and plate fixation in distal tibia diaphyseal fractures close to the mortise. UlusTravmaAcilCerrahiDerg.
11. Huang JJ. A comparative study between interlocking intramedullary nail and percutaneous plate fixation for distal tibial fractures. Guangxi Med J. 2008;30:1355–7.
12. Ni XY, Liu F, Shao YW, Zhang H, Gao WR. Comparison of intramedullary and extramedullary fixation for distal tibial fracture. ActaUniversitatisMedicinalisNanjing(Natural Science). 2010;30:538-542.
13. AtillaPolat.Intramedullary nailing versus minimally invasive plate osteosynthesis for distal extra-articular tibial fractures: a prospective randomized clinical trial.Article in Journal of Orthopaedic Science · March 2015
14. Im GI, Tae SK. Distal metaphyseal fractures of tibia: a prospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screws fixation. J Trauma. 2005;59(5):1219–23.