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RESEARCH ARTICLE

MANAGEMENT OF DISTAL THIRD FRACTURES OF TIBIA BY PLATING OR INTERLOCKING NAILING: A COMPARATIVE STUDY

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ABSTRACT

Fractures of distal 1/3rd of tibia have become very common due to increase in road traffic accidents. Various methods of treatment are in practice with varying results and complications. Aim of this study was to evaluate the results of inter locking nailing and plating as treatment methods for closed fracture distal one third tibia and to compare the advantages and disadvantages of inter locking nailing(ILN) versus plating in these two groups of patients. 24 adult patients with closed fracture of distal one third tibia without intra articular extension were included in this study. They were divided in to two groups of 12 each. One group was subjected to ILN and the other group to plating procedure. Open reduction was done in 9 patients and 3 were fixed by minimally invasive percutaneous plate osteosynthesis (MIPPO) technique. The follow up period ranged from 6 weeks to 1 yr. Johner and Wruch's criteria was used for evaluation and comparison. Results were excellent in 66.6% and 41.6%, Good in 25% and 33.3%, fair in 8.3% and 16.6% of ILN and plating groups respectively and 8.3% showed poor results in plating group. This study concludes that closed ILN was an appropriate method when compared to plating as it showed optimal results and less complications in management of fracture distal one third of tibia.

INTRODUCTION

Fractures of the distal tibia accounts for less than 10% of all fractures of lower extremities and occur more frequently in men than women aged between 35-40 years (Court-Brown CM *et al*, 1995). The management of distal tibial fractures remained challenging in orthopaedic traumatology. By virtue of its location and subcutaneous position in the leg, tibia is exposed to risk of injury and open fractures. High energy trauma and poor blood supply at lower one third shaft of tibia pose difficulties in bringing out optimal results. Various treatment methods are in practice including non-operative treatment (Sarmiento A *et al*, 1989 and Dehne E *et al* 1961), external fixation (Bone L *et al* 1993 and Bonar SK *et al* 1993), ILN and plate osteosynthesis. Open reduction and internal fixation was popular in the 1970s, following favorable results reported by Ruedi and Allgower in 1969(Ruedi *et al* 1979).

Bourne *et al*. in 1983(Bourne RB *et al* 1989) and Teeny et al. in 1990 (Teeny S *et al* 1990) reported high rates of tibia ILN (Wu CC *et al* 1993) or plating by MIPPO (Mast J *et al* 1989 and Bahari S *et al* 2007) as standard procedures of choice. Type of implant and fixation methods was selected based on the patient requirements. Extensive soft tissue dissection during surgical procedures further compromises blood supply, leading to increased post operative complications. Current literature suggests closed ILN as a safe and effective method in managing these fractures (Edinburgh Royal Infirmary 1995).

MATERIALS AND METHODS

This study was conducted in the department of Orthopaedics S.V.R.R. Government General Hospital, a tertiary referral hospital attached to Sri Venkateswara Medical College, Tirupati. Pre informed written consent was obtained from all the patients included in this study.

Inclusion criteria: Fracture within 8 cm from tibial plafond, closed extra articular fractures and age ≥ 20 years.

Exclusion criteria: compound fractures, segmental fractures, fracture extension into plafond and associated complications.
Among those patients satisfying selection criteria, 24 patients were selected randomly and divided in to two groups of 12 each. One group was subjected to plating and the other group to ILN procedure. The data was recorded in a proforma as per association of osteosynthesis (AO) guidelines. After quick and appropriate pre-operative workup, surgeries were done electively under SA / EA and tourniquet control in dedicated orthopedic operation theaters with C - arm image intensifier facilities. AO type of ILN and plates of dynamic compression plate (DCP), limited contact plate (LCP) were used. ILN procedures were done through vertical patellar tendon splitting

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approach. Position of the nail and accuracy of reduction was verified in 90/90 position in AP view and figure of '4' position for lateral views. Placement of proximal inter locking bolts were applied in figure of 4 position and two distal interlocking screws with limb in straight position. Plating was done as open procedures in 9 patients and by MIPPO method in 3 patients. Medial approach was adopted for plating. DCP or AO LCP devices were selected based on individual requirements. Closure of wounds was done over suction drain. Intra venous antibiotics were given for 5 days postoperatively. Immediate postoperative radiographs were evaluated for accuracy of reduction and position of implants. Active range of movements of knee and ankle joint along with quadriceps strengthening exercises were started on the next day of surgery. Oral antibiotics and supportive medication continued till suture removal. Non weight-bearing gait was started after subsidence of postoperative pain. Follow up of patients was done at 6 weeks intervals for one year. Partial weight bearing was allowed from 6 weeks post operatively and full weight bearing only after considerable callus in radiographs. Evaluation of results was done according to Johner and wruch's criteria (Johner R *et al* 1983).

RESULTS

Observations made in this study were as shown in table-1.

Table 1 Clinical detail of patients with fracture distal third tibia

Sno	Clinical details	Plating(n=12)	ILN (n=12)	Total (n=24)
1	Age in years • Average • Range	46.6 24-70	46.6 24-70	
2	Sex • Male • Female	8 4	8 4	16 08
3	Mode of injury • Road traffic accident • Fall from height	10 2	11 1	21 3
4	Type of fracture (MullerAO) • A1 • A2 • A3	7 3 2	6 3 3	13 6 5

There was male predominance with average age group of 46.6 years and most common cause being road traffic accident (RTA) in both the groups (Table-1).

Table 2 Average postoperative time for full weight-bearing and Radiological union

SnoS	Parameter	Average Post operative period (in weeks)	
		Plating	ILN
1	Full weight-bearing	15.8	13.6
2	Radiological union	19.0	18.3

Table3 Postoperative Complications

Sno	Complications	Plating (n=12)	Percentage%	ILN (n=12)	Percentage %
1	Wound infection	2	16.66	Nil	Nil
2	Delayed union	4	33.3	1	8.3
3	Malunion	1	8.3	3	25.0

Average postoperative time for full weight-bearing and Radiological union (Table - 2) was slightly more in plating group than ILN group. Most of the fractures were united within 19 weeks in both the groups. Union of fracture was considered when presence of bridging callus in two planes and absence of pain and movement at fracture site

Postoperative complications like wound infection and delayed union was more in plating than in ILN groups, whereas malunion was a little higher in ILN group (table-3).The final outcome of results are shown in table-4.

Table4 Overall Results

Sno	Overall Results	Plating (n=12)	Percentage %	ILN (n=12)	Percentage %
1	Excellent	5	41.66	8	66.66
2	Good	4	33.33	3	25
3	Fair	2	16.66	1	8.33
4	Poor	1	8.33	0	0

DISCUSSION

This study was intended to evaluate the results of plating versus ILN as treatment modalities for distal 1/3rd fractures of tibia. Analysis and results were compared with other studies (Siddhartha *et al* 2014, Aso Mohammed *et al* 2008, Janssen *et al* 2007, Vallier *et al* 2008, Im GI *et al* 2005 and Guo JJ *et al* 2010).

This study showed a male predominance in the third and fourth decade of life with RTA as the most common cause for fracture (Table-5).

Table 5 Clinical details of present study and other supportive studies

Sno	Clinical details	Present study	Siddhartha *et al*	Aso Mohammed *et al*
1	Age in Yrs • Average • Range	46.6 24-70	36 20-56	42 15-80
2	Sex •Male •Female	66.6% 33.3%	70% 30%	80% 20%
3	RTA	87%	83%	64%

Postoperative complications such as wound infection, delayed union and mal-union observed in this study coincided to a certain proportion with other supporting studies (Table-6). Post-operative infection could be due to compromised vascularity to the bone and soft tissues in open reduction and plating procedures. Open procedure was associated with increased incidence of wound complications and infection compared to closed interlocking nailing. Two patients treated by open reduction and plating in this study had post operative infection. There were no wound complications in patients treated by MIPPO and ILN. Delayed union was considered when radiological union took place after 20 weeks of postoperative follow-up and was four times more common in OR with plating than ILN procedures. All patients of delayed union eventually achieved radiological union without any additional procedure Mal-union was described by several authors as $>10^0$ of medio-lateral angulations. Malunion with ILN was 3 times more to that observed in plating.

Table 6 Complications of present study and other supportive studies

Sno	Complications	Present study (%)	Im GI *et al*, (%)	Janssen *et al*, (%)	Vallier *et al* (%)	Guo JJ *et al* (%)
1	Wound infection					
	• Plating	16.6	23.3	15.4	5.8	Nil
	• ILN	Nil	3.3	14.2	5.8	Nil
1.	Delayed union					
2.2	• Plating	33.3	Nil	16.7	12.7	14.6
	• ILN	8.3	Nil	25.0	12.0	6.8
3.	Malunion					
4.3	• Plating	8.3	Nil	16.7	8.3	Nil
	• ILN	25.0	Nil	25.0	23.3	Nil

Relatively higher incidence of malunion in ILN group could be due to progressively widening medullary canal towards lower tibial metaphysis. Comminution and difficulty in maintaining reduction during impaction of nail might have also contributed to mal-alignment. Minor complications like pain and stiffness of ankle was seen in 1/3rd of patients in plating group. Knee pain was complained by 1/4th of patients in ILN group.

The final outcome was excellent in 66.6% of ILN group and 41.6% in plating group, good in 25% of ILN group and 33.3% of plating group, fair in 8.3% ILN group and 16.6% of plating group, 8.3% poor results only in plating group

CONCLUSION

In the management of fracture distal one third tibia as both ILN and plating procedures were found to have merits and demerits, the choice of surgical procedure should be based on individual patient requirements, availability of equipment and expertise. In this study closed Inter Locking Nailing showed favorable outcome and less complications when compared to open plating procedure. Hence it may be concluded that closed inter locking nailing is the optimal method for treating fracture distal one third tibia.

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