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Original Research Article

Lateral distal tibial locking compression plate fixation through single lateral incision technique is biologically superior and mechanically equivalent alternative to medial plate fixation for lower third tibia-fibula fractures

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ABSTRACT

Background: A number of surgical options for management of distal tibia fractures makes scenario confusing and available techniques are associated with complications. Recently lateral plating of tibia has shown good promise. To compare results between medial and lateral distal tibial locking compression plate for treatment of distal third tibia fractures
Methods: Prospective clinical study was carried out among 24 patients presenting with distal third tibia fractures. Patients were randomized into two groups of 12 each. One group was allocated into medial distal tibial LCP and second group was allocated into lateral distal tibial LCP. In first group, approach taken was medial or anteromedial while in second group, approach taken was lateral. Follow up was done for six months after surgery.
Results: There were 10 cases in medical group and eight cases in lateral group which had fracture due to road traffic accidents. All cases in medical group had concomitant fibula fracture while such cases were 10 in lateral group. One case in each group developed infection after surgery. There was one case of superficial skin dehiscence and one case of hardware problem in medial group compared to none in lateral group. Two cases from medial group required removal of implant compared to none from medial group.
Conclusions: Lateral distal tibial LCP seems to provide biological advantage than medial distal tibial LCP without difference in biomechanical properties of implants. Single lateral incision technique is an ingenious, biologically sound, and cosmetically superior for fixation of both lower third tibia & fibula fractures together.

Keywords: Tibia, Treatment, Fractures, Medial, Lateral

INTRODUCTION

Fractures of the tibia are seen in the bimodal pattern. They involve high energy mechanism as well as low energy mechanism. The low energy mechanism results due to trauma which is not direct or a force that is torsional. They result in fractures which are spiral in nature with or without fracture of the fibula. The injury to the soft tissue is minimal in low energy mechanism fractures of the tibia. Direct trauma can cause high energy fractures of the tibia. They result in the fractures that are either short oblique or wedge shaped. The injury to the soft tissues is much more in the high energy tibia fractures compared to the low energy tibia fractures. It has been estimated that about 4% of the elderly do suffer from these tibial fractures but can be seen in the younger population also depending upon the site and type of trauma.[1,2] Fractures of the distal tibia are a challenge for management. This is due to the particular soft tissue characteristics at the level of distal tibia and secondly it is

due to a number of options available for the treatment which makes confusion more and more. There is controversy on choice of the surgical treatment. Nailing methods are subject to complication like reduction may not be achieved properly or it may not be possible to retain it. Infections and nonunion are common complications of the plate insertion surgeries.[3,4] Rigid fixations can result as a complication of the open reduction and plating and at the same time the anatomical reduction may be retained. Traditional method of medial plating is considered a good option but, in this case, there is high rate of the dehiscence of the wounds and it can also be associated with other complications like infection and problems of the hardware.[5] A new method to overcome the above said complications called as per cutaneous medial plating which is far less invasive has come up.[6] But a lot of technical expertise is required in this method. Anatomic reduction may not be achieved with this. If the tibia fracture is associated with fibula fracture, then there is requirement of the additional incision.[7] Now there have been few studies which reported use of lateral plating for tibial fractures associated with the fracture of the fibula. They reported very good results with minimal complications. But their sample size was too small to comment about it.[8] Hence with this background, present study was carried out to study the results between medial and lateral distal tibial locking compression plate (LCP) for treatment of distal third tibia fractures.

METHODS

This prospective clinical study was carried out from September 2011 to December 2012among 24 patients admitted in SMS hospital, orthopedics department

Inclusion criteria

Inclusion criteria for current study were; patients willing to participate & give consent for the study, patients who are skeletally mature and patients with distal tibia fractures with or without concomitant fibula fractures: closed fractures or open fractures in which soft tissue injury and skin condition is good allowing for definitive treatment.

Exclusion criteria

Exclusion criteria for current study were; patients with open fractures in which soft tissue injury is not healed or skin condition is poor, patients with concomitant vascular injury and patients were admitted through emergency room. Initial resuscitation was done till all the vital were stabilized. Later laboratory works up was carried out. Radiological evaluation was done and Muller's AO class were assigned. Patients willing to participate and give consent for the study, skeletally mature with distal tibia fractures with or without fibula fractures, closed fractures or open fractures in which the soft tissue and skin condition allowed for definitive treatment were included in the present study. Patients not willing to participate and not giving consent for the study, skeletally immature, with open fractures in which skin or soft tissue condition did not allow for definitive treatment were excluded from the present study but managed as per the standard guidelines. Treatment was divided into two types; temporary treatment and definitive treatment. Among the patients include in the present study, those with closed fractures, CR and GT slab application was done as part of temporary treatment. For patients with open fractures up to Gustilo Anderson Class IIIa level, debridement, closure and then CR and GT slab was applied, they were also given the antibiotics intravenously as part of temporary treatment. For patients with open fractures IIIB type, debridement, irrigation of the wound, spanning external fixator/calcaneal pin traction application was done along with intravenous antibiotics as part of temporary treatment. All these patients have undergone pre-operative evaluation. It included optimum condition of the skin and soft tissues for definitive step and ensuring administration of pre-operative antibiotic doses. Definitive treatment was given with ORIF with LCP. Patients were randomized into two groups of 12 each. One group of 12 cases was randomly allocated into medial distal tibial LCP and the second group of 12 cases was randomly allocated into lateral distal tibial LCP. In the first group, the approach taken was medial or anteromedial while in the second group, the approach taken was lateral.

During follow up on day zero of post-operative period, IV antibiotics, limb elevation and active toe movements, static and active quadriceps exercised were given. Dressing was checked on post-operative day two. Sutures were removed along with splint on day 14 and active mobilization of ankle was carried out. Radiological assessment, partial weight bearing and knee ankle ROM was carried out at six weeks of surgery. Radiological assessment, full weight bearing and knee ankle ROM were carried out at three months of surgery. Radiological assessment, full weight bearing, knee ankle ROM, return to full activities after clinical and radiological union was carried out at six months and final outcome analysis was done. Clinical and radiological outcome was assessed at the end of six months and recorded in the pre-designed, pre-tested, semi structured study questionnaire designed for the present study. The data was entered in the Microsoft excel worksheet. The data was analyzed using proportions.

RESULTS

The mean age in the lateral group patients was significantly more compared to medial group patients but the sex distribution was comparable in two groups (Table 1). There were 10 cases in medial group and eight cases in lateral group which had fracture due to road traffic accidents. There was one case in each group who got fracture due to fall from height. There were two cases of fracture due to assault in medial group compared to none

in the medical group. There was one case each in two groups who had fracture due to fall of heavy object (Table 2). All cases in the medial group had concomitant fibula fracture while such cases were 10 in the lateral group. There were five cases in each group who had developed the intra articular fracture (Table 3). One case in each group developed infection after surgery. There was one case of superficial skin dehiscence in medial group patients compared to none in lateral group patients. There was one case of hardware problem in the medial group patients compared to none in the lateral group patients (Table 4). Two cases from the medial group patients required removal of implant while no case from the medial group patients required removal of the implant (Table 5).

Table 1: Age and sex distribution of the study subjects in two groups.

Variables (n=12)		Medial group N (%)	Lateral group N (%)	t/Chi square value	P value
Age (years) (mean±SD)		36±3.6	42±4.2	3.757	0.001088
Sex	Male	11 (91.7)	10 (83.3)	0.381	0.5371
	Female	01 (8.3)	02 (16.7)		

Table 2: Distribution of study subjects as per mode of injury in two groups.

Mode of injury (n=12)	Medial group		Lateral group	
	N	%	N	%
Road traffic accident	10	83.3	08	66.7
Fall from height	01	8.3	01	8.3
Assault	0	0	02	16.7
Fall of heavy object	01	8.3	01	8.3

Table 3: Distribution of study subjects as per type of fracture.

Type of fracture (n=12)	Medial group		Lateral group	
	N	%	N	%
Concomitant fibula fracture	12	100	10	83.3
Intra articular fracture	05	41.7	05	41.7

Table 4: Distribution of study subjects as per complications after surgery.

Complications after surgery (n=12)	Medial group		Lateral group	
	N	%	N	%
Infection	01	8.3	01	8.3
Superficial skin dehiscence	01	8.3	0	0
Hardware problem	01	8.3	0	0

DISCUSSION

There were 10 cases in medial group and eight cases in lateral group which had fracture due to road traffic accidents. All cases in medial group had concomitant fibula fracture while such cases were 10 in lateral group. One case in each group developed infection after surgery. There was one case of superficial skin dehiscence and one case of hardware problem in medial group compared to none in lateral group. Two cases from medial group required removal of implant compared to none from medial group.

Table 5: Distribution of study subjects as per requirement of implant removal.

Requirement of implant removal (n=12)	Medial group		Lateral group	
	N	%	N	%
Yes	02	16.7	0	0
No	10	83.3	12	100
Total	12	100	12	100

Saini et al compared two groups and found that the surgery duration and removal of sutures was similar in two groups.[9] Two cases of nonunion were reported from medial group compared to only one from the lateral group. The proportion of excellent was 20% in the medial group compared to 15% in the lateral group. The authors concluded that lateral plating was biter than medial plating. Shingati et al compared intramedullary nailing with plating for distal tibia fracture patients.[10] The cases due to road traffic accidents were 85% in the nailing group compared to 70% in the plating group but the difference was not found out to be statistically significant. Gustilo Anderson grade 1 was seen in 5% of the cases in plating group compared to 10% in the nailing group. Hooper et al carried out a study to compare nailing with conservative management for patients who had distal tibia fracture.[11] They found that patients with nailing had faster union, less proportion of malunion, and less proportion of shortening compared to the conservative management group. Hence authors suggested using nailing for management of distal tibia fracture cases compared to the conservative management. Yenna et al found that there was no statistically significant difference between medial plating group and lateral plating group in terms of biomechanical stiffness.[12] Manninen et al studied 20 cases operated with lateral approach and found that excellent results were achieved in 17 cases.[13] Two cases developed malunion.

Superficial wound infection was seen in four cases. That was managed on a conservative basis. They concluded that lateral approach is the best technique even though a lot of technical expertise is required. Lee et al evaluated retrospectively 88 cases and compared the results of medial and lateral plating for distal tibia fractures.[14] They observed that functional outcome was good and comparable in both the groups and the malunion rate was also very low in both the groups. But it was seen that lateral plating group had significantly less number of complications and also the problems related to the hardware

CONCLUSION

Lateral distal tibial LCP seems to provide biological advantage than medial distal tibial LCP without difference in biomechanical properties of the implants. Single lateral incision technique is an ingenious, biologically sound, and cosmetically superior for fixation of both lower third tibia & fibula fractures together.

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