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Management of Distal Metaphyseal Tibial Fractures by Locking Plate Fixation

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Abstract

Twenty patients of Distal Tibial fractures over a period of two and half years were retrospectively reviewed for this study. All were adult patients with males fifteen female five. 4 mm LCP plates were used (distal medial tibial LCP) in all the cases. Fibula fixation was performed in the majority of comminuted fractures to prevent collapse of the fracture. There were four cases of delayed wound breakdown in fractures fixed with the plate (DMT LCP). Five patient required primary bone grafting. MIPO with LCP was observed to be reliable method of stabilization of these fractures. The pre contoured DMT LCP was observed to be a better tolerated implant in respect to complication of soft issue, bone healing and functional outcome.

Keywords : Distal Metaphyseal Tibial Fractures; Distal Medial Tibial Locking Plate (DMT LCP); MIPO (Minimally Invasive Plate Osteosynthesis).

Introduction

Distal third tibial fractures are generally not suitable for IM nailing, despite certain reports indicating satisfactory results in some of the fractures. External fixation can be used as either a temporary or definitive method of treatment, especially in fractures with severe soft tissue injury, but melanin and delayed union continue to be the main problems with this method of fixation. Conventional plate osteosynthesiscan further lead to higher incidence of non union, infection and implant failure. Therefore, MIPO offers best possible option in a biological manner. This retrospective study was undertaken to evaluate the healing rate, complications and functional outcome of distal metaphysical Tibial Fractures from Jan 2011 to Jun 2013.

Materials and Metals

Twenty patient with distal tibial fractures treated with DMT- LCP between Jn 2011 to Jun 2013 were review patients with open fractures (Gustilloand Anderson grade IIIB and C), old fractures (>4 weeks), complex pilon fractures (AO43C3) and pathological fractures were excluded from the study. Twenty patient with twenty ditaltibial fractures (15 males and 5 females) with median age of 36 years (Range 18 to 56 years). Fifteen patients had RTA and five had a fall. Antero-posterior and lateral radiographs of the leg including ankle joint were obtained to establish the fracture pattern, classification and pre-operative planning. Using the AO classification, twelve fractures were type A (3 type A1, 5 type A2, 4 type A3), five fractures were type B (1B1, 2B2, 2B3) and three were type C (2 type C1 and 1 type C2).

Open fractures were classified according to Gustillo and Anderson classification. There were five cases of open fractures with three cases grade1, one case each of grade II and one case of IIIA. A 3.5 mm 1/3rd tabular plate was used to stabilize the fibula before fixation of the tibia to maintain the alignment of the leg and ankle in the presence of tibialcomminution, thereby making the stabilization of tibia easier. Through a small incision over the medial malleolus, sparing the saphenous vein and nerve, the tibial plate was inserted extra periosteally. Fractures fragments were reduced using indirect reduction techniques. Pre-contouring of the plate was performed so as to approximately match the contouring of the distal tibial and was followed by stabilization using proximal and distal locking screws. Closed reduction achieved anatomical alignment in seventeen cases and the remaining three required open reduction. In all cases Distal medial tibial Locking plate (DMT LCP) was used. Primary bone grafting was used in five cases. Limb elevation to achievegravity assisted venous drainage along with active toe and ankle movements were carried out for the initial two weeks. Stitches were removed in approximately two weeks.

Non weight bearing ambulation was permitted in approximately two weeks after proper wound healing and appearance of wrinkle sign. Patients were followed up clinically and radiography in the OPD fracture clinic at monthly intervals for the six months and every two months two one year to assess progress of union and possible complications. Full weight bearing was allowed only after clinical and radiological evidence of union. Union was defined as bridging three of the four cortices and disappearance of the fracture line on the plain radiographs for a patient who was able to bear full weight. Fractures in the process of union but not united at six months was considered as delayed union. Non union was defined as a fracture that did not heal within a year. Melanin was defined as the incongruity of the auricular surface of more than 2mm or misalignment grater than five degrees in any plane.

Table 1: Frequency of side of injury

Side	Frequency	Percentage
Right	15	75
Left	05	25
Total	20	100

Table 2: Sex distribution

Sex	Frequency	Percentage
Male	15	75
Female	05	25
Total	20	100

Table 3: Mechanism of injury

Mechanism	Frequency	Percentage
h/o Fall	05	25
h/o RTA	15	75
Total	20	100

Table 4: Type fracture based on AO classification

Type	Frequency	Percentage
A	12	60
B	05	25
C	03	15
Total	20	100

Table 5: Type of open fracture

Type	Frequency	Percentage
Grade-I	03	60
Grade-II	01	20
Grade-III	01	20
Total	5	100

Results

Compression plate osteosynthesis with MIPO technique was used in simple fracture patterns (15 cases) Bridge plating plus MIPO was used in rest of the tibial fractures with combinations (5 cases). There was intraoperative difficulty in closer of the surgical wound in three cases 4mm lateral compression –LCP

and two cases of metaphyseal LCP, hence the fibular skin incision was left open after stitching the muscle layer and delayed closure was done subsequently. Superficial infection was observed in one patient with AO type 43 A1, compound grade IIIA fracture fixed with 4mm LC-LCP. Stitches of the distal incision were opened for debridement and the wound healed with topical care. The mean time to full weight bearing was 16 weeks (range 12weeks -32 weeks). The mean time to union was 19 weeks (16weeks -32 weeks) in 18 cases. Of these, three fractures had delayed union, with union time of less then nine months. Non union was observed in one case. This required secondary bone grafting to full up the gap before union could be achieved. All cases of delayed union and non-union were observed in cases where plates were used in bridgemode. A total of 18 patient fixed with DMT LCP reported local plain over the medial malleolus.

Table 6: Type of implant used

Type	No of cases	Percentage
4MM Distal medial LCP plates	15	75
Bridge plate	05	25
Total	20	100

Discussion

The treatment of distal metaphyseal fractures of the tibia by closed IM naling or by ORIF using plate may be associated with complications such as malunion, non union, secondary loss of reduction, wound dehiscence, local septic complication and stiffness of adjacent joints. MIPO of these fractures is technically feasible and advantages as it minimizes soft tissue compromise and devascularisation of fractures fragments. This procedure includes three important steps: closed reduction, menimal soft tissue dissection and stabilization with a long percutaneously inserted plate fixed with a limited number of undisplaced screws in this retro spective study of twenty patients with twenty fractures treated with MIPO achieves eighteen cases healed with unit melunion or bone healing complations which is comportable to healing rates reported in other studies incorporative MIPO techniques and support the biological advantages of MIPO techniques over open deduction techniques especially deling with severe soft tissue injuries. The rate of malunion (one case) in our series (5%) is comparable to the rates (3.8%-5%) reported in the literature. The rate of non-union in our series (5%) is also comparable to the rates (0.6% -6%) in the literature. All the instances of delayed union or non union occurred in the bridge mode. Collingeet all suggested extra measures at in risk patients, including those with highly comminuted fractures patterns, bone loss or type II or III open fractures.

Our study included DMT-LCP and we focused on fracture healing and complication it is not essential to fix fibular fractures in the presence ofsimple fracture pattern of the tibia provided the fibular fracture is proximal to the syndesmosis.

There was one case of non union, which was a high energy open fracture and it presented with co-morbidities such as PVD, alchohal and tobacco abuse, which are known to be associated with complications of bone healing. Skin irritation in the distal screw and pain over the medial malleolus were observed in 60% of DM plate LCP. Local soft either irritation and pain over the medial malleolus can be avoided using low profile plates such as distal medial tibia LCP. However, an important observation was made that the pre contoured distal media tibial LCP required additional contouring.

The limations of our study include its retrospective nature and potential for user bias because the surgon could not be blinded with respect to the locking plate in the treatment, though it was largely guided availability of implants. However, on account of long follow up in this study, we can conclude that the treatment of DMT factures with an LCP using the minimally invasive lock plate OS (MILPO) technique is a reliable alternative method of stabilization. It decreases the incidence of complications of soft tissue and bone healing associated with the conventional methods of plating on external fixation of these fractures. IM nailing though biological suffers from a limitations of inadequate fixation due to small distal fragment, even more so in comparison to 4.5mm LC-LCP and metaphyseal LCP with respect to complications of soft tissues and bone healing and functional outcome, though its contour needs to be modified. Additional measures in the form of acute docking of the fracture, primary bone grafting and supplementary fibular fixation in comminuted fractures are recommended.

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