Research Paper

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A Study of Management of Distal Tibial Fractures Treated by Minimal Invasive Percutaneous Plate Osteosynthesis

Medical Science

KEYWORDS : - pilon fracture, distal tibia, locking plate, mippo, soft tissue, infection, plafond

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ABSTRACT

We have studied 25 cases during the time period of 2010 to 2012 of distal tibial fractures which were treated by minimal invasive percutaneous plate osteosynthesis(mippo) at our institute

Mean time to union was 18.3 weeks for closed fracture and 20.4 open fractures .Three patients had infection ,one patient had implant failure while one patient developed non union which required bone grafting.68 % percent of the patients had excellent results as evaluated by heflet and hooper series of distal tibia .While 88% percent of the patients returned to their previous occupation.

INTRODUCTION

The fracture of the tibia & fibula are amongst the most common long bone fracture and the incidence is increasing in frequency due to Vehicular accident, Rapid industrialization, Subcutaneous location of tibia & fibula, Increase in violence.

The treatment of unstable distal tibia or pilon fractures remains controversial.To achieve union many procedures are recommended such as closed reduction and cast , open reduction and internal fixation,intramedullary nailing , hybrid or ring external fixation [1,2,3,4,5,13] he difficulty that arises in the treatment of fracture distal third tibia fibula is:

(1) Tendency to re-displacement of fracture fragment following subsidence of swelling specially in oblique, spiral & comminuted fractures when treated by cast .
(2) Delayed union due to the precarious vascularity especially in distal third tibia.
(3) Functional & cosmetic deformation if the rotational or alignment position of the fragment is not achieved, as it is important because knee & ankle joints are in same parallel axis.

External fixation13 and intramedullary nailing techniques1 undoubtedly minimise soft-tissue trauma and have been shown to reduce wound infection but their use is complicated by malunion and nonunion, imperfect reduction of articular surface, and pin tract infection. Plate osteosynthesis have the advantage of rigid fixation, anatomical reduction & early mobilization of limb. The disadvantages of plate osteosynthesis are extensive stripping of soft tissue especially periosteum, excessive blood loss ,infection .

In the recent decades the internal fixation of fractures has evolved with a change of emphasis from mechanical to biological priorities and from compression plating to internal fixators.10 The term " biological" expresses the aim of the treatment : to take advantage of whatever biological support from the bone and soft tissue that is still available after the trauma and conservation of vascularity of the bone during surgical intervention to ensure continued vitality of the individual fragments and to achieve improved fracture healing10.

We used distal tibial metaphyseal plate or anatomical precontoured distal tibial locking plate as per surgeons choice .

We report a series of patients who were treated in our institution for fractures of the distal tibial metaphysis with or without intraarticular involvement.9

Management Protocol

Our protocol in management of distal tibia or pilon fracture consists of immediate reduction with temporary plaster stabilisation. Soft tissue assessment is performed prior to surgery, and if there is any doubt on the viability of the soft tissue, bridging external fixation for skeletal and soft tissue stabilization or limb elevation is given till edema subsides and wrinkles appear .

Initial attention is given to fracture line which may be intra articular and extend in to the tibial plafond. These articular fragments are anatomically reduced either by percutaneous means using IITV and pointed reduction clamp applied, and fixed with lag screws then approximate length of the plate is determined such that the proximal end extends at least three screws beyond the proximal limit of the tibial shaft fracture .

MATERIAL AND METHODS

Patients with distal tibia or pilon fractures treated in our institution were prospectively followed. X rays were taken and All fractures were classified using the AO classification and intra-articular fractures were further classified using the Ruedi & Allgöwer classification17. Fractures were considered healed when mature bridging callus was identified on radiographs and patients reported no pain on weight bearing. Soft tissue outcome was assessed on basis infection, wound dehiscence.Functional outcome was assesed by Heflet and Hooper series for distal tibia .

Results:

In the present study a effort is made to study the outcome of fracture lower third tibia by BIOLOGICAL FIXATION (MIPPO) between the time period of 2010 -2012 .

Following criteria's were used to assess the results of the study .We compare our results with criteria of Heflet & Hooper series for management of fracture distal tibia

Pain	ABSENT	0
	PRESENT	1
LIMP	ABSENT	0
	PRESENT	1
DEFORMITY	ABSENT	0
	ROTATIONAL	1
	ANGULATION	2
SHORTENING	ABSENT	0
	0-1cm	1
	0-2cm	2
INFECTION	ABSENT	0
	SUPERFICIAL	1
	DEEP(SEQUESTRA)	2
ANKLE MOVEMENT	DORSIFLEXION MORE THAN 15 DEGREE	0
	EQUINUS	1
WALKIING CAPACITY	UNAIDED	0
	WITH STICK	1

	WITH CRUTCHES	2
SUBJECTIVE FEELING	BETTER	1
	GOOD	2
	FAIR	3
	POOR	4

TOTAL POINTS 15

Excellent 0-5

Good 5-8

Fair 9-14

Poor 15

Observations made during study were as follows:

1. Twenty five patients, 19 males and 6 females, were available for follow-up. Mean age was 42 years (range 20- 60 years).
2. Eleven patients had fractures were related to high-energy trauma while 10 patients had history of road traffic accident
3. Eleven patients amongst them were labourers and 5 were farmers by occupation.
4 Five cases were open fractures and were classified by Gustilo-Anderson classification accordingly amongst which three cases were Type I, while two cases were Type II . The fractures were also classified by AO/ASIF classification Twenty three cases were 43A, 2 cases were 43C based on the AO/ASIF classification.
5. Thirteen patients had spiral fracture pattern while eight patients had transverse fracture pattern
6. Time taken to union for 91 percent of the patients were between 12-24 weeks with mean time to fracture healing 18.3 weeks for closed fractures and 20.2 weeks for open fractures. Two patients developed delayed union while two patients developed non union.
7. According to heflet and hooper series for distal tibia 68 percent had excellent result while 20 percent had good result. Two patients had poor results due to implant failure and infection
8 . Three patients had a valgus union and two patients had 0.5 cm shortening at the final follow up.
9. 52% of the patients had complain of pain ,56% of the patients had implant impingement as the major complaint at final follow up.
10. Two patients had developed non union which required a secondary procedure in the form of bone grafting. There were 2 cases of implant failure

Discussion

The results of surgical management have been shown to be affected by Type of fracture, Quality of articular reduction achieved at surgery, Procedure by which fracture is managed.

Failing to appreciate the soft tissue condition will invariably complicate the injury with infection, wound dehiscence or non union. Where the soft tissue injury is significant, bridging external fixation is advantageous for skeletal and soft tissue stabilisation13 . Definitive fixation is only advisable when the soft tissue allows it, when the'wrinkle sign' is evident8,10,11,14,15. Previously published infection rates in the management of this injury range from 0% to 50%1,2,3,18. ORIF has been shown to have the highest infection rates compared to other methods of treatment .Deep infection and wound dehiscence are the major soft tissue complications. We found infection in 3 patients (12%) with discharging sinus who were treated first with daily dressing and antibiotics and the sinuses healed.

Reports suggest that intramedullary nailing has the lowest infection rates compared with other techniques(1,5) but the technique is associated. Studies involving external fixation techniques showed complications such as loosening, malunion, imperfect articular reductions and pin tract infections 13.

The anatomical precontoured distal tibia locking plate or distal tibia metaphyseal plate applied with minimally invasive techniques allows fracture

reduction and alignment without the associated wound complications in ORIF8,14,15,16. We found two cases of hardware failure where 1 patient underwent a revision procedure in form of implant removal, compression plating and bone grafting Other patient refused for a revision procedure and is walking with limp and pain (Heflet and Hooper series score fair) . All our patients were found to have acceptable reduction and alignment post operatively and at union.

Fracture healing is defined as mature callus formation seen on plain radiograph with pain free full weight bearing. Mean fracture healing was found to be 18 .3 weeks for open fracture while 20.2 weeks for closed fracture. Our results are comparable to other studies using the MIPPO technique in Syah Bahari et al series14 where the mean fracture healing was found to be 22.4 weeks postoperatively. Comparing the results with other methods of fixation, our results are better in comparison with ORIF and external fixation. 1,2,6,8,9,11,13,14,15

Distal tibia plating allows early active range of movement & we found that ankle stiffness is not a problem. Superficial tenderness or impingement over the medial aspect of the medial malleolus was noted in five cases but only three opted for plate removal as it interfered with activities of daily living. In our study, 88% of patients were returned to their same profession stating less morbidity and disability after operation.



Excellent result

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