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Surgical Management of Distal Tibia Fracture By Minimally Invasive Percutaneous Osteosynthesis Using Locking Plates - A Prospective Study

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ABSTRACT:
BACKGROUND: *Because of minimal soft tissue ,subcutaneous position and precarious blood supply,treating the distal tibia can be difficult.The purpose of this study is to mainly focus on efficacy of minimally invasive percutaneous plate osteosynthesis for treating distal tibia fracture.*
METHODS *: This is prospective study including both male and female patients having fractures of distal tibia,who were 30 in number ,presented to mims general hospital Vizianagaram during the period from jan 2021 to June 2022,who were treated with minimally invasive percutaneous plating (MIPPO).*
RESULTS : *Among 30 patients ,13 males(45%) ,17 females(55%) age ranging from 22 yrs to 66 yrs. With average age of 45 yrs.Most of them are between 35 – 60 yrs of age group.After union among 30 patients ,18 (60%) patients had a 90 or more AOFAS score out of possible 100 points i.e excellent outcome,30 % of patients with good,10% with fair outcome.*
CONCLUSION : *The MIPPO is a good fixing method for distal 1/3rd fractures of tibia that preserve the majority of osseous vascurity, # hematoma,allowing for biological repair.This technique is employed in fracture patterns where locking nail is not possible i.e with tiny distal metaphyseal pieces of tibia,vertical split #,comminuted #.Delayed and non union can be prevented due to preserved vascularity.*
KEYWORDS: *Distal tibia fractures, MIPPO, Preserved vascularity, Delayed union, Non union.*

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I. INTRODUCTION

Because of minimal soft tissue,subcutaneous position,precarious blood supply,treating the distal tibia can be difficult[1].Despite advances in non surgical and operative techniques,Distal tibia fractures remain a contentious topic.And the goal is to straighten the fracture,realign the limb length and achieve early functional recovery[2].

Because of significant complication rates both from primary injury and the treatment ,distal tibial fractures remain the most difficult one to treat[3].They are more common as the no of RTA has increased.It accounts for 1% of fractures of lower extremity,10%of tibia fractures,0-8% B/L fractures and 0-5% compartment syndrome.

Regarding management must of these fractures are operated by closed reduction of intramedullary interlocking nailing(IMIL),open reduction and internal fixation with plating(ORIF),closed reduction with percutaneous plating or external fixators.Every approach has its own benefits and as well as drawbacks.Stable extra articular fractures withminor shortening can also be treated conservatively.

Intramedullary nailingis not recommended for these distal tibial metaphseal fractures ,because it is difficult to acquire two distally locking screws and they also reported greater prevalence of malunion[4].

External fixation is useful in fractures which are open type with soft tissue injury but it can lead to inaccurate reduction and relatively high risk of infection.Malunion,nonunion,pin loosening,pin tract infections are all common.As a result of which ,External fixation is not recommended as a long term fixing method[5].

Traditional open reduction with internal plate fixation,necessitate significant soft tissue incision and periosteal stripping ,even in competent hands,which can lead to more incidence of complications such as infection ,delayed union and non union.

In recent decades,percutaneous osteosynthesis which is minimally invasive (MIPPO) with indirect reduction has proven to be an effective therapeutic option for difficult lower extremity fractures[6].MIPPOs goal is to retain the fractures osteogenic haematoma and periosteal blood flow while avoiding iatrogenic soft tissue injury locking compression plate (LCP) provides enhanced stability with a small number of screws in certain situations.The plate is held in place by locked screws which prevents the plate from pushing against the bone ,protecting the periosteal blood flow.The plates anatomical form prevents the fracture from misaligning and improves axial and angular weight distribution.

Our objective is to study functional outcome of MIPPO ,using medial distal anatomical locking compression plates for distal tibial fractures and also to study its efficacy in terms of time needed for fracture union , ROM of ankle joint , Infection rate,implant failure rate,Rate of malunion and non union.

II. MATERIALS AND METHODS

Clinical material – Present study is a prospective study conducted in the Department of orthopaedics, Maharajah institute of medical sciences, Vizianagaram, Andhrapradesh between january 2021 to June 2022.

30 patients were included in the study who had fractures distal tibia and met the selection criteria were treated with minimally invasive percutaneous plating(MIPPO).

INCLUSION CRITERIA : Distal tibia fracture involves lower 3rd of tibia diaphysis and diaphyseal metaphyseal junction AO /OTA clamps type A,B,C distal tibia fractures,Ruedi Allgower type 2 and 3 pilon fracture, simple fracture Age 20-80 yrs.

EXCLUSION CRITERIA : Type 1 R.A classification pilon fracture,compound fracture,delayed presentation > 3wks.Non union distal tibia fracture.

CLINICAL EXAMINATION: On admission the patients general health was evaluated for hypovolemia,A complete clinical examination was conducted which included delayed history of Age,Gender,Occupation,Mode of injury,previous concomitant illness.

INVESTIGATIONS: Routine blood investigations were done for all the patients.Radiographs were taken in two planes -AP ,lateral views.

SURGICAL PROCEDURE: Patientswereoperatedunderspinalanaesthesiaandunderpneumatictourniquet control. Patients were positioned supine over a radiolucent operating table.Theinjuredlegwaspositionedfreely,withkneeextended.Scrubbed and painted from mid thigh to foot and drapped.

The concurrent fibula fracture is fixed in comminuted distal tibia fracture to restore the axial alignment of tibia and indirect fracture reduction and is made optional for simple distal tibia fracture.

A vertical and curvilinear incision was made with caution to avoid injury to saphenous vein and nerve,with a hemostat ,a subcutaneous plane was created without stripping the periosteum or disrupting fracture hematoma . Under c arm guidance epiperiosteal tract is made and 3 mm k wires were used as a toystick to aid in fracture reduction and reduction clamp to hold reduction in place.As a hybrid fixation,compression osteosynthesis is attained in simple fracture by utilising a non locking screw proximal to fracture site . Atleast 3 locking screws were inserted on both sides of fracture with separate stab incisions.Skin closure done and limb was splinted with below knee posterior slab or brace.

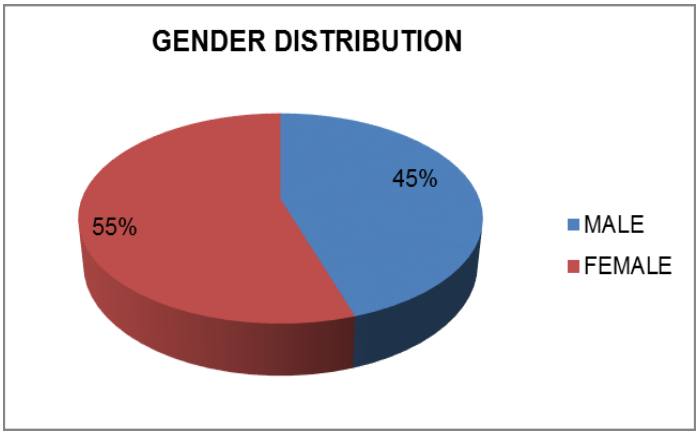
III. RESULTS :

Present study consisted of 30 individuals with distal tibial fractures .This included 13 males (45%) and 17 females (55%), age between 20 -66 yrs with average age of 45 ,most of the patients are over 35 years old. There are 18 right sided distal 3rd tibia fractures, 12 left sided distal 3rd tibia fractures RTA (80%) most common mode of injury ,remaining 20% due to self fall.

AGE INCIDENCE :

Age	No.of Patients	Percentage
20-30y	5	15%
31-40y	5	15%
41-50y	10	35%
51-60y	6	20%
61-70y	4	15%

FOLLOW UP: follow up period lasts for about 6 to 8 months on average of 7 months.At around 6 to 7 wks after surgery,majority of the patients began partial weight bearing and full weight bearing at around 8 to 14 wks ,period of union ranged from 16 to 28 wks, with an average of 20 wks .



COMPLICATIONS :

Majority of cases went smoothly,except that one case (5%)developed superficial wound infection.Treated with regular dressing and iv antibiotics ,1 case (5%) with delayed union ,1 case (5%) with varus deformity.

FINAL OUTCOME :

According to ankle evaluation scoring method -AOFAS(American orthopaedics foot and ankle society) function assessment was done .

Among 30 patients ,18 (60%) showed excellent results ,9 (30%) showed good ,3(10%) showed fair results.

CLINICAL OUTCOME RESULTS :

Result	No.of patients	Percentage
Excellent	18	60
Good	9	30
Fiar	3	10
Total	30	100

IV. DISCUSSION:

Fracture of distal tibia was one of the most challenging fractures to adequately treat . Treatment options and long term clinical outcomes are influenced by the state of soft tissues and the quantity of communution received at the time of injury . The main aim of surgical treatment is to anatomically align the fracture fragments with sufficient stability and early mobilization which is accomplished with minimum bony and soft tissue devascularization.

This study was chosen to determine the efficiency of the MIPPO with LCP in the treatment of the distal tibia meta diaphyseal fractures ,patients of age group 20 to 66 yrs were included , most of them 35 to 60 yrs ,with 13 male and 17 females .Majority of the patients were surgically treated with in 3 days trauma.Weight bearing is gradually increased as radiographic fracture healing progressed .

On union, among 30 , 18 patients has AOFAS score of 90 or more out of 100 points with average score of 88.25 .

Aksekli MAE et al in their study of 35 patients with tibia diaphysis and distaltibia fractures treated withMIPPOplating wasevaluated for time requiredfor unionand complications ,showed fracture union at an average time of 21 weeks ,all

patientsshowedexcellentresultsexceptforonewhohadimplantfailureduetonecrosis,concluded that MIPPOis effective treatment for tibia diaphysis and distal tibiafractureswithlow complication andhighunionrates[14].

Dhakar et al in their study of 50 patients with fractures of distal tibiatreatedwithMIPPOplatingtechniquewasevaluatedforfunctionalandradiologicalresultswith MIPPO technique showed fractures united in 45 patients with delayed union in 5patients,43patientsreturnedtotheirnormalworks,3patientsdevelopedanklestiffness ,4 patients had implant failure due screw breakage ,concluded that MIPPO isan effective treatmentfor fractures of distal tibia and associated with better functionaloutcome[15].

V. CONCLUSION:

The MIPPO method is a good fixing method for distal third tibia fractures that preserves the majority of osseous vascularity, fracture hematoma, allowing for biological repair. It is employed in fracture patterns where locked nailing is not possible, such as fractures of distal tibia. Due to preserved vascularity there is a less incidence of delayed and non union, less risk of infection due to limited exposure. A short stay in hospital due to quick return to normal activities.

Limitations of study: this study has got its limitations due to relatively small sample size. There is a need for large sample size to conclude and achieve statistical significance to apply to the population at large.

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Illustrations (figures):

Preoperative x ray

Figure 1: draping

Figure 2: skin incision

Figure 3: epiperiosteal plane

4: Sliding of plate

Figure 5:Incision for proximal locking

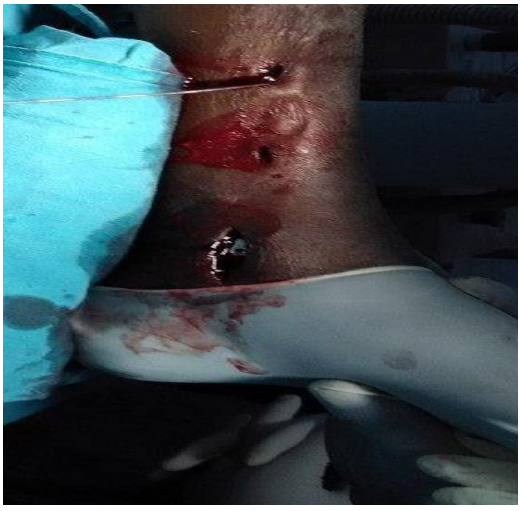

Figure 6: Skin closure

Figure 7: postoperative X ray

Figure 8. 20WEEKS X-RAY

Figure 9 & 10: ankle plantarflexion & dorsiflexion

Abbreviations and symbols:

MIPPO	Minimally invasive percutaneous plate osteosynthesis
AOFAS	American orthopaedics foot and ankle society
LCP	Locking compression plate

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