Original Research Paper

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A PROSPECTIVE STUDY OF MINIMALLY INVASIVE PERCUTANEOUS PLATE OSTEOSYNTHESIS USING LOCKING COMPRESSION PLATE FOR MANAGEMENT OF DISTAL TIBIAL FRACTURES

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ABSTRACT

BACKGROUND: MIPPO is an established technique for fixation of distal tibia fracture. Our study aimed to evaluate MIPPO using locking compression plate in treatment of distal tibial fractures with regards to time for fracture union, functional outcome and intra-operative and post-operative complications.

METHODS: This is a prospective type of study in which 36 patients admitted at GMC kota, from Oct 2018 to Sept 2019 with distal tibia fractures were included. Patients were surgically managed by closed reduction and internal fixation with minimally invasive percutaneous plate osteosynthesis (MIPPO) using LCP .All patients were evaluated clinically and radiologically before and following surgery, for an average period of follow up of 6 months.

RESULT: The fractures united in 32 (88.8%) patients before 20 weeks while in 4 (11.2%) patients it took upto 24 weeks.11(30.6%)patient had excellent,16(44.4%)had good,5(13.9%) had fair and 4(11.1%) had poor results according to Modified AOFAS ankle hindfoot Scale.Post-operatively, 5 patients developed superficial skin infection and 2 patients developed ankle stiffness due to loss of post operative physiotherapy protocol.Good amount of range of motion of ankle joint was present in almost all patients.

CONCLUSION: MIPPO technique provides adequate stability to maintain the reduction and thus allow early motion. It facilitates early union as it also preserves blood circulation to the fracture fragments. The greatest advantage with MIPPO is that fracture haematoma is not disturbed much. It is also effective in extra articular fractures occurring within 5cm of the joint where intramedullary nails do not provide enough stability. Even though this technique has steep learning curve, newer anatomically contoured locking compression plates for the distal end tibia fractures has reduced surgical time in both extra articular and intra articular fractures.

KEYWORDS : Distal Tibia fracture, MIPPO, LCP

INTRODUCTION

The distal third tibia fractures are unique and represent a significant challenge to most of the surgeons even today. They are only 1-10% of all lower extremity fractures. The distal one third of the tibia has less muscle coverage in comparison to rest of the tibia. Often, these fractures are comminuted and are unstable. Disturbingly, they can be associated with severe closed or open soft tissue injury. Hence, complex fractures of the distal tibia are difficult to treat.

Traditionally, these difficult fractures have been managed by open reduction and rigid internal fixation with a compression plate. A high rate of good to excellent results has been reported. However, this technique has not produced consistent outcomes and has a high incidence of complications, including infection, poor wound healing and non-union.

Conventional plate osteosynthesis with open reduction can further devitalise fragments and lead to higher incidence of nonunion, infection and implant failure. Therefore, minimally invasive osteosynthesis, if possible, offers the best possible option as it permits adequate fixation in a biological manner.

Locking plates have the biomechanical properties of internal and external fixators, with superior holding power because of fixed angular stability through the head of locking screws, independent of friction fit. In addition, it is possible to use these plates in a minimally invasive technique without fear of secondary displacement in the absence of perfect contouring.

METHODOLOGY

This is a prospective study from October 2018 to September 2019. 36 Adult patients with fractures of lower third tibia admitted to govt. medical college kota were taken for this study after obtaining their informed, valid written consent.

Inclusion Criteria:

Age more than 18 years both males and females.
Patients with AO Classification Type 43-Distal Tibial fractures
Patients fit for surgery
Patients with Gustillo Anderson Type-I open fractures

Exclusion Criteria:

Patients less than 18 years of age
Patients unfit for surgery
Patients not willing for surgery
Gustillo Anderson Type- II & III open fractures
Associated vascular injuries
Pathological fractures

On admission of the patient, a careful history was elicited to reveal the mechanism of injury and the severity of the trauma. The patients were then assessed clinically to evaluate their general condition and the local injury. Methodical examination was done to rule out fractures at other sites.

Management of closed fractures:

Local examination of the injured extremity revealed swelling, deformity and loss of function. Palpation revealed abnormal mobility and crepitus at the fracture site. Distal neurovascular status was assessed by the posterior tibial artery and dorsalis pedis artery pulsations, capillary filling, local temperature, pallor and paraesthesia.

Antero-posterior and lateral radiographs of the affected leg along with ankle were taken and the fracture patterns were classified based on the AO/OTA classification of fractures of distal tibia.

The limb was then immobilized in an above knee Plaster of Paris slab till definitive fixation with locking compression plate done.

Management of Open Fractures:

Patients with open fractures were graded using the Gustilo Anderson classification for open fractures. Antibiotics were started immediately for all patients. single dose of tetanus toxoid was given. After obtaining the necessary radiographs, Type I open fractures were treated by cleaning of the wound with copious amount of normal saline and Hydrogen peroxide, followed by painting of the skin around the wound with Povidone iodine and surgical spirit. This was followed by primary wound closure if required. The limb was then immobilized in an above knee Plaster of Paris slab till definite fixation was done. Type II & III fractures were not included in this study.

Surgical Approach:

Medial Approach was used for all cases operated. 3-4 cm incision was taken over the medial malleoli taking care not to injure saphaneous vein. Proximal incision was taken over the plate depending on the plate size. Percutaneous plate placement was performed after sufficient closed, indirect reduction or percutaneous direct reduction. The LCP was placed submuscularly and extraperiosteally through the small incision on the medial malleolus. Under guidance of image intensifier fracture was manually reduced and maintained with reduction forceps. The plates were temporarily held in place with standard plate holding forceps. 2mm K-Wires were used to secure the plates proximally and

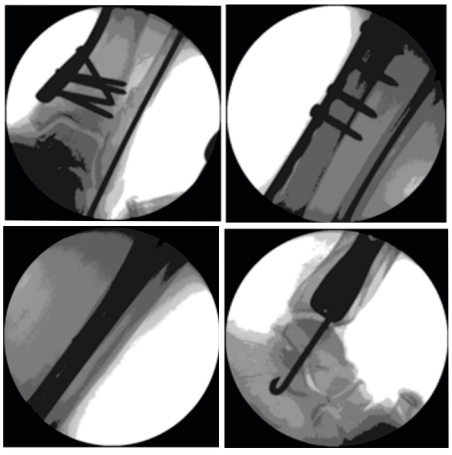
distally in the slots provided on the plates. A Threaded Plate Holder can also be used as an aid to position the plate on the bone.

Post operative regimen:
Immobilization with above knee slab and non-weight bearing of the patient using standard walking frame was done from the first post operative day under the supervision of a physiotherapist. Intravenous antibiotic regimen was continued for 5-7 days (12-14 days in compound fractures) after the surgery. Another 5 days of oral antibiotics were advised. Suture or staple removal was done at 10th-12th post operative day. Delayed suture removal on 15th day was done if required in cases where wound closure was difficult. Compound fractures were dressed as per instructions from the plastic surgeon.

Follow up:
The patients were followed up at regular intervals at three weeks, six weeks, twelve weeks and six months to assess the radiological union. After the 1st follow up of three weeks patients were allowed to bear weight with patellar tendon bearing cast. This patellar tendon bearing cast is allowed for three more weeks and later removed.

The fracture was designated as united, when there was periosteal bridging callus at the fracture site at least in three cortices in the anteroposterior and lateral views. Trabeculations extending across the fracture site was also taken into consideration.

FINAL



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RESULTS

Age distribution:
The age of the patients ranged from 24 to 68 years with the fracture being most common in the 3rd and 4th decade and an average age of 45.9±11.8 years.

Table 1: Showing Age distribution

Age	Number Of Patients	Percentage
21-30	4	11.1
31-40	7	19.4
41 -50	15	41.7
51-60	6	16.7
61-70	4	11.1
Total	36	100.0

Sex Distribution:
Out of 36 patients, 27(75%) patients were males and 9(25%) patients were females showing male preponderance because of traveling and working infields and factories.

Table 2: Showing Sex Distribution

Sex	Number of Patients	Percentage (%)
Female	9	25.0
Male	27	75.0
Total	36	100.0

Mode of injury:
In our study, 32(88.9%) patients sustained injury following road traffic accidents and4 (11.1%) patients sustained injury following fall.

Table 4: Showing mode of injury

Mode of Injury	Number of Patients	Percentage
RTA	32	88.9
Fall	4	11.1
Total	36	100.0

Fracture Characteristics:
Clinical:
Out of the 36 cases, 28 (77.8%) cases were closed fractures and 8(22.2%) cases were open fractures.

Table 5: Showing clinical type of fracture

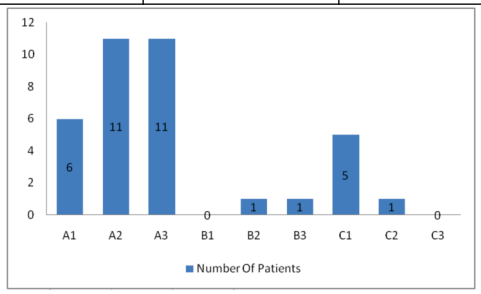
Mode of Injury	Number of Patients	Percentage
Open	8	22.2
Closed	28	77.8
Total	26	100

Open fractures:
Classification of the 8 cases of open fractures were based on Gustillo Anderson classification of open fractures. In our study all 8(100%) were type I open fractures.

Fracture Pattern:
The fracture pattern was classified based on AO classification for fractures of distal tibia. Of the 36 cases studied, 11 (30.6%) cases were A2, 11 (30.6%) were A3, 6 (16.7%) cases were A1,5 (13.9%) were C1,1(2.8%) was B2, 1 was B3 (4%) and 1 (2.8%) was C2.

Table 6: Showing fracture pattern

Fracture pattern	Number of Patients	Percentage
A1	6	16.7
A2	11	30.6
A3	11	30.6
B1	0	0
B2	1	2.8
B3	1	2.8
C1	5	13.9
C2	1	2.8
C3	0	0
TOTAL	36	100



Associated Injuries:
12 of 36 cases studied had an associated fracture of the lower third of fibula. 1 Patient had associated Intertrochanteric femur fracture on the same side. 1 Patient had associated Femur shaft fracture of the same side. 3 Patients had associated Proximal tibia fracture on the same side.

Intertrochanteric fracture left femur	1	2.8
Proximal left tibia fracture	3	8.3
Lower 3rd fibula fracture	12	33.3
Femur shaft fracture	1	2.8

Duration of fracture union:
All the fractures united with an average of 16.83 weeks ranging from 14 to 24 weeks.

Table 8: Showing Duration of Fracture Union

Du r Duration a (Weeks)	Number of patients	Percentage (%)
14-16	17	47.22
16-18	10	27.77
18-20	5	13.88
20-22	3	8.33
22-24	1	2.78
TOTAL	**36**	**100**

CONCLUSION

According to this study, 36 patients with fractures of the distal tibia had undergone closed reduction and internal fixation using locking compression plates by MIPPO technique. This technique provides adequate stability to maintain the reduction and thus allow early motion. It facilitates early union as it also preserves blood circulation to the fracture fragments. The greatest advantage in internal fixation with MIPPO using locking compression plates is that fracture haematoma is not disturbed much. It is also effective in extra articular fractures occurring within 5cm of the joint where intramedullary nails do not provide enough stability.

Even though this technique has steep learning curve, newer anatomically contoured locking compression plates for the distal end tibia fractures has reduced surgical time in both extra articular and intra articular fracture.

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