RESEARCH ARTICLE

A Prospective Study On Outcome Of Minimally Invasive Percutaneous Plate Osteosynthesis(Mippo) Using Medial Distal Tibia Anatomical Locking Compression Plates For Distal Tibia Fractures

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ABSTRACT:

BACKGROUND: Distal tibia fracture is a therapeutic challenge in modern orthopedics. Due to fracture pattern, periarticular location, minimal soft tissue coverage, the surgical treatment is complex one. Various modality of surgical treatment such as closed intramedullary nailing, Open Reduction Internal Fixation with conventional plate osteosynthesis and external fixation has been tried so far. But none of them have good functional outcome but high complication rate (20-50%). So the present study was undertaken to assess the functional Outcome of Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Using Medial Distal Tibia Anatomical Locking Compression Plates for Distal Tibial Fractures.

AIM: To Study the Functional Outcome of Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Using Medial Distal Tibia Anatomical Locking Compression Plates for Distal Tibial Fractures.

MATERIALS AND METHODS: Prospective analyze of the outcome of minimally invasive percutaneous plate osteosynthesis (MIPPO) using medial distal tibia anatomical locking plate for distal tibia fractures & the functional outcome in these patients was done at the Department of Orthopedics, Vinayaka Missons Kirupananda Variyar medical College and Hospital Salem. Patients of age group between 20-80 years with distal tibia fractures involving the lower one third of tibial Metaphysis and metaphyseo-diaphyseal junction AO/OTA classification type A, B, C distal tibia fratures, Ruedi allgower type II&III pilon fractures, simple fractures were included in the study.

RESULTS: Superficial wound infection (13%) occurred in 2 patients. It resolved after regular wound care and antibiotics. Deep wound infection occurred in 3 patients(20%), among them, implant removal and thorough wound debridement was done in two patients after fracture union, fracture was not united in one patient, he was put on temporary external fixation, two patients required local flap cover(13%).Implant removal was done in five patients(4 due to infection, one after fracture healing)(33%).One patient (6%) had plate bending due to premature weight bearing. One patient lost the follow up due to unknown reason. Two patients had malunion (13%). Three patients had angular deformity. One patient had limb length discrepancy. No patient had a postoperative neuro vascular complication.

CONCLUSION: The correct surgical technique (such as positioning the plate at correct offset after appropriate fracture reduction, which is confirmed by a final C-ARM check), and correct timing of surgery (which is evidenced by wrinkle sign), the anatomically precontoured medial distal tibia locking plate is suitable option for internal fixation of distal tibia fractures which may favors a better functional outcome and faster fracture healing

KEY WORDS: MIPPO, distal tibia, fracture, wound infection, locking plates.

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INTRODUCTION:

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Distal tibia fracture is a therapeutic challenge in modern orthopedics. Due to fracture pattern, periarticular location, minimal soft tissue coverage, the surgical treatment is complex one. Various modality of surgical treatment such as closed intramedullary nailing, Open Reduction Internal Fixation with conventional plate osteosynthesis and external fixation has been tried so far. But none of them have good functional outcome but high complication rate (20-50%). Closed intramedullary nailing of distal tibia fracture can be a good option in AO type A fractures but the hourglass shape of the distal tibia does not allow anatomical reduction resulting in rotational and angular malalignment. Closed nailing is not an option, if the fracture line is less than 5cm from the articular margin (Type B, C fracture). External fixation is indicated in severe soft tissue injury or as a temporary stabilizing device. Pin tract infection, malreduction and joint stiffness are the drawbacks of external fixation. Though ORIF with conventional plating provides anatomical reduction and addressing the rotational, angular malreduction. It is associated with extensive soft tissue dissection and periosteal stripping which devitalize the fracture fragment resulting in nonunion, infections and wound dehiscence. The newer technique of fixation of distal tibia fractures - minimally invasive percutaneous plate osteosynthesis involves less soft tissue handling and the minimal periosteal stripping resulting in low infection rate and faster healing. The precontoured anatomical locking plate used on the medial aspect prevents the varus collapse, implant failure and secure the fracture reduction without further displacement.

AIM:

To Study the Functional Outcome of Minimally Invasive Percutaneous Plate Osteosynthesis (MIPPO) Using Medial Distal Tibia Anatomical Locking Compression Plates for Distal Tibial Fractures.

MATERIALS AND METHODS:

Prospective analyze of the outcome of minimally invasive percutaneous plate osteosynthesis (MIPPO) using medial distal tibia anatomical locking plate for distal tibia fractures & the functional outcome in these patients was done at the Department of Orthopedics, Vinayaka Missons Kirupananda Variyar medical College and Hospital Salem.

INCLUSION CRITERIA:

Patients of age group between 20-80 years with distal tibia fractures involving the lower one third of tibial Metaphysis and metaphyseo-diaphyseal junction AO/OTA classification type A, B, C distal tibia fratures, Ruedi allgower type II&III pilon fractures, simple fractures were included in the study.

EXCLUSION CRITERIA:

Patients with Type I ruedi-allgower pilon fracture, Compound fractures, Delayed presentation of more than three weeks and Non-union distal tibia fractures were excluded from the study.

RESULTS:

TABLE 1: AGE DISTRIBUTION OF STUDY POPULATION

Age group	No	Percentage
21-30	4	26 %
31-40	5	33%
41-50	2	13%
51-60	4	26%
Total	15	100%
Mean age	39.5	

TABLE 2: SEX DISTRIBUTION OF STUDY POPULATION

SEX DISTRIBUTION	No	Percentage
Male	9	60%
Female	6	40%

TABLE 3: MODE OF INJURY

Mode		
	No	Percentage
RTA	11	74 %
Accidental fall	4	26 %

TABLE 4: OPERATIVE TIME

Operative Time (mints)		
	No	Percentage
50-60	6	40%
60-70	2	14%
70-80	3	20%
80-90	3	20%
90-100	1	6%
MEAN TIME	71	

TABLE 5: COMPLICATIONS

COMPLICATIONS	No	Percentage

Superficial Infection	2	13%
Deep Infection	3	20 %
Malreduction	2	13%
Delayed union	1	6%

TABLE 6: FUNTIONAL OUTCOME

Functional Outcome	No	Percentage
Angular Deformity	3	20%
Limb Length Discrepancy	1	6 %

TABLE 7: OLERUD-MOLANDER ANKLE SCORE

Olerud-Molander Ankle Score	12th week	Percentage	24th week	Percentage
0-20	0	0	0	0
21-40	4	26%	0	0
41-60	2	14%	0	0
61-80	9	60%	3	21%
81-100	0	0	11	79%

DISCUSSION:

Fifteen patients with distal tibia fractures were included in the study and were managed with Minimally Invasive Percutaneous Plate Osteosynthesis with medial distal tibia anatomical locking plates and. Among the fifteen patients thirteen patients have had concurrent fibula fractures. ORIF of fibula was done in seven patients to maintain the limb alignment and it would help in indirect reduction of tibia fracture. The mean age of the patients was 39.50 years. The study included 9 men (60%) and six women (40%); The distal tibia fracture was caused by a low-energy injury(fall) in 4 patients (26%) and by a high-energy injury in 11 patients (73%). The concurrent fibula fractures were in 13 patients (86%). Left side (60%) is more common than right (40%). The mean time interval between injury and surgery was 10.73 days. The mean operative time was 89.3 min. According to the fracture pattern, three (20%), five (13%), seven (53%) and nine (13%) holed plates were used. In seven patients, fibula fractures were stabilized with one third tubular plate with separate incision (53%). The mean rate of union was 19.4 weeks which is comparable to other studies. 72% of fractures united between 16 to 20 weeks. one patient had delayed union. (7%). The mean Olerud-Molander Ankle injury score improved significantly from 57.3 at the end of 3 months to 81.4 at the end of 6 months.

Superficial wound infection (13%) occurred in 2 patients. It resolved after regular wound care and antibiotics. Deep wound infection occurred in 3 patients (20%), among them, implant removal and thorough wound debridement was done in two patients after fracture union, fracture was not united in one patient, he was put on temporary external fixation, two patients required local flap cover (13%). Implant removal was done in five patients (4 due to infection, one after fracture healing) (33%). One patient (6%) had plate bending due to premature weight bearing. One patient lost the follow up due to unknown reason. Two patients had malunion (13%). Three patients had angular deformity. One patient had limb length discrepancy. No patient had a postoperative neuro vascular complication.

Distal tibia fractures are challenging for the modern orthopedic due to the increasing incidence of fracture in young population. It will affect the productivity of the community. Due to the increased use of high velocity motor vehicles, the number of fractures may increase in future. It more common in second and third decade, and most of the distal tibia fractures are associated with severe soft tissue injury which seems to be challenging for the orthopedic surgeons to treat these fractures.

For distal tibia fractures, the combined external and delayed internal fixation, immediate ORIF with plate osteosynthesis, intramedullary nails are the common modality of treatment. It is found that there is successful outcome after plate osteosynthesis, whereas open reduction and internal fixation with nonlocking plates have high rate of complication-related to unstable fixation, wound complications which later lead on to non-union. The new technique of Minimally Invasive Percutaneous Plate Osteosynthesis is giving good results with less complication, due to minimal soft tissue dissection and periosteal stripping, less vascular compromise of the fracture fragments. The non locking plates were having minimal pull-out strength and associated with screw loosening and varus collapse. The new anatomically precontoured Locking Plate system have the advantage to overcome the complications occurring in conventional plating. Wang Cheng et al they compared the MIPPO technique with conventional ORIF with non-locking plate osteosynthesis. They concluded that it is advantageous over the conventional non locking plate osteosynthesis in terms of low infection rate and faster healing, though with minimal disadvantageous such as skin irritation and malreduction Pierre Joveniau et al they compared the MIPPO with Intramedullary nailing and Conventional ORIF plate osteosynthesis. They concluded that MIPPO have minimal surgical trauma, less soft tissue infection rate and better functional recovery of tibia with faster healing rate with minimal disadvantage such as malreduction. Mehmet Erol et al, Mario Ronga et al, Neeraj Mahajan et al, they concluded that MIPPO is safe and effective procedure for distal tibia fractures. They found MIPPO has the excellent fracture healing, low infection rate with few complications of delayed healing. MIPPO technique have no need of specialized instrumentations; it is less time consuming and cost effective. Eric J. Strauss et al studied the concurrent fibula fractures in distal tibia fracture fixation with locking plate systems. They concluded that locking plate provides better fixation for fracture pattern in which the fibula cannot be effectively stabilized. Minimally Invasive Percutaneous Plate Osteosynthesis with

anatomically precontoured medial distal tibia locking plate fixation of distal tibia fractures are safe and effective method. On reviewing the literature only few studies have been conducted on this. Most authors have concluded that the MIPPO technique with locking plate provides secure fixation and a better outcome. In our two years follow up, we observed 4 complications in 15 patients. 33% of the complications were due to the superficial and deep infections. While some complications such as non-union, post traumatic arthritis, neuro vascular injury were not seen in our study as compared with other studies. The main challenge in the operative treatment of distal tibia fractures is to achieve effective stabilization of an adequately reduced fracture with minimal surgical soft tissue trauma and preserving the vascularity of the fracture fragments to maximize the functional outcome. Inadequate medial buttressing, varus malreduction results in secondary loss of reduction and implant failure. The locking of the screw head onto the threaded hole prevents the screw from backing out. The limitations of our study were a smaller number of patients and not randomized.

CONCLUSION:

In conclusion, the correct surgical technique (such as positioning the plate at correct offset after appropriate fracture reduction, which is confirmed by a final C-ARM check), and correct timing of surgery (which is evidenced by wrinkle sign), the anatomically precontoured medial distal tibia locking plate is suitable option for internal fixation of distal tibia fractures which may favour a better functional outcome and faster fracture healing. The complications like infections, malreduction, angular deformity are less frequent when the distal tibia fracture are treated with locking compression plates, compared to other techniques like conventional plates, intra medullary nails, external fixation, and conservative methods.

CONFLICT OF INTEREST: NIL

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