Original Article

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Closed Distal Tibia Fractures in Adults: The Outcome of Locking Plate Through the MIPO Technique

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Author`s Contribution

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ABSTRACT

Objective: To study the functional outcome of lock plates in distal tibia fractures through the MIPO (minimally invasive plate osteosynthesis) technique, in Mardan Medical Complex, Mardan.

Methodology: This prospective study (consecutive case series) was conducted on a total of 45 patients from June 2018 to December 2021. Adult Patients with isolated distal tibia fractures consented to lock plate (3.5mm) fixation through the MIPO technique after fulfilling the inclusion criteria. The fracture was classified according to the AO/OTA system. The mean delay from injury to operation was 6 days (0-8). Patients were followed up from 9 months to 24 months with a mean follow-up of 19 months. At last follow-up data was recorded. Functional results were graded according to the Olerud-Molander functional evaluation score (OMFS).

Results: The total number of patients who underwent locking plate fixation through the MIPO technique is 45, with a mean age of 55 years (22-88) at the time of surgery. The mechanism of injury was road traffic accidents (47%) in most of the cases followed by falls from height (36%). All fractures united at an average of 19 weeks (15-24) with acceptable length and alignment, except in two cases that united at 26 weeks. No complications like deformities, compartment syndrome, non-union, implant irritation/skin impingement, or implant failure were seen in our study. Functional results were graded according to the Olerud-Molander functional evaluation score (OMFS), 47% were excellent, 44% were good, 7% were fair and 2% were poor.

Conclusion: MIPO is a safe alternative to conventional ORIF in achieving union for plating fracture of the distal tibia. Its functional outcomes are good with the least soft tissue dissection and complications associated with conventional open reduction.

Keywords: Distal tibia fracture, MIPO technique, locking plate, indirect reduction

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Introduction

Distal tibia fracture has been a challenge for an orthopedic surgeon.[1-4] It is a common injury with 10-13% of all tibia fractures.[5] The causative forces leading to these fractures are both mild and severe in magnitude.[6] Because of its location just below the skin, minimal soft tissue coverage, and limited blood supply, it is prone to infection and nonunion.[7] The problem is that's why two-fold; difficulty in fixing the small distal fragment and limited blood supply with deficiency of soft tissue coverage.[8-10]

The best choice of operative procedure for the distal tibia is still controversial.[5] The principles for fracture healing are, stable fixation and early mobilization but without sacrificing the blood flow to the fracture fragments. Different options are available for the fixation of unstable fractures i.e. intramedullary nailing, open reduction internal fixation, and external fixation. Although nailing is associated with the least injury to the surrounding soft

tissues it is not suitable for distal fracture in controlling the deformity in both planes.[11-14] They are also associated with knee problems.[15,5] Open reduction and internal fixation need the dissection of soft tissues which jeopardizes the local vascularity.[1,16,17]

To get the best results one must achieve firm and acceptable fixation without making bone vascularity vulnerable.[3] Plate fixation with less invasive methods is used for deceased soft tissue trauma and viability of the fracture ends.[18,19] Unstable fractures are best treated with a lock plate system through a minimally invasive technique. These devices have angle stable fixation with the least chance of deformity as well as a cut-out of screws.[8] They vary in design, composition, lengths, and screw types.[20] MIPO is a popular technique these days although it is not complication-free at all. Infection and skin impingement by the plate can occur. There is also more or less radiation exposure.[21] Reduction is slightly difficult with the MIPO technique.[14] This study hypothesizes that locking plate fixation through the MIPO technique is an effective way of treating distal tibia fracture.

Methodology

This prospective study in the Orthopaedic Department of Mardan Medical Complex, Mardan from June 2018 to December 2021.

Inclusion criteria: Adult patients with a minimum limit of 18 years of either gender with isolated closed distal tibia fractures AO/OTA43, with least or no comminution.

Exclusion criteria: Patients with polytrauma, pathological fractures, unfit for anesthesia, open fractures, and previous external or other fixation were excluded from the study. Diabetics, active smokers, and patients having an active infection in the operating leg were also excluded.

A total of 45 patents were included in the study according to the inclusion criteria. After approval of the study from the hospital ethical committee (ERB). All patients were fully educated regarding the whole process and informed consent was taken. Adult patients admitted through emergency and outpatient departments fulfilling the inclusion criteria were enrolled for the study. Adult patients with closed distal tibia fractures were assessed both clinically and radiologically. All fractures were classified on plain orthogonal radiographs according to AO/OTA classification. Patients were optimized for anesthesia and surgical procedures. All surgeries were done by two senior surgeons.

Table I: OMFES Score Points	
Excellent	Score 91-100
Good	Score 61-90
Fair	Score 31-60
Poor	Score less than 30

Results

The current study, consisting of a total number of 45 patients, was treated with a locking plate through the MIPO technique. Out of these 45, males were 26(57.77%), and 19 (42.22%) were female patients with a ratio of 1.4:1. Their mean age at the time of surgery was 55 years (22-88). In 24 cases right tibia was fractured and 21 patients had the left tibia fractured. 21 cases sustained fractures following road traffic accidents (high energy trauma) and 16 cases had fallen from height while 5 had sustained fractures following ground level fall (low energy trauma). The mean operative time was 61 minutes. Type A fractures were most common, 89% followed by type B, 9%, and type C, 2%. Most of the patients were operated on within less than 7 days of admission.

Patients were followed up from 9 months to 24 months with a mean follow-up of 19 months. The fractures united in all patients with 4 cases of delayed union, which took 20 weeks for the radiological signs of callus formation, with a mean time of 18 weeks. Post-operatively patients after 4 to 6 weeks depending on the check x-ray patients were allowed full weight bearing. Post-operatively, 2 patients developed a superficial skin infection, and 2 patients developed ankle stiffness which was improved with antibiotics and physiotherapy respectively. One case of deep infection was treated with wound debridement and intravenous antibiotics. Serial follow-ups at 6 weeks, 3 months, and 6 months showed an improved range of motion in ankle joints. A good amount of range of mobility of the ankle joint was present in almost all patients except for three patients with restriction of plantar flexion. There were two cases of mild pain on walking and one with constant severe pain. There was no case of deformity after fracture healing.

Table II; Demographic data and results.		
LATERALITY		
Right	24	53.33%
Left	21	46.66%
FRACTURE TYPE AO/OTA		
43A	40	89%

43B		4	9%
43C		1	2%
Age Range Distribution (years)			
18-30		5	11%
31-40		6	13%
41-50		9	20%
51-60		7	16%
61-70		8	18%
71-80		6	13%
81-90		4	9%
Mode of Injury			
FALL	Ground level	5	11%
	Height	16	36%
RTA	Passenger accident	12	27%
	Pedestrian injury	9	20%
Physical assault		0	0%
Blunt trauma		3	7%
AVERAGE DELAY TO SURGERY			4.28 days

OPERATION TIME(minutes) Average	61	
Complications		
Infection-superficial	2	4.4%
Nonunion	0	
Malunion	0	
Stiffness ankle	1	2.2%

Discussion

The main objective of treating distal tibia fracture is the re-establishment of the normal anatomy of the tibia and normal biomechanics of the ankle joint with the least complications such as infection. The minimally invasive approach to the distal tibia for lock plate fixation in elderly osteoporotic patients is an extremely useful procedure. The lock plate is also mandatory fixation of short distal fragments even in young adults. It is also an acceptable method with better results for adult nonosteoporotic patients with some extra benefits as compared to the open method. There are fewer chances of local infection because of minimal soft tissue dissection with this method as compared to ORIF. Minimal compromise to local blood flow results in speedy healing of both bony and soft tissue components. An early start of the range of motion exercises can avoid joint stiffness. The lock plate system is an angle-stable fixation with the least chance of alignment loss to varus or valgus malunion as compared to nailing the distal third tibia or conventional plates.

Our average time to radiological union was 18.09 weeks which is almost similar to T.W.Lau et al.[21] Functional results were graded according to the Olerud-Molander evaluation score (OMFS).[22] Which were 47% excellent, 44% good, 7% fair, and 2% poor. Our mean OMFES points were 86.55 (range 25-95) which is similar to Barış A et al.[23] The union rates were better in types A & B than in C fracture. Functional scores were also better for types A and B (p-value <0.05). This was because of intraarticular involvement, cartilage damage, and poor rehabilitation by the patient. This is evident from the literature that fracture complexity is a bad prognostic factor for good outcomes.[24] The most common mode of injury was road traffic accidents (RTA) followed by falls from height. Blunt trauma, resulting from a fall of a heavy block, stone, or timber on the leg, was only 7%. Most fractures (80%) were reported in ages 30 to 80 years. The mean age at the time of surgery was 54 years in our study which is almost the same as in Surinder Kumar's study.[22] In the current study average time to surgery was 4.28 days which is also approximately the same as in the study by Venkata Paluvadi SM.[25]

Limitations of the study: The sample size was small and the short duration of follow-up was. For long-term results, the duration should be increased and the sample size should be bigger.

Conclusion

MIPO is a safe alternative to conventional ORIF plating fracture of the distal tibia. Its functional outcomes are good with the least soft tissue dissection and complications associated with conventional open reduction. It is recommended to apply the basic principle of fracture management to avoid bony and soft tissue complications and revision surgeries. Timing of surgery and soft tissue condition is most important for a good outcome as is a scrupulous operating skill.

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