



ISSN (P): 2521-3466
ISSN (E): 2521-3474
© Clinical Orthopaedics
www.orthoresearchjournal.com
2018; 2(3): 38-41
Received: 14-05-2018
Accepted: 16-06-2018

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Comparative study of minimally invasive plate osteosynthesis versus distal tip locking tibia nailing in treatment of distal 1/3 tibia shaft fractures

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Abstract

Introduction: Distal 1/3 tibia shaft fractures pose a greater challenge to the surgeon due to its proximity to the ankle joint and due to lack of soft tissue protection. Choosing Modality of fixation in this fractures is quite difficult due to its proximity to ankle joint and less soft tissue coverage. Here this study tries to compare two most commonly used modalities that are tip locking nail and MIPO to find a better mode of fixation.

Methods: There are 42 patients of fractures distal 1/3 tibia shaft fractures during a period of January 2016 and January 2017. They are randomly divided into two groups out of which 21 treated by tip locking nail and 21 patients by MIPO.

Results: Out of 42 patients 21 (50%) treated by MIPO and 16 (50%) by tip locking nail. The mean age of the patient treated with the plate was 38.6 years. The mean age of patients treated by expert tibia nail is 39.18 years. 4 patients treated with MIPO had complications of superficial infections, ankle pain, implant failure. 7 patients operated by tip locking nail presented with knee pain, implant failure, malunion.

Conclusion: Our study throws light on the tip locking nail as the effective method in lesser operative time, early mobilization of the patient and faster healing of fracture compared to MIPO. Even surgical wound infection rate was more common in MIPO than tip locking nail. But, anatomical reduction and proper fixation are achieved through MIPO than compared to tip locking nail.

Keywords: Distal 1/3 tibia shaft fractures, MIPO, tip locking intramedullary nail, extra articular

Introduction

Tibia bone is subcutaneous bone with depleted muscular coverage. Fracture distal end 1/3 tibia shaft most commonly encountered fracture in high energy trauma^[1]. Distal 1/3 tibia shaft fractures have consequently decreased vascularity which in turn causes delayed bone union¹. A variety of treatment modalities have been suggested including external fixation, intramedullary nailing, plate fixation are commonly followed procedures. But nailing has drawbacks of malunion, nail propagates into ankle^[2]. For plate, there is extensive exposure of the fracture site and infections are common^[3]. To overcome this difficulties tip locking nail and MIPO were introduced. This study includes the outcome of patients treated with tip locking nail and MIPO for distal 1/3 tibia shaft fractures.

Materials and methods

Out of 42 patients with distal 1/3 tibia shaft fracture during January 2016 to January 2017 are included in the study. They are divided into two groups of 21 patients into MIPO and 21 tip locking nail group.

The inclusion criteria are:

1. Patients above 18 years
2. All extra-articular distal 1/3 tibia shaft fractures

Exclusion criteria

- 1) Pathological fractures
- 2) Open tibia fractures
- 3) Pilon fractures
- 4) Associated with malleolar fractures

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The patients were assessed after taking history and local examination X rays and investigations are done. The fracture was stabilized above knee slab and later on posted for surgery. The patient was followed up for 3 months by serial radiographs and clinical examination and look for the range of movements, wound complications, pain, Union. The functional outcome assessed by the American orthopedic foot and ankle society score.

Results

Of 42 patients treated, patients treated by tip locking nail had the mean age of 39.8 years and by MIPO is 38.6 years. Road traffic accidents are the most common mode of injury. The mean surgical time for tip locking nail patients was 52 minutes and for MIPO is 76 minutes. The mean radiological healing time for tip locking nail patients was 13 weeks and for MIPO is 15.2 weeks.

Table 1: Shows sex ratio of patients operated with MIPO and tip locking nail.

Sex	Mipo	Tip Locking Nail
Male	16	15
Female	5	6
Total	21	21

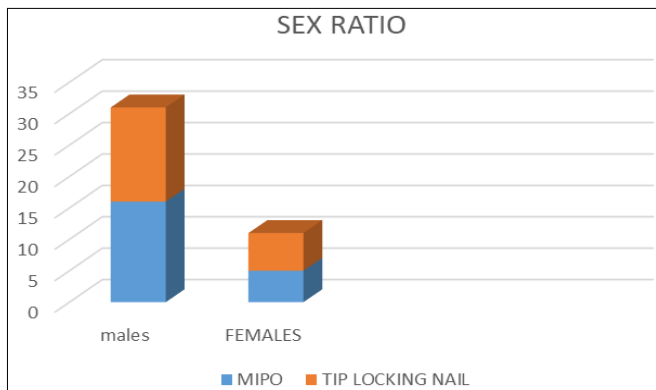


Fig 1: Shows bar diagram male and female patients operated by MIPO and tip locking nail.

Table 2: Showing various modes of injuries and their treatment.

	MIPO	Tip Locking Nail	Total
Rta	19	19	38
Fall	2	1	3
Sports	0	1	1

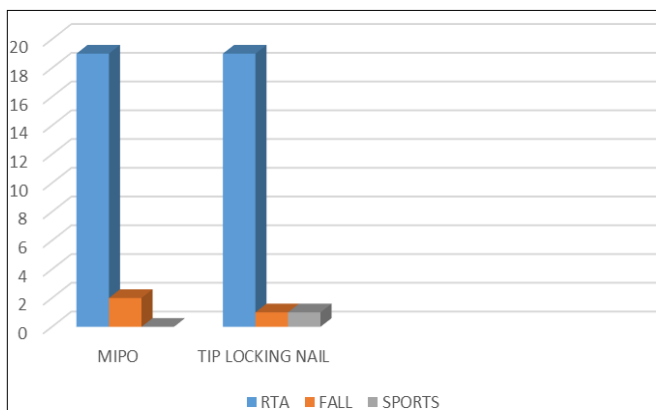


Fig 2: Shows various modes of injuries and their mode of treatment.



Fig 3: Shows x-ray image of 35 year male patient with twisting injury of leg and x- showing oblique fracture of distal 1/3 tibia fracture.

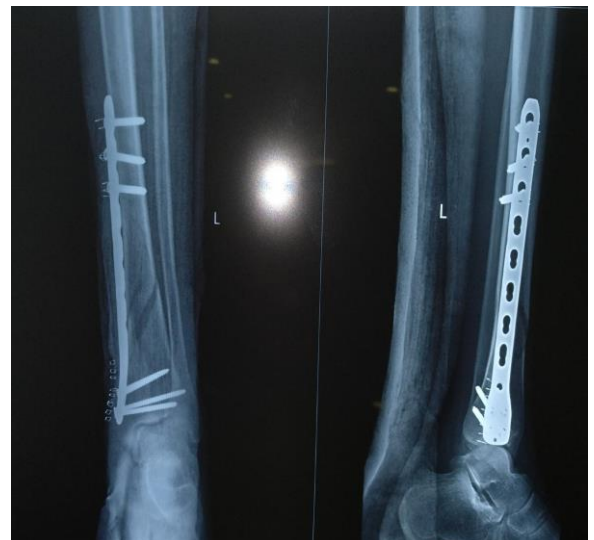


Fig 4: Post-operative day 2 x-ray image of the operated limb operated with MIPO.



Fig 5: Shows x-ray image of 33 year old male patient with history of self-fall from bike and develop oblique fracture of tibia distal 1/3 shaft.

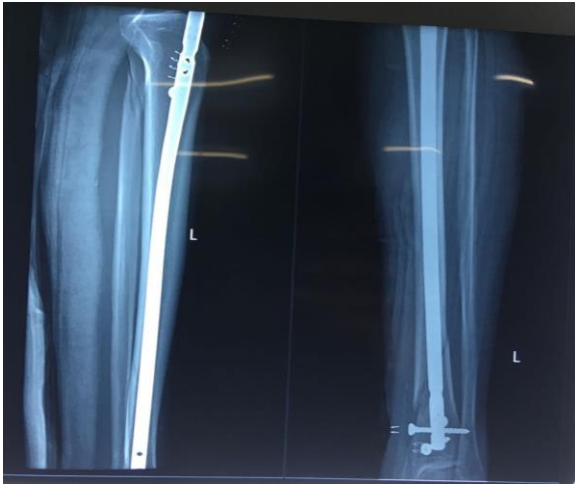


Fig 6: Shows post-operative x-ray image of the patient operated with tip locking intramedullary nail.

	MIPO	Tip Locking Plate
Advantages	Good Rigid Fixation Anatomical Reduction	Less Invasive Load Sharing
Disadvantages	Soft Tissue Dissection, Surgical Site Infection	Malunion

There were reports suggesting MIPO as safe while avoiding various complications like extensive soft tissue dissection. Changes in implant design enhance the stability of the bone-nail construct and reduce the risk for secondary malalignment in tip locking nailing compared to standard nail. KUHNS *et al.* [9] studied on expert tibia nailing the results of their prospective case series demonstrate favorable results and extended indications, compared to standard tibia nails. Tyllianakis *et al.* [10] in their results indicate interlocking intramedullary nailing is a reliable method of treatment for distal tibia fractures and is characterized by high rates of union and a low incidence of complications.

Our study shows tip locking nailing showed better results in the meantime of surgery and early mobilization. The mean union time is better when compared to plating. This was reinforced by Yash Rabari *et al.* [11] in their study that less surgical time and early mobilization in nailing compared to plating. In our study, it also showed the plating had lesser complications compared to nailing in malunion, knee pain, ankle pain. Hasenboehler *et al.* [12] in their study showed MIPO seems more advantageous for soft tissue and bone biology, prolonged healing was observed in simple fracture patterns when a bridging plate technique was used. Lau *et al.* [13] stated in their study that complications such as late wound infection and impingement are relatively common. The overall clinical outcome is still good despite the presence of these complications.

Conclusion

Thereby we conclude that tip locking nailing is an advantage compared to plating due to less time of surgery, early mobilization and faster union in treating distal tip locking nailing, lesser infections of the operative site compared to MIPO. But, due to smaller sample size we cannot comment about the overall functional outcome of the distal tibia fractures and further studies are required.

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Postoperatively 4 patients operated with MIPO presented two with superficial infections, two with ankle pain, and 7 patients operated with tip locking nail presented three with knee pain, one malunion and one non-union. Superficial infections are treated with sensitive antibiotic therapy in plating patients. One patient with nonunion has been treated by secondary bone grafting.

Discussion

The Orthopaedician take most substantial challenges while operating distal tibia fractures. Most of the fractures due to RTA resulted from axial and rotational forces. There are various modalities proposed for the fixation. Non-operative treatment has drawbacks of the non-union, joint stiffness, loss of reduction [4, 5]. External fixation can cause loss of reduction, pin tract infection, malunion. The open reduction can cause extensive soft tissue dissection, infections, wound complications [6, 7, 8].

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