

International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2017; 3(2): 720-722
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www.orthopaper.com
Received: 14-02-2017
Accepted: 15-03-2017

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Treatment of distal 1/3 tibia fractures: plating versus intramedullary nailing – A prospective comparative study

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DOI: <http://dx.doi.org/10.22271/ortho.2017.v3.i2h.74>

Abstract

Background: Tibia is the most commonly fractured bone amongst all long bones of the body due to its position and lack of soft tissue protection. Treating tibia distal 1/3rd fracture is still a greater challenge. Fracture of distal shaft without involving articular surface are of common occurrence but the management of these unstable extraarticular distal tibia fractures remains challenging. The mechanism of injury and the prognosis of these fractures are different from pilon fractures, but their proximity to the ankle makes the surgical treatment more complicated than the treatment of tibial midshaft fractures.

Methods: There were 73 patients of fracture distal 1/3 tibia were enrolled during 2-May-2015 to 31-Dec-2016 in the study. They were randomly divided into two groups, there were 30 patient treated with distal tibia tip locking nail and distal 43 patient treated with distal tibia plate.

The patients were followed up every four weeks till radiological union was seen. At every follow up clinical examination was done to assess status of the surgical wound, pain, tenderness, range of motion of ankle, stability of the fracture and clinical union. X rays were taken in AP and Lateral views to look for signs of radiological union. The union is confirmed radiologically when plain X-ray showed bone trabeculae or cortical bone crossing fracture site on at least three surfaces on orthogonal radiograms. The functional outcome was assessed by. The American Orthopedic Foot and Ankle Society Score (AOFAS).

Results: There were total 73 patients among them 43 (58.9%) treated with open reduction and internal fixation with distal tibia plate and 30 (41.1%) treated with intramedullary tip locking nail. The mean age of patient treated with plat was 39.98 years (SD+9.64, Min-Max: 25-60) and treated with nail was 41.2 years (SD+10.28, Min-Max: 22-61).

Conclusion: Our study suggest plating is more effective method for extra articular closed distal 1/3 tibia fracture than intramedullary tip locking nail according to functional outcome with minimal postoperative complication

Keywords: Distal tibia, plate, nail

Introduction

Tibia is the most commonly fractured bone amongst all long bones of the body due to its position and lack of soft tissue protection^[1]. Treating tibia distal 1/3rd fracture is still a greater challenge^[1]. Fracture of distal shaft without involving articular surface are of common occurrence but the management of these unstable extraarticular distal tibia fractures remains challenging. The mechanism of injury and the prognosis of these fractures are different from pilon fractures, but their proximity to the ankle makes the surgical treatment more complicated than the treatment of tibial midshaft fractures. A variety of treatment methods have been suggested for these injuries, including nonoperative treatment, external fixation, intramedullary nailing and plate fixation^[2]. However, each of these treatment options is associated with certain challenges. Nonoperative treatment may be complicated by loss of reduction and subsequent malunion. Similarly, external fixation of distal tibia fractures may result in insufficient reduction, malunion, and pin tract infection. Intramedullary nailing can be considered the “gold standard” for the treatment of tibial midshaft fractures, but there are concerns about their use in distal tibia fractures. This is because of technical difficulties with distal nail fixation, the risk of nail propagation into the ankle joint, and the discrepancy between the diaphyseal and metaphyseal diameter of the intramedullary canal^[3].

Open reduction and internal plate fixation results in extensive soft tissue dissection and may be associated with wound complications and infections. The optimal treatment of unstable distal tibia without articular involvement remains controversial. There is no consensus on the best method of treatment. This include outcome of the patients treated with Distal tibia plate and Distal tibia tip locking nail in extra articular distal 1/3 tibia fracture as this are two main modalities of treatment.

Material and Methods

There were 73 patients of fracture distal 1/3 tibia were enrolled during 2-May-2015 to 31-Dec-2016 in the study. They were randomly divided into two groups, there were 30 patient treated with distal tibia tip locking nail and distal 43 patient treated with distal tibia plate. The inclusion and exclusion criteria were as mentioned below.

Inclusion criteria

- All extra articular closed fractures of distal 1/3 up to 43-A3 of AO classification distal tibia
- Patients of age 18 years and above
- Fresh fractures

Exclusion criteria

- Fracture of middle 1/3 and proximal 1/3 region of tibia
- Patients treated conservatively or any other method for other medical reasons.
- Open fractures.
- Pathological fractures.
- Patients who were lost to follow up or died before the fracture union.
- Patient with nerve injury.

The patients were first seen in the casualty. The history was taken followed by general and local examination of the patient. Neurovascular status was noted specially for nerve injury. X rays and other investigation were done. The fracture was temporarily immobilized with a below knee slab. Pre-operative planning and investigations were done and the patients were posted for open reduction and internal fixation with plate or closed reduction internal fixation with tiplocking nail.

Standard minimal invasive approach was used for tip locking nailing. Medial minimal invasive approach was used for distal tibia plating. Fracture classified according to AO classification of fracture distal tibia.

The patients were followed up every four weeks till radiological union was seen. At every follow up clinical examination was done to assess status of the surgical wound, pain, tenderness, range of motion of ankle, stability of the fracture and clinical union. X rays were taken in AP and Lateral views to look for signs of radiological union. The union is confirmed radiologically when plain X-ray showed bone trabaculae or cortical bone crossing fracture site on at least three surfaces on orthogonal radiograms. The functional outcome was assessed by The American Orthopedic Foot and Ankle Society Score (AOFAS).

Results

There were total 73 patients among them 43 (58.9%) treated with open reduction and internal fixation with distal tibia plat and 30 (41.1%) treated with intramedullary tip locking nail. The mean age of patient treated with plat was 39.98 years

(SD+-9.64, Min-Max: 25-60) and treated with nail was 41.2 years (SD+-10.28, Min-Max: 22-61).

The sex of the patient is not significant statistically. (Table.1) Road traffic accident was major mode of injury to distal tibia fracture. (Table-2)

The mean radiological healing time in patient operated with plat was 14.30 weeks (SD+-0.74) and in patient operated with nail was 13.43 weeks (SD+-0.63). The mean radiological healing time difference in patient operated with plat and in patient operated with nail was 0.87 week(t=5.25, df=71, P value =0.0001).

With open reduction and internal fixation with plat more excellent results were found than close reduction and internal fixation with tip locking nail according to functional outcome with AOFAS score assessment which is statistically significant. (Figure1)

Postoperatively in the plating group there were 4 cases complications and in the nailing group there were 12 cases with complications. Complications were more in the nailing group, which was statistically significant. (Figure.2)

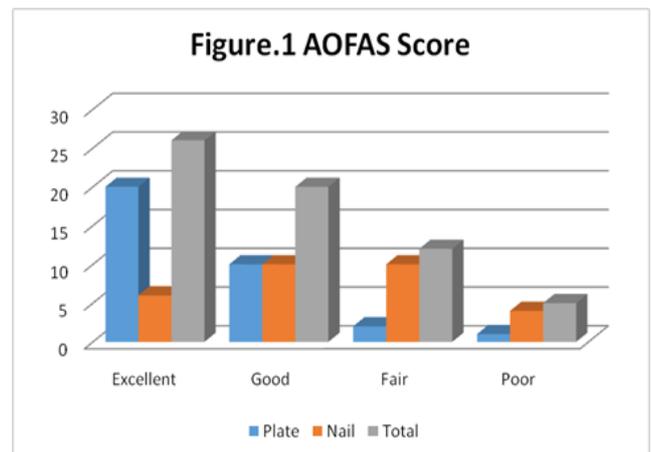
Table 1: Sex of the Patient

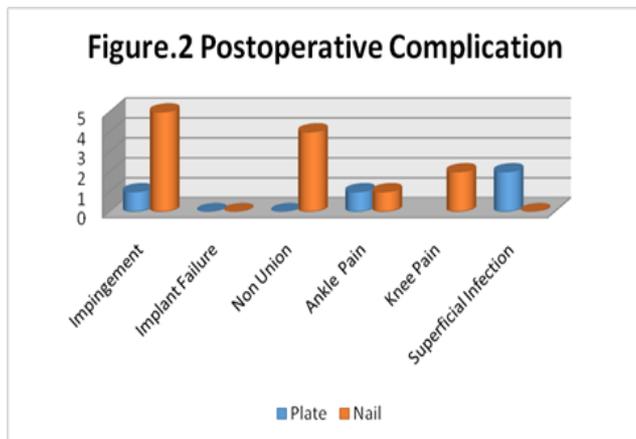
Sex	Plate	Nail
Male	38	27
Female	5	3
Total	43	30

Chi Square-0.27 P value-0.87

Table 2: Mode of Injury

Mode Of Injury	Plate	Nail	Total
Domestic	1	2	3
RTA	38	26	64
Sport	1	0	1
Assault	3	2	5





Discussion

Distal metaphyseal fractures are challenging fractures to treat given the number of complications arising out of various surgical modalities of treatment. These fractures are most often high energy fractures resulting from axial and rotational force on distal tibia [4-7]. There are multiple studies in the literature comparing various modalities of treatment for distal tibial fractures. The various treatment options include plating, Nailing, AO external fixation, Ilizarov fixation to conservative treatment. Although many studies are there already in the literature comparing the efficacy of each surgical methods the optimum treatment remains controversial.

Nonoperative treatment is also used in case of stable fractures with severe co morbidities but complications like delayed union, malunion and joints stiffness are very common [8,9].

Locking plate fixation gives good rigid construct, anatomical reduction and biomechanically superior to intramedullary nailing, however it results in results in extensive soft tissue dissection resulting in wound complications and infections. Hardware complications are more with locking plates warranting implant removal more frequently. With use of minimally invasive techniques the complications have significantly reduced [10-12].

Tip Locking Intramedullary nails are commonly used for treatment distal tibia fracture where the fracture is away from the plafond allowing two or more distal locking bolts. Though it is less invasive than plating, technically more challenging to achieve and maintain reduction because of anatomic characteristics of distal tibia [13-18].

Our study principally compares the results of distal tibial fractures treated with tip locking intramedullary nailing and plate. This study has shown plating to have lower rates of nonunion and malunion and lower rate of complication than in plating group but little more healing time than nail. Patients undergoing nailing anterior knee pain was seen in two patients. Four patients from nailing group had gone into nonunion for which additional surgery was done to achieve union. For four nonunions in nailing group, bone grafting was done. Two patients had superficial infection in plating group post operatively which was managed by wound debridement and antibiotic according to culture.

Conclusion

Our study suggest plating is more effective method for extra articular closed distal 1/3 tibia fracture than intramedullary tip locking nail according to functional outcome with minimal postoperative complication.

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