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# Assessment of the treatment outcome of closed extra-articular distal tibia fracture: IM nailing vs plating

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## Abstract

**Background:** The tibial diaphyseal fractures are the most common type of long bone fractures encountered by most orthopedic surgeons. In accordance with descriptive indices of tibia fractures on the basis of their location in the bone, distal tibia fractures have the second incidence of all tibia fractures after the middle tibia fractures. The purpose of the study was to assess the complications and treatment outcome of closed extra-articular distal tibia fracture.

**Methods:** The results of the management for 76 patients with closed extra-articular distal tibia fracture by intramedullary nailing and plating were reviewed retrospectively. The variables included AO (Arbeitsgemeinschaft fur Osteosynthesefragen) classification of tibia fracture, the mean duration of union, malunion, and nonunion.

**Results**: Twenty seven and forty nine patients were treated by intramedullary (IM) nailing and plating respectively. The most common type of fractures was A1 which was observed in twenty five patients. Initial union and nonunion occurred in sixty three and thirteen patients respectively. Eight patients had nonunion in plating group and five of twenty seven patients in IM nailing group. Eleven of twenty seven patients in IM nailing group suffered from malunion while only four patients in the other group had this complication.

**Conclusion**: The plating Technique in comparison with IM nailing has a satisfactory functional outcome. The technique has a lower incidence of malunion and nonunion, and it should be recommended as a good treatment option for the management of extra-articular closed fracture of distal tibia.

**Keywords**: Closed extra-articular fracture, management, distal tibia.

## Introduction

The tibial diaphyseal fractures are the most common type of long bone fractures encountered by most surgeons [1]. On the basis of the fracture location in the bone, distal tibia fractures have the second highest incidence of all tibia fractures after the middle fracture of tibia [2]. Management of distal tibia fractures poses one of the most challenging treatment problems in fractures management due to the high rate of nonunion and difficulty in reduction management.

Treatment options are both operative and nonoperative ones. The three basic operative techniques are intramedulary nailing, plating,

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and external fixation. Intramedullary nailing has revolutionized the management of tibial diaphyseal fractures although many studies showed that use of such technique has lots of complications [3,4,5]. Many studies have suggested various clinical outcome in cases managed by plating fixation [6,8,9].

Due to absence of defined criteria in the literature for the surgical approaches to such fractures, this study centered to assess and compare the treatment results of IM nailing technique and plating approach.

**Methods**

The clinical outcome of Intramedullary nailing and plating of distal tibia fractures was reviewed in seventy six consecutive patients at Shafa Yahyaian hospital between 1382 - 1386. The mean age of patients with surgical treatment was 34.76 years (range, 18 to 82 years). Fifty Eight patients were male and eighteen were female. All patients had an established distal tibia fractures. IM nailing had been used in twenty seven patients; plating in forty five patients and lateral plating in other four cases. In those treated by lateral plating, three cases had union without any malunion but nonunion occurred in others.

The distal tibia fracture was classified radiographically with use of AO system [7] into three distinct radiographic types of fracture. Forty four patients had unifocal fractures (Type A); Wedge fractures occurred in twenty six cases (Type B) whereas six cases had complex fractures (Type C) (Table 1).

The anteroposterior and Lat x-rays were obtained on the regular basis postoperatively until osseous union was achieved and visits were done variably thereafter. All patients were examined by the senior author at the time of the most recent follow-up. Particular attention was paid to the anterior knee pain, the range of motion of the ankle and any residual angular deformity. The mean duration of follow-up after the surgery was 11.03 months [range, 5 to 66 months).

*Treatment Protocol*

Identical operative technique was used in each group of patients [IM nailing, lateral plating and medial plating group).

**Results**

Generally, union of the fracture site was achieved in sixty three patients with a mean of 126.1 days in the plating group and 129.6 days in other. In lateral plating group, initial consolidation of the fracture was obtained in three of four patients. Most union of the fractures as well as nonunion was observed in male patients.

Among thirteen nonunion cases, eight patients were belonged to the plating group and others to the Intramedullary nailing one. In other words, eight of forty nine patients with plating had nonunion [16.3%) whereas nonunion occurred in five of twenty seven cases treated by the IM nailing [18.5%).

Malunion of the distal tibia resulted in eleven of twenty seven patients managed by IM nailing while only four of forty nine patients in plating group suffered from malunion (Table 2). The most frequent malunion was valgus deformity (47.6%). Seventy one cases (93.4%) had no superficial or deep infection. But at the final follow-up, three superficial and two deep infected cases were detected.

Concerning other complications, one patient had peroneal nerve palsy in the IM nailing group and one DVT in the plating group.

**Discussion**

Currently, three surgical techniques (Plating, IM nailing, and external fixation) are being used with relative success for the treatment of distal tibia fractures. However, there is a lack of long-term studies of these methods.

The current technique of tibia plating has been well described, and several authors have reported success in obtaining initial consolida-



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| AO system | IM Nailing | Plating |
|---|---|---|
| A1 | 6 | 19 |
| A2 | 10 | 6 |
| A3 | 1 | 2 |
| B1 | 2 | 6 |
| B2 | 6 | 10 |
| B3 | 1 | 1 |
| C1 | 0 | 1 |
| C2 | 1 | 0 |
| C3 | 0 | 4 |

Table 1. The AO classification of the tibial diaphyseal fractures in the IM nailing and plating groups

tion [10,11]. However, there are potential pitfalls. The technique requires a long surgical incision in which soft tissue injury can not be avoided.

Numerous authors have reported the use of IM nailing for treatment of the distal tibia fractures [1,3,4,10,12]. Twelve of twenty four patients with distal tibia fractures treated with IM nailing were reported on by Janssen et al [12]. It was concluded that maintenance of alignment in all directions by IM nailing was a difficult task and tibia malalignment can cause degenerative changes in knee and ankle joints. Jenssen et al reported different complications in their study. The Flexor Hallucis Longus involved in the fracture site in one patient which required the second surgery. Another patient had medial plantar nerve injury. The other complication of this technique was anterior knee pain [12].

In our practice, the rate of union was nearly identical in both groups as shown by other studies and incidence of nonunion in the IM nailing and plating groups was almost identical to Vallier et al proved the matter in their study [3].

Nontheless in this study, malunion occurred much more in those treated with the IM nailing much more than plating group. The incidence of malunion in different studies was ranged from 0 - 50% [4,12,13]. Some authors suggested that the fibula fixation played a key role in preventing tibia angulation in both treated groups particularly in the 1/3 distal tibia fractures [12]. In our practice, all fibulas were fixed in the plating group in contrast to IM nailing group. The low rate of malunion in the plating group was probably related to the fibula fixation.

| | IM Nailing | Plating |
|---|---|---|
| Cases with malunion | 11 | 4 |
| Cases with no malunion | 16 | 45 |

Table 2. Number of patients with and without malunion in the IM nailing and plating groups

Infection also was other challenging complication in the surgical management of tibia fractures. The incidence of infection was reported from 0 - 8.3% and 0 - 5.3% in the plating and IM nailing group respectively [1,9,10,12]. In our practice, its incidence was higher in the latter group.

## Conclusion

Most cases of distal tibia fractures can be successfully treated with the IM nailing technique & plating approach, but attention to details is critical. On the basis of our experience with both techniques, we can make some recommendations on the plating technique which has a satisfactory functional outcome. The essential surgical step of the plating technique includes careful handling of the soft tissues in order to minimize complications although the rate of malunion in this group could be lower than the IM nailing group.

In comparing the consolidation time, the rate of nonunion and infection in both groups of patients hasd no significant difference occurred. This probably could be explained by a large number of plating versus IM nailing in our hospital.

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