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An outcome analysis of extra articular distal tibia fractures treated with intramedullary nailing and plating

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Abstract
Distal tibia fractures even without articular involvement can be difficult to treat. The aim of our study was to compare the clinical and functional outcomes in patients with distal tibia fractures treated with either plating or intramedullary nailing (IMN). We evaluated the clinical and radiological results with at least 1 year follow up. Our results showed that the distal tibia fractures can be successfully treated with both interlocking as well as plating although our study showed improved outcomes in intramedullary nailing group. We believe that a larger prospective study is required to establish the findings conclusively.

Keywords: Distal tibia, fracture, nailing, plating, extra-articular

Introduction
Tibial fractures continue to remain as the most common long bone fracture. Among these fractures distal tibial fractures continue to present a tougher scenario for treatment as the optimal surgical protocols continue to remain as debatable [1]. Operative fixation remains the mainstay of treatment in displaced fractures. Plating and intramedullary nailing are both well-accepted methods, but both have their own share of complications. Anatomically the medullary cavity of the tibia has a fairly uniform cavity until the junction of the proximal 2/3rd and distal 1/3rd junction. Thereafter, the cavity starts expanding till the subchondral region at the ankle. This explains why nails don't get a good hold in such fractures. On the other hand the limited soft tissue envelope at this region continues to be an impediment to open reduction with internal fixation using plate fixation. This often leads to soft tissue complications and nonunion [2]. Intramedullary nailing has the advantage in such conditions of minimising soft tissue damage and being quite biological. Implant prominence has been an issue with plating in distal tibia as a late sequela [3]. While anterior knee pain has been associated with nailing [4, 5, 6]. Incidences of malalignment have been reported with both the methods [7, 8]. The purpose of our study was to evaluate the clinical outcomes, functional outcomes, and complications of extra-articular distal tibial fractures by intramedullary nailing and plate fixation. Our hypothesis was that intramedullary nailing would provide more acceptable results than plating in extra-articular fractures of distal tibia.

Material and Methods
This was a retrospective study of distal tibia fractures treated by intramedullary nails and plates. We reviewed 55 cases of distal tibia fractures that had been operated by us between 2011 and 2016. None of the skeletally immature cases on x-ray were included in the study. Also, excluded were cases where pathological fractures were suspected.

Treatment protocol
All the open fractures had been debrided and irrigated early. Any fracture that had demonstrated soft tissue compromise was initially managed with spanning external fixator. Once the soft tissue oedema/inflammation subsided to an acceptable level, internal fixation had been carried out. Fibula fixation was done as per discretion of the surgeon for both ankle stability, alignment as well as gaining length in comminuted tibia fractures.
In the patients who had been managed with nailing, fracture reduction was carried out under

fluoroscopic guidance. Incision was made with lateral parapatellar approach and standard tibial nailing was carried out. Patients managed with plating underwent plating with 3.5 mm anatomically contoured stainless steel plates. Compression plating was carried out for simpler fracture geometries while the comminuted fractures were treated with bridge plating.

Post-operative protocol

Post operatively analgesics were prescribed as requirement. Antibiotics advised as per the hospital antibiotic policy. Limb elevation was maintained to prevent swelling and range of movement exercises had been started as soon as pain permitted. Surgical stitches/staples were removed at 12th postoperative day. Weight bearing was advised only after callus had been detected on serial x rays.

Evaluation

The patients were followed up at 2, 6, 12, 24, 36 and 52 weeks postoperatively as per the surgeons usual protocol. Clinical and radiological evaluation was carried out at 52 weeks was used for assessment in our study. Radiological union, time to union, malalignment, any infections (either superficial or deep), secondary surgeries as and when required had been documented for all the patients. We defined union as Union was defined as radiographic bridging of 3 cortices and minimal pain with full weight bearing [9, 10].

Results

We evaluated a total of 55 patients managed with extra articular distal tibial fractures. Parameters assessed were time to fracture union, time till full weight bearing, any secondary surgical procedures required, rate of nonunion, malunion, ankle range of motion, and any other complications.

Table 1: Comparison of results between intramedullary interlocking nailing and plating

	Plating	Intramedullary nailing
No of cases	25	30
Non union	1	0
Malunion	1	1
Infections (superficial + seep)	4	2
Other complications	7	11
Associated fibula fracture	17	21
Time to fracture union	24 weeks	20 weeks
Range of motion achieved (dorsiflexion)	10 degrees	14 degrees
Full weight bearing	18 weeks	14 weeks

Discussion

The distal tibia are defined as the area with in Muller squares of the ankle joint [11]. Anatomical reduction being an important component in the management of distal tibia reduction often entail the open reduction and internal fixation. But this often leads to an extensive dissection leading to devitalization of soft tissue around the injury zone. This gradually lead to extensions in the indications of intramedullary nailing. This prevented extensive soft tissue dissection, allowed earlier load bearing and spared the extra osseous blood supply.

The average duration after which we allowed full weight bearing in the nailing group was 14 weeks while in the plating group it was 18 weeks. Solanki *et al*. and Jayesh *et al*. had reported similar results in their studies.

Solanki *et al*. had shown 19 weeks and 23 weeks as the approximate duration for radiological union in their patients. In our study the results were somewhat similar at 20 weeks and 24 weeks for the nailing group and the plating group respectively.

We had one case of nonunion and it had been managed by plating. Kasper *et al*. in their study had reported 2 cases of nonunion, but their total number of cases was higher.

We found surgical site infection in 4 of the cases managed by plating and 2 of the cases managed by nailing. This was in line with reports of Solanki *et al*. and Krzysztof Piątkowski *et al.*

Average dorsiflexion achieved was higher at 14 degrees in the nailing group as compared to 10 degrees in the plating group.

Like barak *et al.* we also faced malunion in 1 case each in the nailing group and the plating group.

We also conclude that our study had some notable and significant weaknesses. Our study was retrospective in design, which prevented optimal matching. The number of cases studied was low which mandates that a larger study may be necessary for confirmation of the results in this study. A single surgeon study eliminates many variables but also faces the problem of less heterogeneity in the cases or management pattern and less probability of generalising the results.

Fig 1: Preoperative x-ray of distal tibia fracture

Fig 2: Post-operative image of distal tibia fracture managed with plating

Fig 3: Distal tibia fracture managed with intramedullary interlocking nail on follow up at 52 weeks

Conclusion

We came to the conclusion that the extra-articular distal tibia fractures can be treated successfully with both intramedullary nailing and plating. We also identified a few parameters where the results were better for the intramedullary nailing group. In patients managed with nailing we achieved better range of motion, earlier fracture union, less infection rate and earlier mobilization and full weight bearing. We conclude that intramedullary interlocking nail is a more satisfactory method for treatment of extra articular fractures of distal tibia.

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