

Functional Outcome of Distal Third Tibia Fractures Managed by Minimally Invasive Plate Osteosynthesis

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Abstract

The aim of this Study was to assess the “functional outcome of distal third tibia fractures managed by minimally invasive plate osteosynthesis”. The American Orthopaedic Foot and Ankle Society (AOFAS) score was used to calculate the functional outcome. During above mentioned period total 15 patients were treated for distal tibial fracture using MIPO (Minimally Invasive Plate Osteosynthesis) technique.

At the end of six months, AOFAS scores were measured with 3 patients having excellent score, 9 patients having a good score and 3 patients having a fair score. Concerning the complications of surgery, no complication was encountered in 13 of the cases, 1 case encountered a superficial infection and 1 case had a wound dehiscence which were managed accordingly.

Distal tibial fractures typically result from high-velocity trauma and are accompanied by severe soft tissue injury. Consequently, it raises the question of whether to give soft tissue or articular congruity and anatomic reduction priority. The functional outcome of MIPO technique for distal third tibial fractures was evaluated with this study. In our study we have found there is less of soft tissue damage and better bone healing with using MIPO technique.

Keywords: Osteosynthesis • Orthopaedic • Accompanied • Malunion • Fractures

Introduction

The tibia is the most commonly fractured long bone. According to the location of the fracture in the tibia bone following the tibial shaft fractures, the distal tibia has the second highest incidence [1].

Distal third tibia fractures typically result from high-velocity trauma with significant soft tissue injury. In managing these fractures, surgeons face a dilemma of whether to prioritize soft tissue recovery or anatomic reduction and articular alignment.

Ruedi and Allgower presented their seminal paper in 1962, in which 74% of patients had a good functional outcome after 4 years thereby revolutionizing the treatment protocol of distal tibia fractures [2]. Then, in the 1970's and 1980's, the principles of Open Reduction Internal Fixation (ORIF) were widely used in the management of lower third tibia fractures, but these were associated with a high rate of complications such as superficial infection, arthrodesis, osteomyelitis, non-union, malunion [3,4].

Another study by Ruedi and Allgower found good results at follow up post 9 years, but because the majority of the affected patients in their study had low velocity injuries, generalized agreement for

treatment or management for these injuries could not be established [5].

Ruedi and Allgower conducted another study in 1979 with patients who had high velocity injuries and concluded that the overall results were better in low velocity injuries compared to high velocity injuries [6]. Better outcomes were obtained when appropriate soft tissue management was combined with fracture fixation [7,8].

The various treatment modalities for these types of fractures include open reduction and internal fixation with plating, Biplanar external fixator spanning the ankle joint, Ring Fixator application, closed reduction and internal fixation with intra medullary nailing, and Minimally Invasive Plate Osteosynthesis (MIPO).

The method chosen for stabilisation should be sufficient to maintain the reduction. Our study's goal is to look at the functional outcomes of patients who have distal third tibia fractures treated with the Minimally Invasive Plate Osteosynthesis (MIPO) technique.

A study conducted by Borens O et al. titled 'Minimally invasive treatment of pilon fractures with a low-profile plate: preliminary results in 17 cases' from 1999-2001 concluded that minimally invasive

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surgical technique including new low-profile plate decreases soft tissue problems while leading to fracture healing [9]

Another study done by Yip WH et al., entitled 'early experience of meta-physal plating by the minimally invasive plate osteosynthesis technique for closed distal tibial fractures' concluded that the results were encouraging and MIPO was a rational treatment for management of these fractures [10].

Materials and Methods

This study was conducted on 15 patients of distal tibial fractures, at Dr. D.Y. Patil medical college and research center, Pimpri, Pune, from August 2020-September 2022. Required consents from all the patients and ethical committee clearance were taken before conducting the study. During above mentioned period total 15 patients were treated for distal tibial fracture using MIPO (Minimally Invasive Plate Osteosynthesis) technique.

All the patients consenting to be a part of this study over the age of 18 years and medically fit were included in this study. Patients with open fractures, polytrauma, pathological fractures and having neurovascular injuries were excluded from the study. Ethics committee approval was taken before commencing the study. Ruedi-Allgower classification was used to classify the fractures. Fracture was fixed with a distal tibia Locking Compression Plate using the Minimally Invasive Plate Osteosynthesis (MIPO) Technique without opening the fracture site. All the cases were operated by the same surgeons.

Immediate range of motion and non-weight bearing walking was emphasized in post-operative period based on stability of fracture

reduction. Intravenous antibiotics were given till post-operative day 5 and then oral antibiotics were continued till the day of suture removal. The suture removal was done on post-operative day twelve. On discharge non-weight bearing walking with walker and ankle range of motion was advised. Partial weight bearing was started post 12-14 weeks once radiological evidence of bone union was seen.

Patients were followed up at one month, two months, three months and 6 months interval. The American Orthopaedic Foot and Ankle Score (AOFAS) were used at six months to evaluate the functional outcome.

Results

The mean age of patients in our study was 39.3 years. Out of 15 patients, 10 were males and 5 were females. For laterality, 10 patients had a right sided fracture and 5 had a left sided fracture. With respect to the fracture pattern, 10 patients had a Ruedi-Allgower type one fracture, 4 had a type two fracture and 1 patient had a type three fracture.

At the end of six months, AOFAS scores were measured with 3 patients having excellent score, 9 patients having a good score and 3 patients having a fair score.

Concerning the complications of surgery, no complication was encountered in 13 of the cases, 1 case encountered a superficial infection and 1 case had a wound dehiscence which was managed accordingly (Table 1).

| S. No | Pain (40) | Function (50) | | | | | | | Alignment (10) | Total (100) |
|-------|-----------|---------------|----|----|---|----|-----|-----|----------------|-------------|
| | | L | WD | WS | G | SM | HFM | AHS | | |
| 1 | 40 | 10 | 5 | 5 | 8 | 8 | 6 | 8 | 5 | 95 |
| 2 | 40 | 7 | 5 | 3 | 8 | 8 | 6 | 8 | 10 | 95 |
| 3 | 30 | 7 | 5 | 3 | 8 | 4 | 6 | 8 | 10 | 81 |
| 4 | 30 | 10 | 4 | 3 | 8 | 4 | 3 | 8 | 10 | 80 |
| 5 | 30 | 7 | 4 | 3 | 8 | 4 | 3 | 8 | 10 | 77 |
| 6 | 30 | 7 | 2 | 3 | 4 | 4 | 3 | 8 | 5 | 66 |
| 7 | 30 | 7 | 4 | 3 | 4 | 8 | 6 | 8 | 5 | 75 |
| 8 | 30 | 7 | 4 | 0 | 4 | 4 | 6 | 8 | 10 | 73 |
| 9 | 30 | 10 | 5 | 3 | 8 | 4 | 6 | 8 | 10 | 84 |
| 10 | 30 | 4 | 4 | 3 | 4 | 4 | 3 | 8 | 5 | 65 |
| 11 | 30 | 7 | 4 | 5 | 8 | 4 | 3 | 8 | 10 | 79 |
| 12 | 30 | 7 | 4 | 3 | 8 | 4 | 3 | 8 | 10 | 77 |
| 13 | 40 | 7 | 4 | 5 | 8 | 8 | 6 | 8 | 10 | 96 |
| 14 | 40 | 7 | 4 | 3 | 8 | 4 | 3 | 8 | 10 | 87 |
| 15 | 40 | 7 | 4 | 3 | 8 | 4 | 3 | 0 | 10 | 79 |

Table 1. Aofas score chart.

Discussion

Due to the results depending upon multiple factors, selecting a mode of treatment for a distal tibia fracture is still challenging and contentious. It depends on a number of variables, including the condition of the soft tissue, the level of comminution, and the involvement of the articular surface. Our goal is to stabilize the

fracture while also achieving anatomic reduction of the articular surface. Utilizing techniques that reduce bone and soft tissue de-vascularization is the best way to achieve this goal.

Distal tibial fractures typically result from high velocity trauma and are accompanied by severe soft tissue injury.

Consequently, it raises the question of whether to give soft tissue or articular congruity and anatomic reduction priority.

The functional outcome of MIPO technique for distal third tibial fractures was evaluated with this study. To achieve stability, anatomical reduction and rigid fixation were initially prioritized. Due to increased rate of delayed-union and non-union as a result of excessive soft tissue and bone devascularisation, these methods were rendered ineffective. As a result, techniques that prioritized biology over stability emerged and evolved over time.

The average age of patients in our study was 39.3 years which is comparable with studies done by Cory collinge et al., where the average age was 43 and by Vallier et al., where the average age was 39.1 years [11-13].

In our study, the male preponderance for such kind of injuries were 66.66%, which was comparable to study of Cory collinge et al. in which male preponderance was 77%.

After comparing the AOFAS scores post 6 months, 20% patients had an excellent outcome, 60% had good outcome whereas 20% had a fair outcome. Thirteen patients developed no complications post-surgery. One patient had a superficial infection which was managed using oral antibiotics and proper dressing and required no further intervention. Wound dehiscence was observed in one patient who was managed by re-suturing and responded well to it.

Conclusion

In our study we have found there is less of soft tissue damage and better bone healing with using MIPO technique. MIPO technique is the preferred technique when minimal soft tissue injury and severe comminution was present. MIPO approach can better restore alignment and has the advantage of retaining the biology of the fracture.

To conclude we would like to state that after analyzing the overall functional recovery of distal tibial fractures treated with MIPO technique we have learnt that MIPO is a better technique for location of fracture, involvement of articular surface and soft tissue status.

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