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Assessment of functional outcome of lower third tibial fracture fixation with distal tibial locking plate: An observational study

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Abstract

Background: Fractures of the distal third shaft and distal metaphysis of tibia are one of the difficult and challenging problems faced by orthopaedic surgeons. These fractures are usually associated with fractures of the lower third of fibula which need to be addressed separately to get well aligned ankle mortis, unlike the proximal and mid third shafts fractures of tibia, where fibular fractures need not always be treated separately. Hence; the present study was planned for assessing the functional outcome of lower third tibial fracture fixation with distal tibial locking plate.

Materials & methods: A total of 30 patients with lower third tibial fractures were enrolled. Pre-operative clinical and radiographic examination of all the patients was carried out. Patients were prepared for locking plate fixation and pre-anaesthetic preparation was done. All the orthopaedic procedures of locking plate fixation were carried out under the hands of skilled and experienced orthopaedic surgeons. Follow-up was done and functional outcome was assessed on follow-up. Olerud-Molander functional evaluation score (OMFES) was used for evaluating the functional outcome on final follow-up. Complications, if any, were recorded separately.

Results: According to OMFES, while assessing the functional outcome, it was observed that excellent results were present in 20 percent of the cases while good results were present in 70 percent of the cases. Fair results were found to be present in 10 percent of the cases. Complications were found to be present in 23.33 percent of the cases. Malunion was found to be present in 1 case, while non-union was found to be present in 2 cases. Superficial infection was found to be present in 13.33 percent of the cases.

Conclusion: Even though distal locking plates are associated with good functional outcome, significant proportion of the patients show occurrence of postoperative complications. Hence; proper care should be while performing these orthopedic procedures for reducing complication rate.

Keywords: Complication, tibia, plates

Introduction

Fractures of the distal third shaft and distal metaphysis of tibia are one of the difficult and challenging problems faced by orthopaedic surgeons. The problems associated with these fractures are due to the fact that distal third shaft and distal metaphysis of tibia are relatively less vascular. Since this area is having less soft coverage, even relatively low energy injuries can result in severe soft tissue damage and comminution of the fracture. These fractures are usually associated with fractures of the lower third of fibula which need to be addressed separately to get well aligned ankle mortis, unlike the proximal and mid third shafts fractures of tibia, where fibular fractures need not always be treated separately^[1-3]. Nearby ankle joint (being a hinged type), poses unique problem. Any malunion disturbs the normal biomechanics of the ankle and foot, thereby leading to arthritis of the ankle and foot joints. The optimum management of such extra-articular pilon fractures is conjectural with no clear guidelines depicting treatment. Historically the closed fractures of lower tibia have been treated by closed reduction and casting other modalities include plating (open and minimal invasive), interlocking nail, external fixators including Ilizarov circular ring fixators. Even within the specific modality of treatment there exists many variations in the technique^[4, 5]. Hence; the present study was planned for assessing the functional outcome of lower third tibial fracture fixation with distal tibial locking plate.

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Materials and Methods

The present study was conducted with the aim of assessing the functional outcome of lower third tibial fracture fixation with distal tibial locking plate. A total of 30 patients with lower third tibial fractures were enrolled. Written consent was obtained from all the patients after explaining in detail the entire study protocol. Study period for the present research was from July 2014 to June 2016. Only those patients were included who underwent treatment for lower third tibial fracture fixation with distal tibial locking plate. Biplanar injury radiography was evaluated to determine the fracture location and involvement of distal part of tibia.

Inclusion Criteria

- Skeletally mature patients,
- Patients with negative history of any other systemic illness,
- Patients involving distal 5cm of tibia and all closed and Gustilo-Anderson type I fractures,
- Patients with negative history of any known drug allergy

Complete demographic details of all the patients were obtained. Pre-operative clinical and radiographic examination of all the patients was carried out. Patients were prepared for locking plate fixation and pre-anaesthetic preparation was done. All the orthopaedic procedures of locking plate fixation were carried out under the hands of skilled and experienced orthopaedic surgeons. Follow-up was done and functional outcome was assessed on follow-up. Olerud- Molander functional evaluation score (OMFES) was used for evaluating the functional outcome on final follow-up [6]. Grading of this scoring system was as follows:

- Excellent: Score 91 to 100,
- Good: Score 61 to 90,
- Fair: Score 31 to 60 and
- Poor: Score of less than 30

Complications, if any, were recorded separately. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi-square test and one way ANOVA were used for evaluation of level of significance.

Results

In the present study, a total of 30 patients were analyzed. Mean age of the patients was found to be 53.3 years respectively. 43.33 percent of the patients belonged to the age group of more than 50 years. 63.33 percent of the patients were males while the remaining were females. According to OMFES, while assessing the functional outcome, it was observed that excellent results were present in 20 percent of the cases while good results were present in 70 percent of the cases. Fair results were found to be present in 10 percent of the cases.

In the present study, overall, complications were found to be present in 23.33 percent of the cases. Malunion was found to be present in 1 case, while non-union was found to be present in 2 cases. Superficial infection was found to be present in 13.33 percent of the cases.

Table 1: Age-wise distribution

Age group (years)	Number of patients	Percentage
Less than 30	5	16.67
30 to 50	12	40
More than 50	13	43.33

Table 2: Gender-wise distribution

Gender	Number of patients	Percentage
Males	19	63.33
Females	11	36.67

Table 3: Functional outcome according to OMFES

Functional outcome	Number of patients	Percentage
Excellent	6	20
Good	21	70
Fair	3	10
Poor	0	0

Table 4: Complications

Complications	Number of patients	Percentage
Superficial infection	4	13.33
Non-union	2	6.67
Malunion	1	3.33

Discussion

The proximal tibia is triangular in shape with a vast metaphyseal region narrowing distally. The tibia shaft is a long bone that articulates with the talus, fibula and the distal femur. The vascular anatomy is extensive and dependent on the compartment of muscles it supplies. The anterior tibial artery is the first branch of the popliteal artery, passes between the 2 heads of the tibialis anterior and Extensor hallucis longus (EHL) terminating as the dorsalis pedis. The posterior tibial artery is a continuation of the popliteal artery coursing in the deep compartment of the leg terminating as the medial and lateral plantar arteries. The aim of the treatment of the distal tibial fractures is to achieve union of the fracture in normal alignment and regaining the stable, mobile and painless ankle joint while avoiding the infection and other complications [7-9].

In the present study, a total of 30 patients were analyzed. Mean age of the patients was found to be 53.3 years respectively. 43.33 percent of the patients belonged to the age group of more than 50 years. 63.33 percent of the patients were males while the remaining were females. According to OMFES, while assessing the functional outcome, it was observed that excellent results were present in 20 percent of the cases while good results were present in 70 percent of the cases. Fair results were found to be present in 10 percent of the cases. Viberg B *et al.* evaluated the proportion of complications and the functional outcome following ORIF with low-profile locking plates in patients with distal tibia fractures. Retrospective data was retrieved using county databases, operation books, health record and X-ray images for 6 hospitals (1 level 1, 5 level 2) in the Region of Southern Denmark. Between January 2007 and April 2011 70 consecutive patients with 71 distal tibia fractures were treated with low-profile locking plate were included. The proportion of post-operative complications, classified as minor and major complications, was retrieved from electronic health records and patient interviews. Long-term functional outcome assessed by EuroQol EQ-5D-5L questionnaire, AOFAS Ankle-Hindfoot scale, and return to pre-injury job function through patient interview and examination. There were 32 43A, 5 43B and 34 43C-fractures, 12 open and 10 high-energy fractures. Forty-nine cases (69%) experienced complications during the follow-up time, of which 34 were minor complications and 15 were major complications. Median EQ-5D-5L index value was 0.76, median EQ VAS-score was 80, and median AOFAS score was 73. Thirty-three percent of working patients had not returned to work as a result of the fracture. Their study suggested that treatment of distal tibia fractures with low-profile locking plates

might have a higher proportion of complications and worse functional outcome than previously reported^[9]. Rathod SR *et al.* assessed the functional outcome and complication rates of distal metaphyseal fracture. They have studied 40 patients in civil hospital Ahmedabad. Age range of the patients was 20–60 years. Most common mode of trauma in both the groups is road traffic accident. Associated fibula fracture was present in 18 (90%) participants in group 1 (nailing) and 17(85%) patients in group 2 (plating). Differences between two groups regarding duration of surgery were not significant. No significant intraoperative complications were noted in both groups. Time after which partial weight bearing and full weight bearing was started were significantly shorter in group-1 ($p=0.005$). The average time before union was 23.45 weeks (range, 16-36 weeks) in group 1 and 26 weeks (range,19-41 weeks), ($p=0.09$). Malalignment was found in 25% of patients in group 1 and 10% of patients in group 2. Angulation in group 1 was 3.4 degree (range, 0-12) and 1.0 degree (range, 0-9) in group2 ($p=0.04$). The overall results were comparable and most patients were satisfied with the results. These results indicated that both modalities of treatment deserve a place in treating distal metaphyseal fractures of tibia.¹⁰ In the present study, overall, complications were found to be present in 23.33 percent of the cases. Malunion was found to be present in 1 case, while non-union was found to be present in 2 cases. Superficial infection was found to be present in 13.33 percent of the cases. Hasani I *et al.* Presented the superior results of the two-stage minimally-invasive method using locking plate fixation, making this a historic step forward in treating distal tibia fractures. Twenty-three patients were finally included. In analysing the data collected, they focused their attention on the final functional outcomes as indicated by dorsiflexion nine months after injury and also according to the AOFAS Ankle-Hindfoot Scale. Results were excellent with no or minimal consequences. Where complications were present, these were benign and did not require further surgery. They believed that this modern method for the treatment of distal tibia fractures should be applied routinely and considered as the gold standard in this domain^[11].

Conclusion

From the above results, the authors concluded that even though distal locking plates are associated with good functional outcome, significant proportion of the patients show occurrence of postoperative complications. Hence; proper care should be while performing these orthopedic procedures for reducing complication rate.

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