Original Article

Complications of lower third tibial fractures treated with locking compression plate

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Abstract

Background: Distal tibial fractures represent a significant challenge to most of the orthopaedists even today. There has been an increasing trend towards use of a locking plate for treatment of complex fractures of the distal part of the tibia. The present study was conducted to evaluate clinical results and complications of lower third tibial fractures treated with locking compression plate. **Material and Methods:** A total of 30 Adult patients with fractures of lower third tibia admitted to department of Orthopaedics at a tertiary care hospital. They were treated with locking compression plate after obtaining informed written consent. Patients were followed up for clinical results and complications. **Results:** All the cases were followed for an average of 11 months with mean fracture healing time of 18.7 weeks. All fractures united well except one patient had delayed union which took 26 weeks. 83% patients had good to excellent results. Four (13%) patients developed superficial skin infection, 3 (10%) developed malleolar skin irritation, 2 (7%) developed ankle stiffness and 1 (3%) developed deep skin infection. **Discussion:** Locking compression plate for distal third tibia fractures is effective treatment modality offering early union, better functional outcome and fewer complications. Though superficial skin infection and implant prominence are most commonly encountered complications, they can be dealt easily.

Key Words: Lower third tibia fracture, locking compression plate, complications.

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INTRODUCTION

During the first half of 20th century, distal tibial fractures were considered so severe and prone for complications that the fractures were deemed non manageable by surgical reconstruction[1]. Distal tibial fractures represent a significant challenge to most of the orthopaedists even today. They are only 1-10% of all lower extremity fractures[2]. Conservative treatment by cast application lead to prolonged immobilization, leading to ankle and knee stiffness affecting quality of life of the patient[3]. Intramedullary nailing for complex distal tibia fractures is difficult surgical option with higher rates of mal-union, whereas, external fixators when used were associated with pin track infection and loss of reduction. For the past decades, plating using fracture reduction has been successful in treating complex fractures of the lower extremity especially distal tibia. The goal of this technique is to apply stable plate fixation while maintaining the fracture biology and minimizing soft tissue problems[4-6]. Recently, there has been an increasing trend towards use of a locking plate for treatment of complex fractures of the distal part of the tibia[7,8]. Compared with a conventional plate, a locking plate imparts a higher degree of stability and provides better protection against primary and secondary losses of reduction and minimization of bone contact[9,10]. In addition, locking plates have the biomechanical properties of internal and external fixators, with superior holding power because of fixed angular stability through the head of locking screws, independent of friction fit[11]. This prospective study was undertaken to evaluate clinical results and complications of lower third tibial fractures treated with locking compression plate.

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MATERIAL AND METHODS

This prospective study included 35 patients with lower third tibial fractures that were treated with locking compression plate, of which four cases lost to follow up, one died of cardiac problem. Therefore, the final sample size was 30 cases. Patients above 18 years of age, fractures unfavorable for interlocking nailing, extra articular fractures of distal third tibia and closed fractures and compound grade 1 and 2 fractures according to Gustilo Anderson's classification were included in the study. Patients below 18 years of age, medically unfit for surgery, not willing for surgery, with intra articular fractures of distal tibia, compound grade 3 fractures and with pathological fractures were excluded from the study. On admission, the patients were then assessed clinically to evaluate their general condition and the local injury. General condition was assessed with the vital signs and systemic examination. Methodical examination was done to rule out fractures at other sites. Local examination of the injured extremity revealed swelling, deformity and loss of function. Distal neurovascular status was assessed by the posterior tibial artery and dorsalis pedis artery pulsations, capillary filling, local temperature, pallor and paraesthesia. Antero-posterior and lateral radiographs of the affected leg along with ankle were taken and the fracture patterns were classified based on the AO/OTA classification of fractures of distal tibia[12]. The limb was then immobilized in an above knee Plaster of Paris slab till definitive fixation with locking compression plate done. Under lumbar subarachnoid block (spinal anaesthesia), all 30 cases underwent closed reduction with minimally invasive percutaneous plating osteosynthesis technique with the help of fluoroscopic control too. For this, vertical incision of 3-5 cm starting from tip of medial malleolus for plate insertion was taken. Plate was slided in submuscular plane. For insertion of proximal diaphyseal screws 1 to 2 cm small stab incisions were taken. The plate may be temporarily held in place with standard plate holding forceps or the Push-Pull reduction device. Universal drill guide was used for an eccentric (compression) or neutral (buttress) insertion of cortex screws. The 2.8 mm threaded drill guide was screwed into the LCP plate hole until fully seated. The final screw position was verified with a K-wire prior to insertion. The patients were followed up at intervals of 3 weeks. Follow up ranged from 6 months to 17 months.

RESULTS

The age of the patients ranged from 23-62 years with the fracture being most common in the 4th and 6th decade and an average age of 42 years. Out of 30 patients, 21 (70%) were males and 9 (30%) were females showing male preponderance. There were 20 (67%) patients with right and 10 (33%) patients with left distal tibial fractures. 21 (70%) of patients sustained injury following road traffic accidents and 9 (30%) patients sustained injury following fall. Out of 30 cases, 25 (83%) cases were closed and 5 (17%) cases were open fractures. The 5 cases of open fractures classified based on Gustillo Anderson classification of open fractures, type I compound was seen in 3 (60%) and type II compound were seen in 2 (40%) cases. The fracture pattern was classified based on Rudie and Allgower classification for fractures of distal tibia of the 30 cases studied, 5 (22%) cases were AI, 8 (35%) were A2 and 10 (43%) were A3. 21 of 30 cases studied had associated fractures of the lower third of fibula. Three were having upper limb fractures, three were having head injury and one was associated with vertebral fracture while one had polytrauma. Of the 30 cases, one had shortest trauma surgery interval less than 24 hours, and that of longest being 15 days in a patient having associated head injury which was managed conservatively. Average trauma to surgery interval was 6.4 days. The average surgery time was 72.3 minutes. The fixation of associated fibula fracture increased duration of surgery. All the fractures united with an average of 18.6 weeks. There was one case of delayed union showing signs of radiological callus formation after 26 weeks. There were no cases of intra-operative complications. Superficial skin infection was the commonest infection observed in our study (Table 1). No single case developed angulation of more than 7 degrees or limb length shortening more than 2 cm. All cases united well except one case of delayed union but there is no case of non-union developed in present study.

Table 1: Complications encountered in cases

Complications	No. of patients	Percentage
Superficial skin infection	4	13
Deep skin infection	1	3
Ankle movement restriction		
>75%	0	0
50-75%	0	0
25-50%	1	3
<25%	1	3
Malleolar skin irritation	30	10

Results were analyzed using American Orthopaedic Foot and Ankle Society Ankle-Hind foot scale. Out of 30 cases, 18 showed excellent, 7 cases showed good, 3 cases showed fair and 2 cases showed poor results.

DISCUSSION

Fractures of distal tibia are among the most difficult fractures to treat effectively. Distal tibia fractures generally require operative management and can be managed by many ways like closed reduction with

external fixator, closed reduction with intramedullary nailing, open reduction with plating or closed reduction with percutaneous plating. The status of the soft tissues, the degree of comminution and sustained at the time of injury affect the long term clinical results. The goal of operative treatment is to obtain realignment of fractured bone providing enough stability to allow early motion. This should be accomplished using techniques that minimize osseous and soft tissue devascularisation in the hopes of decreasing the complications resulting from treatment. The average time for fracture union in various studies conducted using various methods was 16-26 weeks[11,13,14,18]. Our study had an average fracture union of 18.7 weeks. The treatment of lower third tibial fractures with locking compression plate may be associated with complications such as malunion, nonunion, secondary loss of reduction, wound dehiscence, local septic complications and stiffness of adjacent joints. Although early intervention is advantageous, it is desirable to delay surgery in the presence of gross local swelling until subsidence of swelling and appearance of the wrinkle sign to ensure good local skin condition prior to surgery. Out of these, superficial skin infection is the most common complication encountered. Four of the patients developed superficial skin infections, which were treated with daily dressings and appropriate antibiotics after pus culture and sensitivity. All these infections subsided on the above said treatment. In one patient implant exposed due to deep infection which was not controlled with wound care and intravenous antibiotics, therefore, implant was removed. Temporary fixation with external fixator was done for 2 weeks until subsidence of infection and definitive fixation done after that. Ankle stiffness also commonly encountered which can be minimized by early range-of-motion exercise after stable fixation has been achieved. We had two patients with ankle stiffness. This was probably due to the incompliance of the patient to the advised physiotherapy. Ankle stiffness ranged from restriction of ankle movement from 20-40%. Malleolar skin irritation is due to prominent hardware as a) distal tibia is subcutaneous bone which becomes more prominent in skinny patients and b) distal tibia locking plate being thick profile plate. It can be dealt with proper contouring of implant or use of pre-contoured plates. Three patients developed malleolar skin irritation due to prominent hardware of which implant removal was done in 2 patients after full radiological union. Implant were removed on request, no problem encountered during implant removal Bone healing is excellent with this type of fixation therefore, less chances of delayed union or non-union are seen. Ronga *et al*[11] found deep infections in 16%, ankle stiffness in 26% and non-union in 5% of patients. Shrestha *et al*[13] found 10% superficial and 5% deep wound infection, 10% had varus angulation and 33% had malleolar skin irritation. Whereas, Pawar *et al*[17] found ankle stiffness and implant irritation as most common complicationsin plating group.Local soft tissue irritation and pain over the medial malleolus can be avoided using low profile plates such as the distal medial tibial locking compression plate. Implant removal may also be required in a some of patients treated with the malleolar locking compression plate. To conclude, locking compression plate for distal third tibia fractures is effective treatment modality offering early union, fewer complications. Though superficial skin infection and implant prominence are most commonly encountered complications, they can be dealt easily

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