Conservative Treatment of Nonarticular Fractures of Distal Third Tibia

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ABSTRACT

Introduction: Distal one third tibial fractures can be difficult to manage. Variety of treatment methods have been suggested for these injuries, including conservative treatment, external fixation, intramedullary nailing, and plate fixation. None of these techniques can be considered the "gold standard" for these injuries. The purpose of this prospective study is to evaluate the results of conservative treatment of these fractures.

Methods: Total 39 fractures of distal third of tibia were treated with closed reduction and long leg cast for six to eight weeks followed by PTB cast for six to eight weeks from January 2004 to October 2008. One year follow up was done with 32 patients, eight months follow up with three patients and four patients were lost to follow up.

Results: All the fractures united within six months of duration. Immediate post – reduction average angulation was 3.72 degree in sagital plane and 3.32 degree in coronal plane. Average final angulation was 5.04 degree in sagital plane and 4.32 degree in coronal plane. Average limb length shortening was 6.8 mm. Full range of motion of ankle and knee joint was achieved compared to the normal side by six months of follow up. Though there was displacement of fracture during conservative treatment final outcome was within acceptable limit.

Conclusion: Hence distal one third tibial fractures can be treated conservatively with closed reduction and cast immobilization with numerous advantages over operative methods.

Key Words: *conservative, distal third, fracture, tibia, treatment*

INTRODUCTION

Treatment of fracture of distal tibia often becomes very difficult.[1,2] Various methods of treatment such as nonoperative treatment, external fixation, intramedullary nailing, and plate fixation has been described. None of these are "gold standard" and closed interlocking nail has very good results in managing midshaft fractures of tibia.[3] Conservative treatment may result in loss of reduction and subsequent malunion. External fixation

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may result in insufficient reduction, malunion, and pin tract infection.[3] In the last 20 years, intra-medullary fixation has become the mainstay of treating tibial shaft fractures. Because of its success, the indications have been extended to those of the proximal and distal metaphyseal region.[4] Intramedullary nailing may result in malunion due to the discrepancy between the diaphyseal and metaphyseal diameter of the medullary canal. There might be technical difficulties with distal nail fixation, risk of nail propagation into the ankle joint.[1-6] There may be wound complications and infections due to extensive soft tissue dissection with plate fixation.[1-4]

Most closed diaphyseal tibial fractures can be treated successfully with conservative treatment that avoids the potential complications of surgical intervention.[7,8] The purpose of this study is to evaluate the results of conservative treatment of distal tibial fracture.

METHODS

This is a prospective study carried out in Kathmandu Medical College teaching Hospital from January 2004 to October 2008. All the closed distal tibia or tibia and fibula fractures, up to the junction of middle and lower one third, were included in this study. Open fractures, intra-articular fractures, severely comminuted fractures involving more than 50% of the circumference, pathological fractures, and patients with polytrauma were excluded from this study.

Of the 39 patients that were eligible four were lost to follow-up. 35 patients were included in the study. The mean age at the time of injury was 31 years (range: 18–50). There were 21 males and 14 females. The mechanisms of injury included a slip and fall in 15 patients, motor vehicle accident (MVA) in 10, a fall from a significant height in seven, and direct blow in three patients. Twenty patients had right and 15 had left sided fracture. Thirty one fractures were oblique in pattern and four were transverse.

Patients with significant limb swelling were kept in long leg posterior slab with limb elevated for up to maximum of 10 days depending upon the extent of swelling. Closed reduction was done with patient lying supine hanging leg vertically from the edge of the operation table. General anaesthesia was given if needed. Long leg cast was applied. X-ray of leg was done to access the reduction. Acceptable reduction was considered up to 5 degree of medial or lateral angulation, 10 degree of anterior or posterior angulation, 10 degree of rotation, and 15 mm of shortening.[9] Wedging of the cast was done to correct unacceptable angulation. Isometric quadriceps strengthening exercise started. Long leg cast was continued for six to eight weeks depending upon radiological callus formation and comminution of the fracture. After removal of long leg cast PTB (patella tendon bearing) cast was applied. Then after gradual partial and then full weight bearing ambulation and knee mobilization exercise started. PTB cast was continued for six to eight weeks. Radiological evaluation was done in three months, six months, and one year follow up. Immediate post reduction angulations in both the planes were noted. Duration for union of fracture was noted. Final angulation and limb length shortening were measured after achieving fracture union. Knee and ankle range of motion were compared with normal limb. The statistical analysis were done by using statistical package for social science (SPSS) version 14 for windows.

RESULTS

Results of 35 patients were evaluated in terms of union rate, time taken for achieving union, post reduction and final angulation in sagital and coronal planes, limb length shortening and joint stiffness. Clinical and radiological union in all fractures was achieved within six months. Medial/lateral angulation was measured in antero-posterior view of leg X-ray. Post reduction average medial/lateral angulation was 3.7 degree (2° - 5°). Final angulation in the same plane was 5° (3°-10°). In 27 patients it was 5° or below. In three (10%) cases it was 6°, 7° and 10° respectively. All the angulations observed in the series were lateral angulation. Antero/posterior angulation was measured in lateral view of leg X-ray. Post reduction mean antero/posterior angulation was 3.3° (2° - 5°). During the final follow-up it was 4.3° (2°-8°). In five cases this angle was more than 5°. None of the patients had recurvatum. Average limb length shortening was 6.8 mm (range: 5 - 11 mm). By six months all the patients had full range of motion of ankle and knee joints compared to the opposite uninjured side. Five patients needed extensive physiotherapy for regaining full dorsiflexion of ankle (Table 1).

Table 1. Post reduction and final angulation.

Angulation		Post reduction	Final
Medial /Lateral	Min	2°	3°
	Max	5°	10°
	Average	3.7° (±1.2)	5.04°(±1.3)
Anterior/Posterior	Min	2°	2°
	Max	5°	8°
	Average	3.32°(±1.04)	4.32°(±1.43)

There was no infection and no plaster related complication observed in any patient. Plaster was broken in seven patients (Figure 1-4). Five of them needed reinforcement of the cast and two needed reapplication of the cast.

Figure 1. Pre reduction X-ray

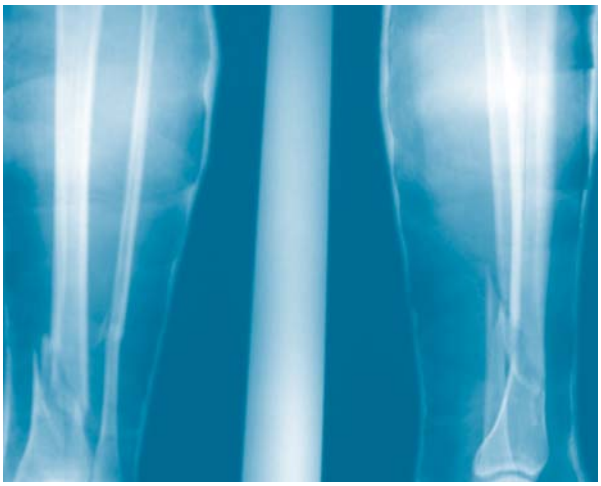

Figure 2. Post reduction X-ray

Figure 3. X-ray in PTB cast

Figure 4. X-ray at final follow up (one year)

DISCUSSION

Distal tibia metaphyseal fractures can be difficult to manage. Treatment selection is influenced by the proximity of the fracture to the plafond, fracture displacement, comminution, and injury to the soft-tissue envelope.[1] Conservative treatment is possible for stable fractures with minimal shortening.[1,7] Indications for intramedullary nailing have expanded to include distal metaphyseal tibia fractures. Intramedullary nailing allows atraumatic, closed stabilization while preserving the vascularity of the fracture site and integrity of the soft-tissue envelope. Intramedullary canal anatomy at this level prevents intimate contact between the nail and endosteum, however, concerns have been raised regarding the biomechanical stability of fixation and risk of malunion. Plate fixation is effective in stabilizing distal tibia fractures. Extensive dissection and periosteal stripping increases the risk of soft-tissue complications and fracture non-union.

In our study all the fractures united within six months. Sarmiento and Latta[7] in their study of 450 cases with conservative treatment of fracture of distal third tibia, non-union was found in four (0.9%) and mean union time was 16.6 weeks. In a study of 674 patients, Nicoll[8] found that union without deformity and with good functional results occurred in 95% of patients treated conservatively with casting. Borg[10] found 9% non-union in his series treated with plating for distal tibial nonarticular fractures. Dogra[6] needed secondary surgical procedure to achieve union in 20% of the cases treated by intramedullary interlocking nail. Zelle[3] conducted systemic comparative review of the results of 1125 distal tibial nonarticular fractures treated with conservative method, with plate and screws and with intramedullary interlocking nail. There was non-union of 1.3% in conservative group, 3.4% in plating group and 5.5% in intramedullary

interlocking group. Non-union is very less with conservative treatment if there is proper immobilization because it is more biological than the surgical treatment. Malunion is relatively less with plate fixation.[1] Oh[5] and Maffullin[11] had no angulation in their study of fracture treatment with plating, whereas Redfern[12] had 5% malunion with the same method of treatment. Dogra had 20 % malunion with intramedullary nailing. Ombremsky[13] had more than 5° angulation in 23% and more than 10° angulation in 7.6 % of patient in nailing group. Zelle reported 15% malunion in conservative group, 16.2% in intramedullary group and 16.1% in plating group. In our study there was post reduction mean lateral angulation of 3.7° and final follow up angulation was 5°. Post reduction mean antero-posterior angulation was 3.3° and final angulation was 4.3°. Though angulation progressed during the course of treatment it was within the limit of acceptance. Sarmiento and Latta[7] reported angulation of less than 8° in 90% of cases and less than 5° in 67% of cases with conservative treatment.

In our study average limb length shortening was 6.8 mm. Sarmiento and Latta[7] reported shortening of less than 12 mm in 94% of patients treated conservatively with functional brace. They allowed the patient to bear weight from the day of brace application. In our study we allowed to bear weight after the application of PTB cast.

In our study all the patients had full range of motion(ROM) of ankle joint compared to the opposite uninjured side by six months. Five patients needed extensive physiotherapy for regaining full dorsiflexion of ankle. Full ankle ROM was achieved with intramedullary nailing group in all patients in the study of Dogra and Fam. Satisfactory ankle ROM was achieved in plating group in the study of Oh[5]. Maffullin[11] reported ankle stiffness in 35% of patients treated with plating.

There was no infection and cast related complications in our study. Borg[10] had infection in two cases among 21 treated with plating. Both of them were diabetic. Zelle[3] reported 4.3% infection rate in intramedullary group and 3.9% in plating group. None of the patients in conservative group had infection in previous studies also.

CONCLUSIONS

Conservative treatment of nonarticular fractures of distal third tibia has acceptable loss of reduction during the course of treatment. There is less chance of nonunion and no chance of infection. Hence these fractures can be treated conservatively with closed reduction and cast immobilization with numerous advantages over operative methods.

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