Int. J. LifeSc. Bt & Pharm. Res. 2012

International Journal of Life Sciences Biotechnology and Pharma Research

ISSN 2250-3137 www.ijlbpr.com

Research Paper

Vol. 1, No. 2, April 2012

Functional Outcome of Closed Distal Third Tibia Fractures Treated with Interlocking Nailing

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Abstract

Background and Aim: Tibia fractures are the most common lower extremity fractures. The subcutaneous anatomy of this long bone predisposes it to high fracture frequency in a high-energy trauma. The tibia is a major weight-bearing, long tubular bone that is axially and rotationally unstable when fractured, which ideally necessitates its surgical fixation in adults. this study was conducted to analyze the outcome in these fractures treated with interlocking nails

Material and Methods: There were totally 40 cases for the study group formed. There were 31 males and 9 females. After initial resuscitation and immobilization, they were taken up for internal fixation. Depending upon their general condition and associated injuries the time interval for surgery varied from one day to two weeks. They were periodically followed at 6 weeks, 3 rd month, 4 th month, 6 th month and every eight weeks thereafter, till fracture union.

Results: In this study, it was observed 87.5% (35) excellent (or) good results. 5% (2) showed fair results, 7.5% (3) of poor results. The much dreaded complications like nonunion, nail protrusion into the ankle have not been observed in the study. The poor outcomes were associated with comorbid conditions. 5 patients had varus/valgus deformity ranging 2 to 5 degrees. Four patients had varus/valgus deformity ranging 6 to 10 degrees. Shortening measuring 0.5 cm found in 5 patients and 1cm shortening was noted in 3 patients. All patients had full range of knee mobility.

Conclusion: The study shows that interlocking nailing gives good results in distal third tibial fractures. Acceptable alignment and range of motion can be achieved. Fibular fixation needs to be done only in patients with syndesmotic disruption.

Key Words: Ankle, Fibular fixation, Interlocking nailing, Tibia

Introduction

Tibia fractures are one of the most common fractures of long bones, constituting about 2% of adult fractures [1,2]. Fractures of the distal third tibia have become challenging and very important in view of management and post-operative treatment plan for Orthopaedic surgeon. By its location the tibia is exposed to frequently to injuries. Because of its subcutaneous location in more than 1/3 length,

open fractures are common and further precarious blood supply makes tibia more prone for infection and non-union.

Though there are various modalities of treatment for distal third fractures, choosing an ideal implant depends on the various factors, including patient characteristics. The dramatic success of interlocking nailing of femoral fractures led the surgeons to believe that similar results might be achieved when applied to the tibia. Because of its success, the indications have been extended to those of the proximal and distal metaphyseal region.[3] The osteosynthesis of tibial fractures with a locked intramedullary nail is recommended by various authors due to the high union rates, low infection and deformity rates and good functional results.[4] Although different treatment method developed for distal tibia fractures exist, the optimal method of fixation is still in debate. Most series of fractures of the tibia contain a proportion of fractures in the distal metaphysis which are wholly extra articular. There is evidence that the mechanism of injury and the prognosis of these fractures are different from those of pilon fractures, but their proximity to the ankle makes the primary treatment more complicated than that for fractures of tibial diaphysis.

Hence this study was conducted to analyze the outcome in these fractures treated with interlocking nails.

Material and Methods

This study was prospective non randomized study. There were totally 40 cases for the study group formed. There were 31 males and 9 females. The common mode of injury is road traffic accidents. The patients with symptoms suggestive of distal third tibia are examined both clinically and radiologically after intial resuscitation. Radiographs of the affected leg with knee and ankle joints were taken. The distance of the fracture from the joint line ranged from 5 to 11 cm. All fractures were classified according to OTA system. There were totally eleven patients in type A, ten patients in type B, two patients in type C. Pre-operative tibial nail size was determined. The nail length should permit end to be countersunk with the distal end centered in the distal epiphysis. Regional anaesthsia was used in all patients except two. Longitudinal midline patellar tendon splitting incision was used. Carm image intensifier was used. Reamed interlocking nailing done in all closed fractures Unreamed nailing done in compound fractures. Both proximal and distal locking was done in all cases. They were followed at six weeks, 3rd month, 4th month, 6th month and every eight weeks thereafter. Fracture union is considered delayed when healing has not advanced after three months. Fracture is considered united when there is no tenderness and X-ray evidence of 3 out of 4 cortices union. Non-union was considered when there is no sign of healing after 6 months. Fracture union was defined as healing of at least 3 of 4 cortices on biplanar plain radiograph. Delayed union was defined as a lack of any healing on plain radiograph within 3 months. Nonunion was defined as a lack of any healing on plain radiograph within 6 months. Malunion was defined as more than 5° of angular deformity or shortening of more than 1 cm.[5,6]

Inclusion criteria

- All skeletally mature patients with distal third tibial fracture

Exclusion criteria

- Fractures with intra-articular extension.
- Distal tibial fractures treated with other modalities.
- Segmental fractures

Depending upon the progress of fracture union partial and full weight bearing started. Knee joint Ankle joint and sub talar joint function assessed during periodic review. Any evidence of rotational deformity was observed periodically. The Johner and Wruh criteria were used to analyse the end results. This criterion includes non-union osteitis, amputations, neurovascular disturbances, deformity-varus/ valgus, anteversion/recurvatum, rotation, shortening, mobility, knee, ankle, subtalar joint, pain gait, sternuous activities.

Results

Total duration of hospital stay was 2 weeks to 8 weeks.10 patients had associated injuries. The average time of radiological union was 15 weeks. No patient in our study went in for nonunion or amputation. No patient had developed neurovascular complications.

5 patients had varus/valgus deformity ranging 2 to 5 degrees. Four patients had varus/valgus deformity ranging 6 to 10 degrees. No anteversion or recurvation deformity noted.

Shortening measuring 0.5 cm found in 5 patients and 1cm shortening was noted in 3 patients. All patients had full range of knee mobility. Three patients had ankle stiffness. All the patients had normal subtalar movements. 13 patients had anterior knee pain. Gait is normal in almost all patients except 4 patients. The mean time of union in many literatures is around 4 months which is same in the present study. The variations in the results of functional outcome in various authors reflect the difficulties in distal third tibial fracture treatment. In this study, it was observed 87.5% (35) excellent (or) good results. 5% (2) showed fair results, 7.5% (3) of poor results. The much dreaded complications like nonunion, nail protrusion into the ankle have not been observed in the study. The poor outcomes were associated with comorbid conditions.

Table 1: Final Outcome

Result	Total. Number of patients	Percentage (%)
Excellent	21	52.5
Good	14	35
Fair	2	5
Poor	3	7.5

Table 2: Nature of complications

Complications	Total. Number of patients	Percentage (%)
Osteomyelitis	3	7.5
Varus/valgus union	9	22.5
Shortening	9	22.5

Discussion

Fractures of distal third tibia are often outcome of high-energy trauma. In many of these cases bone and soft tissue, instability results in unacceptable shortening, angulations or displacement of the fracture. An adequate reduction should be achieved and maintained by some means. A variety of treatment methods are advocated. Eventual radiographic union is not alone a sufficient goal for tibia fracture, the morbidity during treatment, the period of disability, the functional result and the economic consequence must also be considered.[7]

There were 31 males and 9 females. In the series, the average age of the patients was 38.2±12.50 years (range 18-65 years). George CB et al have also reported similar mean age (range 17-85 years).[8] Haydar AJ et al and Vallier et al both reported the mean age of 38 years in their series.[9,10] Most of these fractures were sustained in road traffic accidents. Singer BR, McLauchlan GJ, Robinson CM, et al (1998) reported that these fractures are more common in younger age groups.[11-13]

All the fractures were classified according to orthopaedic trauma association classification system. The time of presentation varied from immediately after the injury to one week after injury. Depending on the general condition of the patient the time taken for surgery varied from immediately to two weeks. Reamed interlocking nailing was done in all closed fractures and unreamed nailing in compound fractures.

There is an associated fibular fracture in 25 patients, out of which 12 patients had upper and segmental fibular fracture, 7 patients had undisplaced middle third fibular fracture, 5 patients had lower third fibular fracture with syndesmotic disruption. On reviewing literature, in a study of Varsalona R, Liu GT evaluating the role of fibular fixation in distal tibial metaphyseal fractures they concluded "adjunctive fixation of concomitant fibular fractures without associated syndesmotic or ankle pathology is not necessary in surgically stabilized extra-articular metaphyseal fractures of the distal tibia"[14] Although fibular fixation has been shown to improve stability of distal tibial fractures, there has been increased potential for soft tissue-related complications and a delay of tibial fracture healing. Whereas Egol, Kenneth A et al concludes that the proportion of fractures that lost alignment was smaller among those receiving stabilization of the fibula in conjunction with interlocking nailing compared with those receiving

interlocking nailing alone.[15] As per Reudi & Allgower of distal tibial pilon fractures, among 6 intra-articular fractures 4 were of type 1 (66.67%). Compared to comminuted fractures simple fractures were common and in simple fractures oblique and spiral fractures were predominant.[16]

In present study fibular plating was done in 6 patients to achieve reduction. Patients were encouraged to get out of bed on second day. Knee and ankle mobilization started immediately. Most of the patients were allowed partial weight bearing after 6 weeks based on clinical and radiological evaluation. Dynamization was performed in 7 patients at a mean time of 10 weeks. Average time for clinical and radiological union was 3 months to 8 months. Kruppa et al reported 19% non-union and 23.8% malunion in their series.[17]

In the study, series 87.5% patients obtained good to excellent results which are comparable to the 86.3% satisfactory or excellent results of the series of Tyllinakis et al. who treated 73 patients with non-pilon distal tibia fractures using Interlocking Intramedullary nailing.[18] Our study reports are in accordance to reports of study done by Im GI, Tae SK (2005)[16] and other studies by Singer BR et al[11], Yang SWet al (2006)[19]and Rand J.A (1986) et al.[20]

In patients treated with locking compression plate and screws complications observed were superficial and deep infections at the surgical site, this resulted in delayed bone union.

Limitations of the study was long-term study duration is needed to assess the incidence of patella femoral arthritis.

Conclusion

The study shows that interlocking nailing gives good results in distal third tibial fractures. Acceptable alignment and range of motion can be achieved. Fibular fixation needs to be done only in patients with syndesmotic disruption. Other patients can be treated with interlocking nailing alone. Some cases because of associated injuries and comorbid condition ended with complications like ankle stiffness and infection. But still, we were able to achieve union in all the cases. However these cases go down by one level in functional assessment score. In distal third tibial fractures with intra-articular extension open reduction & internal fixation with plate and screws has advantages of articular surface reconstruction and anatomical reduction.

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