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Research Paper

Short Term Result of Closed Intra Medullary Fixation of Tibial Diaphyseal Fractures

Medical Science

KEYWORDS : Tibial Diaphyseal Fractures, Intramedullary Fixation, Interlock Nail, early union.

DR. NINAD MOHITE	**MS ORTHO, LIONS GENERAL HOSPITAL MAHESANA**
Dr Harshad P Maheshwari	**D. ORTHO RESIDENT, LIONS GENERAL HOSPITAL MAHESANA**
Dr Nikhil A Garg	**D. ORTHO RESIDENT, LIONS GENERAL HOSPITAL MAHESANA**

ABSTRACT

The present study was undertaken to investigate the outcome of closed intramedullary fixation of diaphyseal fractures of tibia, done with the help of image intensifier. Sixty three cases of closed tibial diaphyseal fractures were treated with closed intramedullary interlock nail. The cases were followed up minimum for a period of one year. The fractures in our study united in an average of about 22 weeks. Because of the high union rate, low infection rate and early mobilization, we consider closed interlock nailing of tibial diaphyseal fractures as one of the most suitable mode of treatment for closed diaphyseal tibial fractures under preferable conditions.

INTRODUCTION

Tibia is the most commonly fractured long bone in vehicular accidents with an annual incidence of tibial shaft fractures is 2 per 1000 individuals1. The use of non-operative treatment of tibial fractures that are widely displaced or that are the result of high-energy forces is associated with a high prevalence of nonunion, stiffness of the joint, and poor functional outcome2,3 Closed Tibial diaphyseal fractures can be internally fixed with Plates or with Intramedullary fixation devices like intra-medullary nails (K-nails, V-nails, Interlocking nail) or multiple flexible intramedullary pins e.g. Enders nails2,4, 5. Interlock nailing has proven to be the method of choice for fixation of these fractures. The intramedullary nailing under image intensifier fulfills the objective of stable fixation with minimal tissue damage resulting in better and quicker fracture unions2 as well as earlier mobilization. The present study was conducted on sixty three closed tibial diaphyseal fractures treated with interlock nailing under image intensifier in our hospital. We studied the clinical and radiological results as well as complications.

MATERIALS AND METHODS

A series of fifty nine consecutive patients with sixty three tibial diaphyseal fractures was selected for this study. All the patients were evaluated clinically and radiographically at the time of admission. All the patients with a closed of open grade I displaced fracture of the tibial shaft more than 5 cm away from either knee or ankle joint were included in our study. The exclusion criteria were

1. Patients with open grade II/III fractures or severe soft tissue injuries
2. Simultaneous fractures involving knee or ankle joints
3. Skeletally immature patients
4. Undisplaced or minimally displaced fractures
5. Patients with head injury
6. Poor general condition on admission (GCS <8)
7. Patients having vertebral column injuries with neurological involvement

Closed reamed interlock nailing under image intensifier was done in each case. After anaesthesia, the patients were placed supine on a normal table. The knee was flexed at 120 degrees. The tibia was approached with the midline infra-patellar incision which extends from the lower pole of patella to just 1 cm distal to the tibial tuberosity. The entry point was made 1 cm above tip of tubersosity after splitting the patellar tendon in line with its fibres. After the entry point was connected to the medullary canal an olive tipped guide wire was passed. The fracture was reduced by longitudinal traction and manipulation. After reduction, the guide wire was passed in the distal fragment and centered in antero-posterior and lateral projections. After sequentially incremental reaming, the guide wire was exchanged and appropriate sized nail was inserted. Proximal locking was done by means of the jig, the fracture was impacted and distal locking was done by freehand technique. After stable fixation, immediate knee and ankle mobilization was started from post-operative day 1. Touchdown weight bearing was allowed in all patients with transverse or oblique fractures. Fracture union was assessed clinically and radiologically at an interval of 6 weeks, 12 weeks and 24 weeks and thereafter every 12 weeks till fracture union. Weight bearing was gradually allowed with clinical signs of healing. Dynamisation was done at 6 weeks whenever it seemed necessary. All patients were followed up for a period of one year. Functional outcomes were evaluated according to the Johner and Wruhs (1983) criteria[6].

OBSERVATIONSANDRESULTS

In our study the average age of the patients was found to be 30 years, more common in young adults between 20-40 years of age (72%). There were 48 male (80%) and 11 female patients (20%). Road traffic accident (95%) was the commonest mode of injury.

Transverse fracture type was most common (47%) followed by oblique variety (40%) and spiral variety (7%). The segmental and comminuted fractures were uncommon. The involvement of middle third of tibial shaft was seen in 38 fractures (60%), lower one third in 16 fractures (25%) followed by upper one third in 9 fractures (15%). 18 (30%) fractures were open grade I fractures. Almost 21 cases (35%) were associated with other significant fractures.

None of the fractures required open reduction. Fracture union was confirmed when there was evidence of bridging callus across the fracture site radiologically, and when there was no pain at the fracture site on full weight bearing without support. 62 fractures in our series united at an average of 22 weeks (range 13 to 42 weeks). 11 of 63 cases showed minimal or no callus formation at 3 months; 9 of them were open fractures. Dynamisation was done in all of them at 12 weeks followed by weight bearing in PTB brace. 9 of them showed signs of union at an average of 7 to 8 months.

One patient had no signs of union; bone grafting was done at 6 months. This fracture was united at 10 months. The other one patient had infection and chronic discharging sinus alongwith delayed union. Injectable antibiotics were continued for 6 weeks without any signs of healing. For this patient, implant removal, curettage, sinus tract excision and external fixation was done at 6 months. The fracture was not united at 1 year follow-up. Anterior knee pain was seen in about 11 (17%) cases. One patient had superficial skin necrosis without infection which resolved with regular dressing and antibiotics.

According to Johner and Wruhs criteria (Table 1), 89% patients had satisfactory (Excellent and Good) results. 11% patients had

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unsatisfactory results. 5 of the 21 patients with other lower limb injury had unsatisfactory results due to other fractures as well.

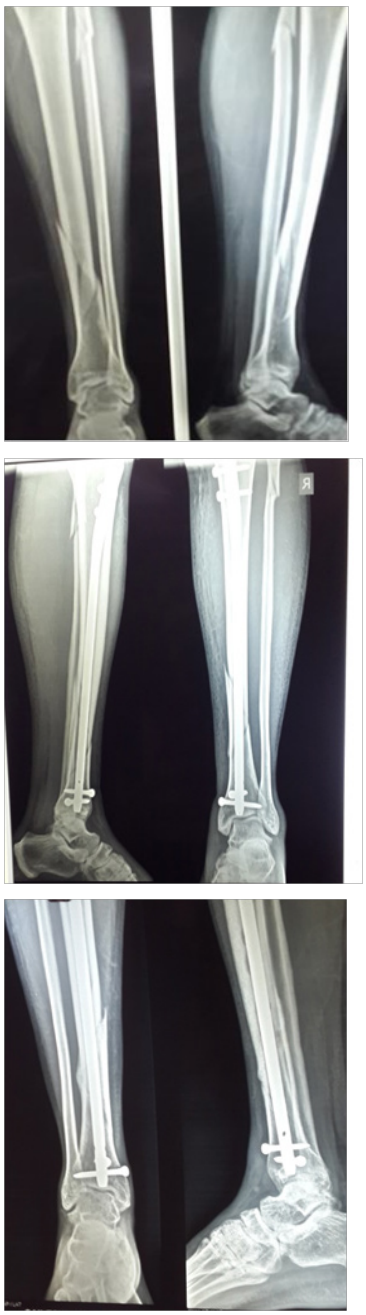

Fig. 1: X-rays showing Preoperative, Immediate post-operative, and at 16 weeks

DISCUSSION

In our study there were 47% transverse, 40% oblique, 7% spiral fractures and segmental and comminuted were uncommon. Hooper et al (1991) reported transverse (48%), oblique (45%), spiral (3.5%) and segmental (3.5%) fractures in their series7. In our series, tibial fractures were commonest at middle third (60%), lower third (25%) followed by upper third [15%]. 21 (33.33%) of our cases had associated fractures (Table 1). Anderson et al (1974) observed that in their series of 208 fractures of 29.4% had major associated fractures that involved contralateral tibia, upper extremity bones, the pelvis or spine, one or both femurs or a combination of all these injuries. These injuries had a major bearing on the treatment of these patients and on their final results8.

Table 1: Associated Injuries

NO.	Injuries	No. of Cases
1.	Contralateral fracture both bones leg	4
2.	Ipsilateral femur fracture	7
3.	Fracture of neck femur	1
4.	Fracture of foot bones	2
5	Fracture forearm bones	3
6	Fracture Clavicle	2
7	Fracture L/E radius	1
8	Fractue Humerus	1

Fracture union was confirmed when there was evidence of bridging callus across the fracture site radilogically, and when there was no pain at the fracture site on full weight bearing without support. In our study, 98% of the fractures were united at one year follow-up (table 2), the time to union ranged from 12 weeks to 42 weeks. A total of 83 % of fractures united in less than 24 weeks, with 37% united under 20 weeks, and 13% united within 16 weeks.

STUDY

Table 2 : Time To Union

In weeks	No. of Cases	%age
<12	-	
13-16	8	13
17-20	15	24
21-24	29	46
25-30	9	14
>30	1	1.5
Non-union	1	1.5
Total	63	100%

11 cases showed minimal or no callus formation at 3 month follow-up. 8 these cases were in lower third. This can be explained on the basis of precarious blood supply and poor soft tissue coverage in lower one third of tibia.

9 of them were open fractures with anticipated drainage of fracture hematoma crucial for fracture union.

Dynamisation was done at 3 months and weight bearing was started in PTB brace. 9 of them united within an average of 7-8 months. Ekeland recommends conversion of static nailing to dynamic nailing at 3 months for better consolidation of the fracture and in case of comminuted fractures we can increase the time to 5 months9.

All the fractures in our series united with an average time interval of 22 weeks (Range 12-42 weeks). This has been supported by other studies also. Bone LB and Johnson KD in one of the earliest large series of interlock nailing reported an average healing time of 17.8 weeks and concluded that the reamed nails were best used for closed, unstable fractures10. Court Brown CM et al (1996) made a prospective study in 50 cases and concluded that reamed is better than unreamed nailing in tibial closed fractures11. Blachut et al concluded that there is a higher prevalence of delayed union and breakage of screws after nailing without reaming12. Larsen et al (2004) studied 45 patients and concluded that the average time to fracture healing was 16.7 weeks in reamed group and 25.7 weeks in the unreamed group. The difference was significant (P=0.004). Mohit Bhandari et al (2008) conducted a multicenter, blinded randomized trial of 1319 adults in whom a tibial shaft fracture was treated with either reamed or undreamed intramedullary nailing and demonstrated a possible benefit for reamed intramedullary nailing in patients with closed fractures13.

The complications that we encountered have been enumerated in table 3.

TABLE 3 Complications

No	Complication	Cases
1	Anterior knee pain	11
2	Superficial Infection	1
3	Delayed union	11
4	Deep Infection	1
5	Non union	1
6	Implant related	3

Anterior knee pain is the commonest complication in intramedullary tibial nailing15. In our series, anterior knee pain was seen in 11 cases (17%). We used the midline longitudinal incision made over the patellar tendon for nail insertion. The aetiology of anterior knee pain after intramedullary tibial nailing is uncertain, although there may be a combination of factors responsible15 including patellar tendon splitting approach. However, Toivannen et al showed that, a paratendinous approach for nail insertion does not reduce the prevalence of chronic anterior knee pain or functional impairment by a clinically relevant amount after intramedullary nailing of tibial shaft fracture16 as compared to patellar tendon splitting approach. Oarfley et al showed that paratendinous approach is related with less knee pain and nail position in relation to the anterior cortex and tibial plateau had no influence on knee pain.

Three patients showed implant related complications. Two of them complained of pain and impingement of distal locks which were removed after union was complete. One patient complained of anterior knee pain and impingement during knee extension. The nail tip seemed to be impinging on patellar tendon in this patient. Once the union was ascertained, implant removal was done at 8 months in this patient.

Deep infection was seen in 1 case (1.7%). This was a open fracture which presented to us after 2 days of trauma. Although considering the high chances of wound contamination, we took decision to go for internal fixation in the best interest of the patient with extended post-operative antibiotic coverage. However, the infection failed to resolve and there was chronic a discharging sinus at the wound site and the fracture showed no signs of union. We went for implant removal and external fixation at 6 months. However, this fracture was not united at one year follow-up. Courte Browne in a series of 391 cases observed a deep infection rate of 1.8% in closed fractures14.

According to Johner and Wruhs criteria, 89% cases had satisfactory functional outcome. 7 cases (11%) had unsatisfactory results. One of them was due to deep infection and non union and the other was due to delayed union. Both were open fractures. The other 5 patients had unsatisfactory results due to associated fractures of lower limb. Thus, apart from complications, associated injuries also significantly affected the functional outcomes at final follow-up.

CONCLUSION

Interlocked intramedullary nailing in under image intensifier has proved to be a one-time procedure leading to union in almost all the cases. This procedure allows immediate mobilization and earlier weight-bearing leading to earlier fracture union with less morbidity and excellent functional recovery. However, our study population was relatively small and we followed up the patients for a short period. Longer follow-up may be necessary for a broader idea of overall results and complications of this method of fracture fixation.

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