Original Article

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Use of Intramedullary Nail in Distal Metaphyseal Fractures of Tibia

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Abstract

Background: The ideal treatment of distal metaphyseal tibia fractures is still controversial. With the development of extremely distal locking multidirectional holes, the application of intramedullary nailing has extended to the treatment of distal metaphyseal tibial fractures. The aim of the study was to evaluate the results of interlocking intramedullary nailing in extra-articular distal metaphyseal fractures of tibia.

Patients and Methods: The study had been done in Mahatma Gandhi Medical College and Research Institute, Department of Orthopaedics. It included 15 patients with age ranging from 25 to 50 (mean 38), who were treated with interlocking intramedullary nailing for distal metaphyseal tibia fractures. About 13 cases were closed and two cases were compound. According to AO classification 12 cases were A1, two cases were A2 and one case was A3. All are due to road traffic accident. 12 patients had concomitant fibula fractures. In all cases, tibial nail with multiple multidirectional distal holes was used. 12 cases were locked dynamically and three cases (AO A2 and A3) were locked statically. Patients were followed up clinically and radiologically with mean follow-up of 16 months (12-20 months).

Results: Union was achieved in all patients within a mean of 5 months (4-8 months). No serious complication was noticed. One patient (6.67%) had knee pain which was due to a protrusion of nail that subsided after nail removal. Two patients (13.33%) had the limitation of ankle range of motion in magnitude of 5-10°. One patient (6.67%) had valgus malalignment of 5°. No rotational malalignment was found in any patients. Shortening of 1.5 cm was found in single patient (6.67%).

Conclusion: Intramedullary interlocking nailing is a reliable method of treatment for distal metaphyseal tibial fractures with a high union rate and low complication rate.

Key words: Distal tibia, Intramedullary nailing, Metaphyseal fracture

INTRODUCTION

Distal tibial fractures are caused by road traffic accident, fall from height, and sports injury. The prevalence of these fractures has increased in parallel with increase in motor vehicle accidents and sports activity. AO classification is most accepted classification. Type A: Extra-articular fractures, Type B: Partial intra-articular fractures, and Type C: Intra-articular fractures. Type A is divided into three subtypes: Simple fractures (A1), fractures with partial comminution (A2), and fractures with large comminution (A3). These fractures are due to high-energy trauma by torsional or compression forces. Clinical examination usually shows pain, swelling, and deformity of the distal tibia. Passive and active ankle movements are painful and restricted. The neurovascular examination is a must. Anteroposterior and lateral radiographs of the distal third of the tibia are of great importance for the diagnosis. The management of these fractures is usually operative. Plate fixation for distal tibia fracture is associated with non-union, delayed union, sloughing of overlying skin, and infection. Interlocking intramedullary nailing is now more preferred technique for these fractures. To achieve good functional result proper alignment must be obtained so that nail will be central in both proximal and distal fragment. Factors leading to non-union are a disturbance of local blood flow by high energy trauma, damage to soft tissue, comminution of fractures, and open reduction method along with other independent additive factors such as

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smoking, alcohol, metabolic abnormalities, and diabetes. Instability due to osteoporosis of the area or improper alignment during reduction leads to breakage of nail or screws, malalignment, delayed union, non-union, and pseudarthrosis.

The aim of our study was to evaluate the results of interlocking intramedullary nailing in distal metaphyseal tibia fractures.

PATIENTS AND METHODS

The study has been done in Mahatma Gandhi Medical College and Research Institute, Department of Orthopaedics. A total of 15 patients, 13 male and 2 female, with mean age of 38 (range 25-50) were treated with interlocking intramedullary nail for distal metaphyseal tibia fracture. The right side was involved in 10 patients and left in 5 patients. About 13 were closed fracture and two were compound. According to AO classification Type A1 were 12, A2 were two and Type A3 was one. About 12 patients had concomitant fibula fracture as well. Closed reduction was done in 14 cases and open reduction in one. Tibial interlocking nail with multiple multidirectional distal holes was used. Average nail diameter was 10 mm (range 9-11 mm). 12 fractures were dynamically locked (all AO Type A1) and rest were statically locked. At least two distal screws were put, if possible three. To prevent varus, valgus or anteroposterior malalignment a ball tip guide wire was inserted and checked radiographically for central placement of tip. Eight out of 12 fibula fractures fixed with 1/3 tubular plate. In our study, we fixed fibula first, so that it helped in aligning the fractured tibia. All compound fractures were debrided in one sitting and nailed after 72 h of antibiotic coverage. There was no intraoperative complication in any patient. All patients were discharged on 10th post-operative day after stitch removal with advice of partial weight bearing. Full weight bearing was allowed after 6-8 weeks depending on union status radiologically. The patient was accessed clinically and radiologically first on the 6th week and then at 4 weekly interval until bony union. Radiographic evaluation includes progression of union, axial angulation on saggital and frontal plane, shortening and torsion. Clinical examination included range of motion of knee and ankle and existence of pain in adjacent joints and at fracture site. Mean follow-up was up to 16 months (range 12-20 months).

RESULTS

All fractures united within a mean of 5 months (ranges from 4 to 8 months). Dynamization was not needed in any patient. The mean time to union in dynamic locking group was 4.8 months and statistically locked group was 5.2 months. No intraoperative complication occurred in any cases. No skin necrosis and no superficial or deep infection occurred. Shortening of 1.5 cm was observed in a single patient with AO Type A3 fracture pattern. Knee pain was complained by single patient which was due to protrusion of nail that subsided on nail removal after fracture healing. Nail or screw breakage did not occur. Two patients had limitation in range of motion of ankle within a magnitude of 5-10°. None had experienced limitation of knee motion (Figures 1-4).

DISCUSSSION

Extra-articular fractures of the distal tibia account for 14.5% of all fractures of distal tibia.[1] The prognosis of these fractures depends on several factors including the presence of comminution, soft tissue damage, osteoporosis, surgical technique, post-operative care and whether the fracture is open or closed. Some authors advocate the use of a locking plate with minimally invasive plate osteosynthesis technique.[2-4] Closed reduction can be achieved with the use of temporary external fixation.[5] Other authors use external fixation with or without minimal internal fixation (screws and K-wires).[6,7] Another alternative is the use of interlocking intramedullary nailing. The technique is demanding in that the guide should be placed approximately 1 cm close to the joint of the ankle without causing damage to the articular surface.[8] Two

Figure 1: Case 1: (a) Pre-operative,(b) immediate post-operative, (c) follow-up at 4 months,(d) follow-up at 6 months

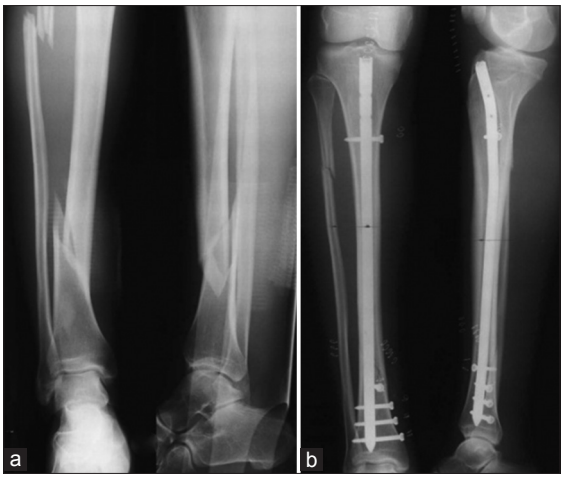

Figure 2: Case 2: (a) Pre-operative,(b) immediate follow-up

Figure 3: Case 3: (a and b) Pre-operative anteroposterior (AP) and lateral view,(c and d) follow-up at 5 months AP and lateral view

Figure 4: (a-c) Case 3: Post-operative clinical photographs at 6 months

screws should be placed to achieve fracture stability.[9] This technique may requires the use of an tibial interlocking nail with multiple multidirectional holes near the distal tip of the nail.[10,11] Fibular fixation with plates is necessary because it increases rotational stability, allows early weight bearing, restores ankle mortise, and prevents the development of post-traumatic arthritis.[12-14] Fibular fixation can be performed before or after tibial fixation. In our study, we first fixed the fibula and then the tibial fracture, which facilitated alignment of the tibial fracture and nail insertion. A comparative study evaluating plate and nail fixation by Egol *et al.* (2006) showed similar results. Tylianikis *et al.* (2000) and Yang *et al.* (2005) state that plate achieves better anatomical reduction whereas nailing has a shorter operation time, better functional results (ankle motion), and lower rates of skin necrosis. There is no method without disadvantages. Plating is associated with relatively higher rates of skin necrosis, infection, and pseudarthrosis, while external fixation with or without minimal internal fixation (screws or K-wires) may result in pin tract infections, malunion, and non-union. The use of nailing decreases these problems, but it is a demanding technique. This method cannot be used in intra-articular fractures (pilon) because open reduction with restoration of the articular surface is required. Our findings are in accordance with the results reported in the aforesaid literatures.

CONCLUSION

The results of our study, which are comparable to the results published in other series, reinforce our opinion that interlocking intramedullary nailing is an efficacious method of treatment for distal tibial fractures provided that there is no intra-articular fracture and incongruity. Good surgical technique, close insertion of the nail, proper alignment, use of two distal screws, and early weight bearing are mandatory to achieve axial restoration, satisfactory functional outcome, high rate of union, and low incidence of complications.

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