Original article:

Outcome of extra articular distal Shaft of tibia fracture treated by reamed interlock nail

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Abstract:

Introduction: Our aim was to Study the outcome of distal tibia fractures by interlock nailing.

Methods and Material: 36 patients with dital tibia fractures, within 6cms of ankle joint and not involving articular surface were studied who were treated with interlock nailing from the period of July 2012 upto September 2014. Regular radiographs and measurement of Ankle range of movement.

Results: Out of the 36 patients accessed, 34 patients had union.2 patients had deep infection which required implant removal and external fixator as mode of treatment, which eventually united.

Conclusions: Various methods of treatment of distal tibia fractures can be used in different conditions and closed reduction, internal fixation with interlock nailing is the treatment of choice for these fractures.

Keywords: Distal Tibia, Extra Articular, Interlock Nail

Introduction:

Distal tibial metaphyseal fractures are difficult to manage and post significant challenge to most orthopedic surgeons[1]. The mechanism of injury and prognosis are different from pilon fractures[2] and their proximity to ankle joint makes surgical treatment complicated[2] . Most of these fractures are associated with fracture displacement, comminution and injury to soft tissue envelope[1].Most fractures at this site need to be fixed because non-operative treatment results in loss of reduction and subsequent malunion and nonunion. Currently, surgeons have a variety of options and implants in their armamentarium for the treatment of these fractures.

The Options Include-

- Intramedullary interlocking nail and bolts with nail or with a shortened tibial nail[3,4].
- Conventional plating with dynamic compression plate (DCP).
- Locking compression plate using minimally invasive plate osteosynthesis (MIPO).
- Polyaxial locking plate using minimally invasive plate osteosynthesis[5]
- External fixation.
- Closed reduction and cast.

Methods and Materials:

All the patients admitted from July 2012 to September 2014 with lower fourth shaft tibia fractures were taken in the study. Approximately 40 Adult patients, with fracture within 6 cms of ankle joint not involving the joint, were followed up prospectively during this period. On admission of the patient, a careful history was elicited from the patient and/or attenders to reveal the mechanism of injury and the severity of the

trauma. 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. Palpation revealed abnormal mobility and crepitus at the fracture site. Distal neurovascular status was assessed by the posterior tibial artery and dorsalispedis artery pulsations, capillary filling, local temperature, pallor and paraesthesia.Antero-posterior and lateral radiographs of the affected leg along with ankle and knee were taken and the fracture patterns were classified based on the AO/OTA classification of fractures, 12 patients had A1 type, 11 patients had A2 type and 13 patients had A3 type fracture pattern.The limb was then immobilized in an above knee Plaster of Paris slab till definitive fixation was done.

Patients with open fractures were graded using the Gustilo Anderson classification for open fractures. 5 patients had open fractures, which were classified on basis of GustiloEnderson Classification. 3 were open grade I,1 patient was Open Grade II,1 patient was Open Grade IIIB.. Antibiotics were started immediately for all patients. Injection cefuroxime 750mg intravenous thrice daily and injection Amikacin 750mg intravenous once daily and Inj Metronidazole 100mg intravenous thrice daily were the antibiotics. Single dose of tetanus toxoid was given. After obtaining the necessary radiographs, Type I and II open fractures were treated by cleaning of the wound with copious amount of normal saline, and Hydrogen peroxide, followed by painting of the skin around the wound with Povodine iodine and sterile dressing was done. The limb was then immobilized in an above knee Plaster of Paris slab till definite fixation was done. In the Type III fracture, patient was taken for emergency wound debridement and Joint Spanning External Fixator was applied primarily and secondarily after soft tissue healed, nailing as definitive fixation was planned.

Nailing was done within 24 hours of injury in all the patients except 1 with open grade IIIB fracture which required external fixator for stabilization and rotational flap for wound coverage. This patient was subjected to nailing 3 weeks after external fixator was done. During the operative procedure, patient was placed supine on radiolucent table.Midline incision to expose patellar tendon from inferior pole of patella to tibial tuberosity. Patellar tendon can be split or can be retracted. With help of a curved awl,entry is made from Anterior Edge of tibia plateau. It is centered in AP view and in direction of canal in lateral view. Ball tip guide wire is passed in distal fragment.Provisional reduction while passing the guide wire is held by insertion of calcaneal Steinman pin for traction or percutaneously by a ball point reduction forceps, all the patients had closed reduction being done. Gradual reaming starting from 8.0mm in increments of 0.5 mm are done upto 11.5 mm. The thickness of the nail is determined by the first clatter of reamer at isthmus and 1.0 to 1.5mm more of reaming is done. Length of nail is inserted at after measuring with another nail outside. Exchange of ball tip with simple guide wire is done. Nail is inserted gradually maintaining the reduction. Proximal Locking is done through aiming arm mount on insertion handle using a 3.2mm drill bit for 3.5mm Proximal Interlock Bolt. For distal lock, Free Hand technique was used by 3.0 mm Steinmenn Pin. 14 patients had 8.0mm Tibia Interlock Nail,10 had 9.0mm Tibia Interlock Nail and 12 patients had 10.0mm Tibia Interlock Nail implanted. Length of Nail ranged from 290 mm upto 400mm.

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Post operative plaster cast Below knee plaster slab was given for a period of 4 weeks followed by removal of slab and gentle ankle mobilisation. Partial weight bearing was started after 4 weeks and full weight bearing was allowed as tolerated by the patient.

American Orthopaedic Foot and Ankle Score (AOFAS) was used to determine the outcome of patients which assess the outcome on basis of pain alignment and mobility status of the patient.Union was defined radiographically when mature callous was seen in 3 out 4 cortices in perpendicular Xray planes and patient had no pain on independent weight bearing on the affected limb. All the fractures united well with an average time to union of 15.3 weeks. There were no cases of malunion in frontal plane (Varus/Valgus)>5^o,in sagittal plane (recurvatum/procurvatum) >10^o and torsional deformity. There were 2 cases of non union due to deep infection which required implant removal and external fixator for stabilisation.

Results:

Between July 2013 to September 2014, 40 patients with extra articular lower 4th shaft tibia fractures were treated with Interlock Nail.36 patients were regularly followed up,which included 27 Male and 9 Female patients. Higher incidence of fractures in Males can be attributed to more travelling of Males on roads leading to RTA.Mean age was 40 years (Range 18-70 years).32(26-Males and 6-Females) were due to high energy fractures related to road traffic accidents and 4(1-Male and 3-Female) were low energy trauma. 5(4-Males and 1-Female) cases were open tibia fractures. 29 patients had fibula fracture out of which 26 were treated with closed reduction and rush nailing and 3 were treated with open reduction and plating. Mean follow up duration was 11 months(range 6-24months). Mean time for Radiological union was 15.3 weeks. Mean AOFAScore was 97 at a mean follow up of 20 weeks. There was 1(Male Pt) case of Superficial infection which were controlled by use of IV antibiotics and rest.Deep infection, defined as culture positive swab from deep tissue was positive in 2 patients(both Male patient and open fractures) which required implant removal and extrernal fixator as mode of treatment. The most common disadvantage was ankle stiffness seen in few patients at 2-3 months of follow up which gradually improved and was insignificant at 6 months follow up.

Discussion:

Fractures of distal tibia are among the most difficult fractures to treat effectively. The status of the soft tissues, the degree of comminution affect the long term clinical results. The goal of operative treatment is to obtain anatomic realignment of the bone while providing enough stability to allow early motion of ankle and knee joints. This should be accomplished using techniques that minimize osseous and soft tissue devascularisation in the hopes of decreasing the complications resulting from treatment and improve outcome.

The long lever arm of intramedullary nail with a short distal fragment and a wide metaphyseal region lead to decreased endosteal bone contact and decreased stability of implant and consequent malalignment.

In a biomechanical study Duda et al, concluded that undreamed tibia nail in distal tibia fractures leads to extremely low axial and high shear strain. They concluded that unreamed nailing of distal tibia fractures without good fragment contact and fibula stabilization should be carefully reconsidered.

Average time for union was 15.3 weeks which is comparable to other studies (Table 1) which show an average between 14 weeks to 27 weeks. Many

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prospective [6, 7,8,9] and retrospective [10,11,12] studies comparing open plating and locked intramedullary nailing for distal tibia fractures have described similar results as regards infection, time to union (14–27 weeks) and rate of non-union (0–9 %) for both techniques. Nailing has the advantage of shorter operative duration and reduced wound problems, ORIF can restore alignment better than nailing that was associated with more malunion.

Several tricks have been describes in order to prevent mal reduction which include use of polar screw, use of multiple thick K wires which help guide the nail in proper direction in distal fragment. In regard to distal locking, multiple locking screws, in different directions help in improving the stability and aid in union.

Conclusion : Tibia Interlock Nail is one of the best modes of treatment for distal tibia fractures. It can be performed even in cases of severe communition and patients with poor skin condition. Outcome of treatment by nailing is excellent in all cases.

Table 1: Comparison of outcome of various studies.

Author	Treatment	Cases	Age	Time of Union	DU/NU	Follow Up
				(weeks)		(Months)
Im and Tae(6)	Nail	34	42	18	3 NU(9%)	24
	Plate	30	40	20	2 NU(7%)	
Yang et al(12)	Nail	13	48.2	22.6	0	33
Jannssen et al(10)	Nail	12	40.7	21	0	72
	Plate	12	43.3	19	0	54
Gao et al(9)	Nail	44	42.2	17.7	0	12
	Plate	41	44.2	17.6	0	12
Vallier et al(7)	Nail	56	38.1	NR	4 NU(7%)	19.9
	Plate	48	38.5	NR	2 NU(4%)	
Mauffery et al(8)	Nail	12	50	21.3	1 DU(8%)	12
	Plate	12	33	NR	3 DU(25%)	12
Li et al(11)	Nail	23	37	NR	0	24.7
	Plate	23	39	23.1	0	25.8
This Study	Nail	36	40	15.3	0	11

DU/NU:Delayed Union/Non union.

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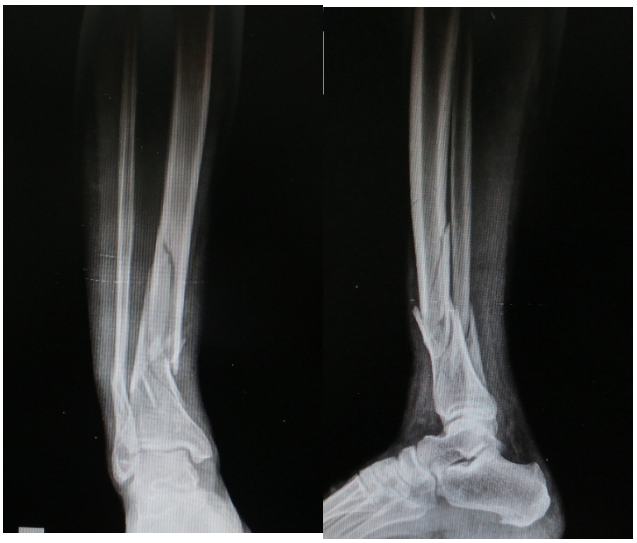

Figure 1-Pre operative x ray, ap and lateral view of ankle and leg

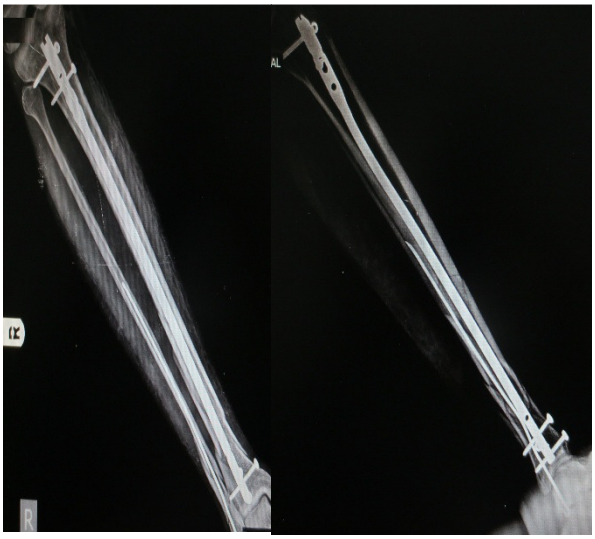

Figure 2: 9 Months post operative x ray,AP and lateral view of ankle and leg

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References:

1. Bedi A, Le TT, Karunakar MA. Surgical Treatment Of Non-Articular Distal Tibia Fractures. J Am AcadOrthop Surg. 2006;14(7),406 -416
2. ZelleBA,Bhandari M, Espiritu M; Koval KJ,Zlowodzki M.Treatment of distal tibia fracture without articular involvement-a systematic Review of 1125 cases.J Orthopaedic trauma 2006;20:1.
3. Ibrahami, A El,Shimi, M, Daoudi,A; Loudyi,P,Elmrini, A,Boutayeb, FIntramedullary naling in management of distal tibia fractures.Current Orthopaedic practice. 2009; 20(3): 300-303
4. Tyllianakis M, Megas P,Giannikas D; Lambiris E.Intramedullary Nailing in distal Tibia Fractures. Orthopaedics; 2000;23(8):805-808
5. AbidMushtaq et al; Distal Tibia Fracture Fixation with LCP using MIPO.European Journal of Trauma and Emergency Surgery. 2009;35:2
6. Im GI, Tae SK. Distal metaphyseal fractures of tibia: aprospective randomized trial of closed reduction and intramedullary nail versus open reduction and plate and screwsfixation. J Trauma 2005;59(5):1219–1223.
7. Vallier HA, Cureton BA, Patterson BM. Randomized, prospective comparison of plate versus intramedullary nail fixation for distal tibia shaft fractures. J Orthop Trauma 2011;25(12):736-741
8. Mauffrey C, McGuinness K, Parsons N, Achten J, Costa ML. A randomised pilot trial of “locking plate” fixation versus intramedullary nailing for extra-articular fractures of the distal tibia. J Bone Joint Surg Br 2012;94:704–708
9. Guo JJ, Tang N, Yang HL, Tang TS.A prospective, randomised trial comparing closed intramedullary nailing with percutaneous plating in the treatment of distal metaphyseal fractures of the tibia. J Bone Joint Surg Br 2010;92:984–988
10. Janssen KW, Biert J, vanKampen A. Treatment of distal tibial fractures: plate versus nail: a retrospective outcome analysis of matched pairs of patients. IntOrthop2007;31(5):709–714.
11. Li Y, Liu L, Tang X, Pei F, Wang G, Fang Y, Zhang H, Crook N. Comparison of low, multidirectional locked nailing and plating in the treatment of distal tibial metadiaphyseal fractures.IntOrthop. 2012; 36(7): 1457–1462.
12. Yang SW, Tzeng HM, Chou YJ, Teng HP, Liu HH, Wong CY. Treatment of distal tibial metaphyseal fractures: Plating versus shortened intramedullary nailing. Injury 2006;37(6):531–535