

## Original Research Article

# Treatment of open tibial shaft fractures using intra medullary interlocking

G. Ramachandra Reddy\*, P. N. Prasad

Department of Orthopaedics, Shadan Institute of Medical Sciences and Research, Hyderabad, Telangana, India

**Received:** 27 March 2017

**Revised:** 06 April 2017

**Accepted:** 12 April 2017

**\*Correspondence:**

Dr. G. Ramachandra Reddy,

E-mail: [gatturahulreddy2001@gmail.com](mailto:gatturahulreddy2001@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** It has been estimated that annual incidence of open fractures of long bones is 11.5 per 100 000 persons with 40% occurring in the lower limb and commonest site is the tibial diaphysis. This study was performed to evaluate clinical outcome of patients with open fracture of shaft of tibia.

**Methods:** It was a hospital based observational prospective study was performed on a total of 30 study participants were enrolled and out of them 2 were lost to follow up. After discharge follow up was done every four weeks for clinical, radiological progress of bony union and soft tissue healing.

**Results:** Majority of the study participants were in the age group of 31-40 years (37%). Males were the main study participant (63.3%). The process of healing took for about 13-16 weeks in 57.1% of the study participants were as in 18% of them it healed within 12 weeks. In 25% of the study participants the healing was completed in more than 16 weeks.

**Conclusions:** It has been observed from the study that interlocked intramedullary nailing is a very effective and safe and technique for the management of open tibial fractures.

**Keywords:** Intramedullary nailing, Open tibial fractures, Long bone

### INTRODUCTION

Among all the bones, tibia is the most commonly fractured long bone, and it has been seen that 24% of shaft fractures present as open injuries.<sup>1</sup> The shaft of tibia is the most common fracture among long bones.<sup>2</sup> They usually occur in young and active patients and are mainly due to high-energy trauma such as motor vehicle accidents, sports or falls from height. Direct trauma because of road traffic accidents causes concomitant severe soft tissue damage with a high incidence of open fractures.<sup>3</sup>

Due to the rapid progressing industrialization and urbanization year by year, there is rapid increase in road traffic, the incidence of high energy trauma are increasing

with the same speed. Tibial fractures are the most common long bone fractures encountered by most of the Orthopaedic surgeons and those who had sustained the injury are presenting with compound fractures. As one third of the tibial surface is subcutaneous, open fractures are more common in tibia than in any other long bone. The blood supply of tibia is more precarious than that of bones enclosed by bulky muscles.<sup>4</sup>

It has been estimated that annual incidence of open fractures of long bones is 11.5 per 100 000 persons with 40% occurring in the lower limb and commonest site is the tibial diaphysis.<sup>5,6</sup> Open fractures in the leg are found to be more severe compared with those in the arm because of the degree of soft-tissue damage and the frequency of associated musculoskeletal injuries.<sup>7</sup>

Literature says that most important causes of tibial fractures are road traffic accidents, sports injuries, direct blows or assault, fall and gunshot injuries. Due to the high prevalence of complications which are associated with these fractures, management is often difficult and proper plan of intervention is a necessity.<sup>4</sup> Every fracture is always considered as an individual problem and the decision to treat it by internal fixation or external fixation should be based on the proper assessment of the advantages and hazards of each method.<sup>4</sup> Therefore the present study was conducted to evaluate clinical outcome of patients with open fracture of shaft of tibia and to assess complications during the process of management of open fractures with intramedullary nailing.

**METHODS**

This hospital based prospective observational study was conducted in the Department of Orthopaedics and Traumatology in Shadan Institute of Medical Sciences and Research from February 2014 to December 2016. All the individuals who reported to the Orthopedic department of our hospital with open tibial fracture and who were more than 18 years of age were included into the study. During the study period we were able to enroll near about 30 patients who had open tibial shaft fracture. Among those 30 patients 2 patients were lost to follow up. So, during the follow up period only 28 study participants were included.

Inclusion criteria were patients of age above 18 years, ASA grade of I, II, III A and III B and open tibial fractures with associated injuries like head injury, other fractures, soft tissue injuries. Exclusion criteria were closed tibial fractures, open tibial fracture already treated with external fixation and grade III C fractures.

The study was conducted after taking permission from the institutional ethical committee. Before the start of the study, the study participants were informed about the purpose of the study and written consent was also taken. A predesigned, pre-structured questionnaire was used. The various variables used in the questionnaire were Age, Sex, complications, duration of union of fractures

For classification of tibial shaft fractures, Gustilo-Anderson’s classification of open fractures was used. The general condition of the study participants was first assessed. Those patients who were in shock were managed by giving i.v. fluids, blood transfusion and they were resuscitated. Severity of wound was assessed. Neurovascular status of the wound was also assessed. Cleaning of wound was done thoroughly. Tetanus toxoid injection and i.v. analgesics were also given. Wound debridement and fracture fixation and all the patients were taken to the theatre as early possible i.e. 8-10 hours following injury.

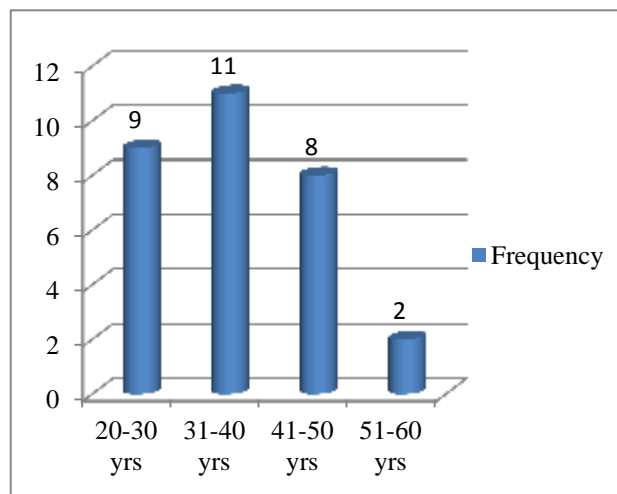
Intramedullary nailing was done. After surgery above knee posterior slab was given with elevation of the limb. Inspection of wound and change of dressing was done

after 48 hours. Antibiotic were given for 10 days. Active toe movements, quadriceps setting exercises and straight leg raising exercises were started. Sutures were removed after 10 days. X-ray was taken at the time of discharge to confirm fracture reduction and position of intramedullary nail. Patients were advised not to bear weight on the operated limb for about 8-10 weeks.

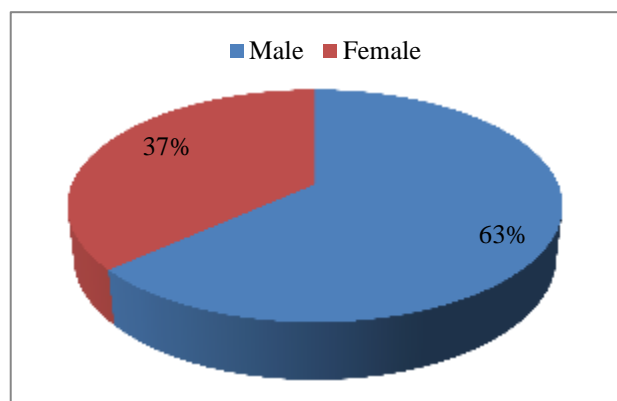
Patients were reviewed every four weeks for clinical, radiological progress of bony union and soft tissue healing. The range of knee and ankle movements was recorded. The statistical method used was simple proportions in Microsoft excel.

**RESULTS**

A majority of the study participants were in the age group of 31-40 years (37%), followed by 20-30 years (30%). About 7% were in the age group of 51-60 years as shown in Figure 1. Most of the patients were males (63.3%) compared to the number of females (37%) as in Figure 2.



**Figure 1: Age wise distribution of study participants.**



**Figure 2: Sex wise distribution of patients.**

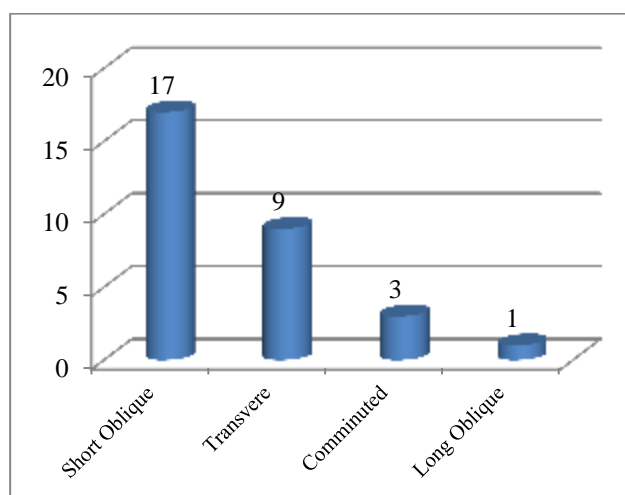
It was seen that the middle third of the shaft of the tibia was the main site of fracture in 53.3% of the study participants which was followed by upper and middle

third junction (27%) and 20% seen in middle and lower third junction respectively as given in Table 1.

**Table 1: Distribution of study participants with site of the fracture.**

Site of fracture	Frequency	Percentage
Upper and middle third junction	08	27
Middle third	16	53.3
Middle and lower third junction	06	20
Total	30	100

57% of the study participants had short oblique type of fracture of shaft of tibia. The transverse type was seen in 30% of the study participants which was followed by comminuted type in 10% and long oblique in 3.3% as seen in Figure 3.



**Figure 3: Distribution of study participants with fracture configuration.**

As per Gustil- Anderson’s classification of fracture shaft femur, 60% of the study participants were in Grade-II. Near about 30% were in Grade-IIIA and 10% were in Grade-IIIB. No patients was found in Grade-I classification as in Table 2.

**Table 2: Distribution of study participants with grading of fracture as per Gustilo – Anderson’s classification.**

Fracture configuration	Frequency	Percentage
Grade II	18	60
Grade IIIA	09	30
Grade IIIB	03	10
Total	30	100

The study participants who had fracture shaft femur among them few were having other associated injuries. It

was found that majority of them had head injury i.e. 21.4% as associated injury. Fracture shaft femur and Galeazzi fracture was seen in 7.1% of them. Colle’s fracture, Posterior dislocation hip and metatarsal fracture was seen in 4% of the study participants as shown in Table 3.

**Table 3: Distribution of study participants with associated fractures.**

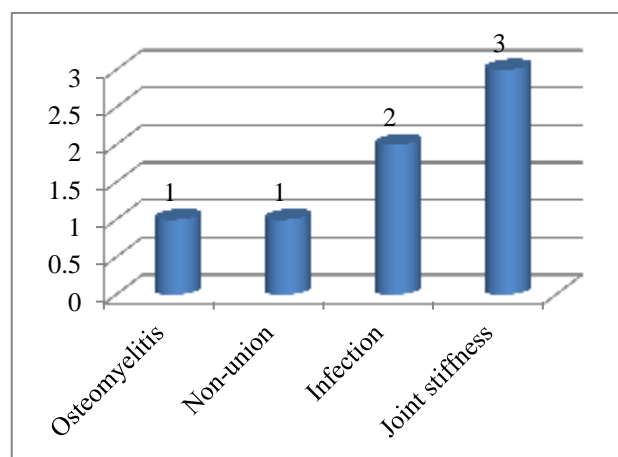
Associated fractures	Frequency	Percentage
Head injury	06	21.4
Fracture shaft femur	02	7.1
Colle’s fracture	01	4
Galeazzi fracture	02	7.1
Posterior dislocation hip	01	4
Metatarsal fracture	01	4

The process of healing took for about 13-16 weeks in 57.1% of the study participants where as in 18% of them it healed within 12 weeks. In 25% of the study participants the healing was seen above 16 weeks as given in Table 4.

**Table 4: Distribution of study participants with duration of union of fracture.**

Fracture union	Frequency	Percentage
Within 12 weeks	05	18
13-16 weeks	16	57.1
Above 16 weeks	07	25
Total	28	100

Joint stiffness was the most common complication seen in 11% of the study participants which was followed by infection in 7.1% of them and osteomyelitis and non-union was seen in 4% of them respectively as given in Figure 4.



**Figure 4: Distribution of study participants with complications.**

## DISCUSSION

In the present study it was observed that that majority of the study participants were in the age group of 31-40 years (37%), followed by 21-30 years (30%). In another study done by Kumar et al majority of study participants were in the age group of 21-30 years (57.14%) which is more in number than present study.<sup>8</sup> Similar findings were observed in another study, more number of study participants were in 21-30 years (45.16%).<sup>4</sup>

Majority of the study participants in the present study were males (63.3%) compared to the females (37%) which was similar with another study were more number of males (82.35%) were study participants than females (6%).<sup>4</sup> In another study done by Thanigai et al 93% of study participants were males which is similar to present study findings.<sup>9</sup>

In the present study 57% of the study participants had short oblique type of fracture of shaft of tibia. The transverse was seen in 30% of the study participants which was followed by comminuted type in 10% and long oblique in 3.3%. Our study findings were different with other study were comminuted type of fracture was seen in 35.2% which is more than present study<sup>4</sup> which is followed by oblique fracture in 26.4% and 23.5% of transverse fracture.<sup>4</sup>

According to the Gustil-Anderson's classification of fracture shaft femur, 60% of the study participants were in Grade-II. Near about 30% were in Grade-IIIA and 10% were in Grade-IIIB. The present study findings were supported by another study where 44.11% of study participants were in Grade-II, 35.29% in Grade-IIIA and 6% in Grade-IIIB.<sup>4</sup> Similar findings were seen in Kumar et al study 64.28% were in Grade- II.<sup>8</sup>

It was found that majority of them had head injury 21.4% as associated injury. Fracture shaft femur and Galeazzi fracture was seen in 7.1% of them. Colle's fracture, Posterior dislocation hip and metatarsal fracture was seen in 4% of the study participants. Few of the associated fractures were common in study done by Mohan et al were head injury was seen in 6% of the study participants which was less in number but was the main associated injury which was followed by fracture shaft femur and Galeazzi fracture in 3% of them.<sup>4</sup>

The process of healing took for about 13-16 weeks in 57.1% of the study participants were as in 18% of them it healed within 12 weeks. In 25% of the study participants the healing was seen for more than 16 weeks in the present study. Another study findings were different from the present study where it was found that the process of healing was completed in 10-15weeks in 39.28% of the study participants In 42.85% of them healing process completed in 16-20 weeks. More than 20 weeks' time was taken by 11% of the study participants.<sup>8</sup> In one study done by Ekeland et al healing was completed by 16 weeks in majority of study participants and in study done

by Vaquero et al the process of healing took more than 16 weeks.<sup>10,11</sup>

Joint stiffness was the most common complication seen in 11% of the study participants which was followed by infection in 7.1% of them and osteomyelitis and non-union was seen in 4% of them. Non-union was seen in 11.8% in study done by Mohan et al which is more than the present study.<sup>4</sup> In Joshi A Ahmed et al study non-union was seen in 10.7%.<sup>12</sup> In Mohan et al study infection was seen in 11.6% which is more than present study.<sup>4</sup> In a study done by Thanigai et al infection was seen in 3.3% which is less than present study.<sup>9</sup>

## CONCLUSION

It has been observed from the study that interlocked intramedullary nailing is a very effective and safe technique for the management of open tibial fractures. The study revealed that all the patients who were treated with intramedullary nailing shown good clinical and functional outcome. Another important advantage with this technique is less complication is seen. This technique can be always used one of the intervention for the management of fracture of shaft of tibia.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

## REFERENCES

1. Court-Brown CM, McBirnie J. The epidemiology of tibial fractures. *J Bone Joint Surg Br.* 1995;77(3):417-21.
2. Heckman JD, Sarasohn-Kahn J. The economics of treating fracture healing. *Bull Hosp J Dis.* 1997;56:63-72.
3. Grutter R, Cordey J, Buhler M, Johner R, Regazzoni P. The epidemiology of diaphyseal fractures of the tibia. *Injury.* 2000;31(3):64-7.
4. Choudhary BM, Amer S, Dorai Kumar R, Vanchi PK. Management of Open Tibial Shaft Fractures Treated By Primary Intramedullary Interlocking Nailing. *J Dental Med Sci.* 2015;14(8):52-6.
5. Court-Brown CM, Rimmer S, Prakash U, McQueen MM. The epidemiology of open long bone fractures. *Injury.* 1998;29:529-34.
6. Howard M, Court-Brown CM. Epidemiology and management of open fractures of the lower limb. *Br J Hosp Med.* 1997;57:582-7.
7. Giannoudis PV, Papakostidis C, Roberts C. A review of the management of open fractures of the tibia and femur. *J Bone Joint Surg.* 2006;88(3):281-9.
8. Kumar A, Kushwaha NS, Singh S, Shantanu K, Waliullah S, Sharma V. To Study Outcome of Intramedullary Nailing in Grade I and II (Gustilo-Anderson) Compound Diaphyseal Fractures of

- Tibia. *Int J Contemporary Med Res*. 2016;3(8):2473-6.
9. Thanigai ST, Sathik Babu MB. Reamed Interlocking Intramedullary Nailing For Open Fractures of Shaft of Tibia. *Indian J Orthop Surg*. 2015;1(3):164-7.
  10. Alho A, Ekeland A, Strømsøe K, Follerås G, Thoresen BO. Locked Intramedullary Nailing for displaced tibial shaft fractures. *J Bone Joint Surg*. 1990;72(5):805-9.
  11. Hernandez-Vaquero D, Suarez-Vazquez A, Iglesias-Fernandez S, Garcia-Garcia J, Cervero-Suarez J. Dynamisation and early weight-bearing in tibial reamed intramedullary nailing: its safety and effect on fracture union. *Injury*. 2012;43(2):63-7.
  12. Joshi D, Ahmed A, Krishna L, Lal Y. Unreamed interlocking nailing in open fractures of tibia. *J Orthop Surg*. 2004;12(2):216-21.

**Cite this article as:** Reddy GR, Prasad PN. Treatment of open tibial shaft fractures using intra medullary interlocking. *Int J Res Orthop* 2017;3:366-70.