

Interlocking Nail in Diaphyseal Fracture of Tibia –A Clinical Study

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ABSTRACT

Introduction: Closed reduction internal fixation with intramedullary interlocking tibial nail is currently the treatment of choice for fractures of shaft of tibia with advantages of early stabilization, early mobilization, with high union rates, less infection rate and implant failure. Aim of the current research was to study diaphyseal fractures and to assess functional outcome of patients with tibial shaft fracture treated with intramedullary interlocking tibial nail.

Material and Methods: A prospective study of 30 adult males and females age group presenting with tibial shaft fracture to Orthopaedic Department of Rohilkhand Medical College were admitted and evaluated from July 2014 to July 2015. Patients fulfilling our inclusion criteria and those who were surgically fit, were included in the study and treated with intramedullary interlocking tibial nail. Johner and wruh's criteria was used to assess the functional outcome.

Results: The results were fair in 6.67%, excellent in 76.67%, good in 30%.

Conclusion: Fracture shaft of tibia are commonly seen in road traffic accident and are common in young people. Tibial intramedullary interlocking nailing has advantages as it preserves periosteal blood supply, maintains length, rotation, alignment, lowers the infection and malunion. Closed internal fixation with intramedullary interlocking tibial nail is a standard surgical procedure for management of tibial diaphyseal fractures. Ambulation without external immobilization can be done early and it also reduces the hospital stay and patient can resume his work activities early as tolerated.

Keywords: Closed nailing, Interlocking, Diaphyseal fractures of tibia.

closed procedure, the periosteum is not disturbed, less incidence of infection, no disturbance of hematoma and soft tissue injury. Treatment aim of tibial shaft fractures are to re-establishing pre-injury anatomy and lower complication rates. Several methods have been used for treatment of this fracture. Closed reduction and cast immobilization have previously been regarded as the standard treatment for low-energy tibial shaft fractures. However, during the last few decades, locking intramedullary (IM) nail has become a popular method for treating tibial shaft fractures.³ The Aim of this study was to study the diaphyseal fractures and to assess functional outcome of patients with tibial shaft fracture treated with intramedullary interlocking tibial nail.

MATERIAL AND METHODS

Adult males and females age group presenting with tibial shaft fracture to Orthopaedic Department of Rohilkhand Medical College were admitted and evaluated from July 2014 to July 2015. Ethical clearance and informed consent were taken prior to study. Patients fulfilling our inclusion criteria and those who were surgically fit, were included in the study. Prospective study of 30 cases was done.

Inclusion criteria

- Greater than 18years of age.
- Acute fractures of diaphysis of tibia.
- Compound grade 1 and 2 fractures (Gustillo Anderson type) and Closed fractures.
- Segmental fractures
- Communitated fractures.

Exclusion criteria

- Less than 18 years of age.
- Compound Grade 3 fractures (gustillo Anderson).
- Pathological fractures, fracture non-union and delayed union.
- Patients not willing and medically unfit for surgery.

The patients were selected based on the history, clinical examination, radiography.

The orthopedics trauma association (OTA), AO classification of tibialdiaphyseal fractures was followed for typing the tibial fracture. All the selected patients were treated with intramedullary interlocking nail and regular follow up for a

INTRODUCTION

A tibial shaft fracture occurs commonly due to trauma, commonly in middle-aged and young people. Less prevalent in childrens and older people. Commonest site of long bone fractures is tibial shaft because of its superficial location.¹

Most common long-bone fracture is tibial shaft fracture encountered by most of the orthopaedic surgeons. Around 26 tibialdiaphyseal fractures per 100,000 of the population per year seen in average population. Females are less commonly affected than males, as the male incidence is about 41 per 100,000 per year and incidence of females is about 12 in 100,000 per year. The average age seen in tibial shaft fracture population is about 37 years; in females 54years and in males 31 years.²

One third of tibial surface is subcutaneous therefore open fractures are common in tibial shaft. Due to hinge joints at the ankle and knee, no adjustment occur for rotatory deformity after a tibial shaft fracture. Non union, infection and delayed-union and are common complications after open tibial shaft fractures. Rapid restoration of bone continuity and early callus formation are the main aim for diaphyseal fracture of tibia. Intramedullary interlocking tibial nailing is preferred over other methods. It's a

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period of six months was maintained at 4 weeks interval. The postoperative follow up and assessment was based on Johner and Wruh's criteria

Grading were done as poor, fair, good or excellent according to Johner and Wruh's criteria (Table-1).

STATISTICAL ANALYSIS

Data was evaluated based on the descriptive statistics. Microsoft word 2007 was used to generate tables and graphs.

RESULTS

In our study total 30 patients were included between age group of 18-69years (figure-1). Average age of the patient in the study was 36.2years. Left tibia was affected in 53.33% of cases. Road traffic accidents were the main mode of injury in 86% of cases (Table-2). 76.67% of the fractures were closed and 23.33% were open (Gustillo-anderson). Majority of fractures were located in the middle-third (40%) in 12 patients and in lower-third in 10 patients (33.3%). Type A 60 % was the most common in 18 patients. Oblique fractures was 33.33% and spiral and transverse are 26.66%. □Fibula was fractured in 80% of cases. Average time duration from injury to surgery is 3.6 days. Females required smaller sizes of nail 8mm and 9mm and males required larger than females 10mm. Female required less length nail less than 340mm and males required more length nail >340mm. Reamed closed intramedullary interlocking nailing is done in all the cases. We started full weight bearing at 18 weeks around while partial weight bearing in 80% at 4-8 weeks and in 8-12 weeks in remaining 20% in our study. Five of our patients required dynamisation. Average duration of hospital stay is 13.01 days. The average healing time was 20.13 weeks. □In our study superficial infection is seen in 3% of patients and anterior knee pain in 10% of patients and fat embolism is seen in 3.33% of patients and shortening is seen in 6.67% of patients

and delayed union is seen in 6.67% of patients. In our study deformities is seen in 13.33% of patients out of which coronal deformities is seen in 4 patients and in that 4 patients one patient also has saggital deformity. In our study 23 patients (76.67%) had excellent, 5 patients (23.3%) had good, 2 patients (6.67%) had fair functional outcome (Table-3).

DISCUSSION

Thirty patients were included in the study, who were admitted to the Orthopaedics Wards of Rohilkhand Medical College, Bareilly Uttar Pradesh. This group patients comprising of male and female in the age group of 18 to 69 years were included in this study.

It includes open injuries, closed injuries as well as different patterns of fractures treated by closed method. In this study, the patients fall in 18-29 years of age group. There were 13 patients in this age group in our study. The average age of the patient in our study was 36.2 years. Fractures of shaft of tibia were commonly seen in the younger people because they are physically active and are also engaged in different outdoor activities, and that's the reason for high-velocity injuries.

Arne Ekeland et al concluded in a study, the patients average age was 35 years.⁴ The average age was around 37 years in a study by Court Brown et al in 1995 in a study.⁵

In this study, males predominated the females. There were 25 male patients (83.33%) and 5 female patients (16.67%). The incidence of males is higher because of their more outdoor activities, while women are involved in household activities.

Court Brown et al observed incidence in his study of around 18.7% and 81.3% in females and males⁵ while Hooper et al observed around 18%and 82% incidence among females and males.⁶ Our study of 83.33% males, the incidence is higher when compared to above studies, whereas 16.67% females in our study is lower when compared to other studies.

Sl no	Criteria	Excellent (Left=Right)	Good	Fair	Poor
1.	Non-unions, osteitis, amputation	None	None	None	Yes
2.	Neurovascular disturbances	None	Minimal	Moderate	Severe
3.	Deformity				
	Varus/ Valgus	None	2-5°	6-10°	>10°
	Anteversioin/ Recurvation	0-5°	6-10°	11-20°	>20°
	Rotation	0-5°	6-10°	11-20°	>20°
4.	Shortening	0-5mm	6-10mm	11-20mm	>20 mm
5.	Mobility				
	Knee	Normal	>80%	>75%	<75%
	Ankle	Normal	>75%	>50%	<50%
	Subtalar	>75%	>50%	<50%	--
6.	Pain	None	Occasional	Moderate	Severe
7.	Gait	Normal	Normal	Insignificant limp	Significant Limp
8.	Strenuous activities	Possible	Limited	Severely limited	Impossible
9.	Radiological Union	Consolidated	Consolidated	Union	Not consolidated

Table-1: Johner and Wruh's criteria for evaluation of functional outcome

Mode of injury	Number of patients	Percentage
RTA	26	86.67%
Fall	4	13.33%
Total	30	100%

Table-2: Mode of injury

Functional outcome	Number of patients	Percentage
Excellent	23	76.67
Good	5	13.33
Fair	2	6.67
Poor	0	0
Total	30	100.00

Table-3: Functional outcome

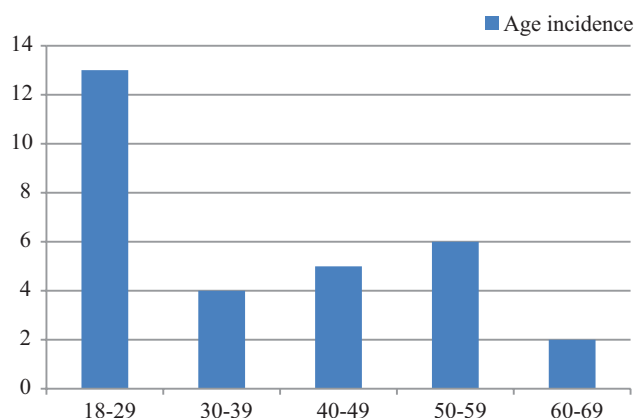


Figure-1: Graph showing age incidence

The incidence of fracture shaft of tibia due to road traffic accidents seemed to be higher in our study (86.6%) compared to Court Brown et al in whose study, the incidence was around 37.5%.⁷ But in this study, also the road traffic accidents was commonest mode of injury followed by fall. This is because of poor road quality and avoiding traffic sense, leading to a higher incidence of road traffic accidents in our country.

In our study, 12 (40%) patients the location of the fracture was in the middle-third of the shaft of tibia, followed by the lower third in 33.33% of the cases. Lawrence B Bone et al noted in his series 53.5% were middle-third fractures.⁸ The tibia in middle-third is more subcutaneous and rigid in nature make it more vulnerable to the injuring force.

Our series had an higher incidence of oblique fractures in 33.33% of cases, transverse fractures made up 10% cases. Oblique and transverse fractures made 43.33% fractures (13 patients). This is comparable to Court Brown et al reported 37.2%.⁹

Fracture of fibula along with the shaft of tibia in our series were in 80% of cases, Court Brown et al reported fracture of fibula in 77.7% of the cases.⁹

18 weeks was the average full weight bearing time. In communitated fractures full weight bearing was delayed in few patients. Lawrence B.Bone et al in his study concluded that in unstable fractures delayed weight bearing was done.⁸ In our series, majority of fractures united in 16 patients were within 20 weeks. The average union time was 20.1 weeks. Court Brown et al⁹ and Arne Ekeland et al⁴ reported average union time at 16.7 and 16 weeks.

Lawrence B.Bone et al observed 6.25% rate of infection.⁸ Arne Ekeland et al noted infection rate of 4.4%⁴ and Blachut PA et

observed 1% rate of infection.¹⁰ In our study, superficial infection rate was 3% and it healed with dressings and antibiotics.

In our study 10% patient reported anterior knee pain. In these patients the nail was abutting the soft tissues and bone structures like tibial tuberosity, patellar tendon and menisci damage causing anterior knee pain. Hernigou P et al, who noted improper entry of nail into medullary canal, may cause anterior knee pain.¹¹ Jarmo AK Toivannen et al observed anterior knee pain intibial intramedullary interlocking nailing.¹²

In our study 3 patients had valgus deformity of 2 – 5 degrees and varus deformity of 2-5 degrees is seen 1 patients, anteversion of 0- 5 degrees is seen in 1 patient. Arneekeland et al observed varus deformity in 4 patients and valgus deformity of 6-10 degrees in 6 patients and, anteversion of 6 – 10 degrees is seen in 3 patients.⁴

In our series final outcome was done using the Johner and Wruh’s criteria, at 6 months taking into account the following symptoms of pain, gait, deformity, shortening, range of motion of knee, ankle and subtalar joints, neurovascular disturbances, radiological union and presence or absence of non-union, ability to do strenuous activities. Grading of functional outcome was done according to poor, fair, good and excellent.^{13,14}

In our series, 76.67% (23 patients) have got excellent, 16.67% (5 patients) have good and 6.67%(2 patients) with fair functional outcome. Arne Ekeland et al reported 64.4% excellent, 28.8% good and 4.4% as fair.⁴

CONCLUSION

Fracture shaft of tibia are commonly seen in road traffic accident and are common in young people. Tibial intramedullary interlocking nailing has advantages as it preserves some endosteal blood supply and whole periosteal blood supply, maintains length, rotation, alignment, lowers the infection and malunion.

Well established standard surgical procedure for management of tibial diaphyseal fractures is Closed internal fixation with intramedullary interlocking tibial nail under c arm guidance. Ambulation without external immobilization can be done early with this operating procedure in most of the cases. It also reduces the hospital stay and patient can resume his work activites early as tolerated.

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