

MANAGEMENT OF DIAPHYSEAL FRACTURES OF TIBIA BY USED OF CLOSED REAMED INTERLOCKING NAIL

Dr. Marut Nandan Kumar¹, Dr. Priya Ranjan²

¹ Associate prof. Department of Orthopaedics, PMCH, Patna

² Senior Resident, Department of Orthopaedics, PMCH, Patna

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Corresponding author: Dr. Priya Ranjan

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Abstract

Background: Fracture shaft of tibia is one of the common fracture encountered by the orthopaedic surgeons in their daily practice, Many patients come to Department of Orthopaedics with tibial fractures. It is one of the common injuries occurring in adult age group.

Material and Methods: A total of 30 patients with closed tibial fractures underwent surgery for the fracture fixation with intramedullary interlocking nail in the Department of Orthopaedics, Patna medical college and Hospital Patna Bihar. Duration of Two years. Patients were selected irrespective of sex.

Conclusion: Intramedullary interlocking nail is the reliable, versatile and effective treatment for closed tibial fractures. The advantage of rapid rehabilitation and relatively few complications serves to recommend this procedure.

Keywords: intramedullary interlocking nail, complications, rehabilitation.

Introduction

Fracture shaft of tibia is one of the common fracture encountered by the orthopaedic surgeons in their daily practice, this is because the bone is subcutaneous with less protection from the surrounding muscle. Over the years various modalities of treatment has been used. Now a days the well laid principle of biological osseous synthesis rightly applied in long bone fracture healing and hence the selection of closed intra- medullary interlocking nailing in this study. Both operative and non-operative treatments of tibial shaft fractures have been strongly advocated. Less severe fractures gradually do well without surgery, the more severe fractures requires surgery. Closed interlocking nailing helps in faster healing of fractures, because the fracture haematoma is not disturbed and also the periosteal callus formation is not disturbed. Interlocking intramedullary nailing of the tibia greatly improves rotational stability and can be used for axially unstable fractures located from 7cm below the knee joint to 4cm above the ankle joint¹. Intramedullary nails with interlocking capabilities were developed in an effort to provide a more stable fracture construct and to expand the spectrum of fractures that could be nailed while avoiding the complications of malunion²

Aims and Objectives

To evaluate the functional outcome in fracture shaft of tibia treated with intramedullary interlocking nail. To maintain limb length and prevent shortening, To study fracture healing and the union rate with intramedullary interlocking

nailing. To prevent angulation and deformity. To mobilize the patient as early as possible.

Review of Literature

Hippocrates also taught about fractures in detail and its management over two thousand years ago. In the treatment of fractures, he employed traction with a windlass, supported with a bench. His work has historic worth, and is also the background of many principle of modern orthopaedic surgery. The term “Orthopaedics” comes from its origin to the Greek word and was coined by the French Physician **Nicolas Andry** (1741), who published a book titled “La Orthopaedica”, meaning art of correcting deformities in children.

The 19th century also saw the emergence of Orthopaedics as a speciality and the first orthopaedic centre was started. Plaster cast was used in 1852, by **Mathysen** and he used bandages impregnated with Plaster of Paris. In the 19th Century, Orthopaedics and fractures depended on braces, casts, manipulations and exercise. **John Hilton** (1804-1878) advocated absolute bed rest for the fractured limb. At the dawn of 20th century, there was rapid evolution of surgery in orthopaedics. The art of correcting deformities and bone injuries, was given a scientific outlook.

Intramedullary Nailing

Persian Surgeon **J. Friedrich Dieffenbach** in 1841, used Ivory pegs to cross the fracture site. Early orthopaedic surgeons, such as **Senn, Lambotte** and **Hey Groves**

investigated the use of Ivory, Bone and Metal nails. The Rush brothers, **Leshi and Lewry** from Mississippi, developed the Rush rod in 1927. „Vase-of-flowers“ analogy of Rush, was usage of straight pins in curved bone and curved pins in straight bone, which is a three point fixation. 1940, **Gerhard Kuntscher**, regarded as Father of Intramedullary nailing, described at the German Surgical Conference, the clover leaf nail. Before this, he has also devised the V-nail. In 1950, **Kuntscher** added medullary reaming to achieve a uniform diameter of medullary canal better fit, extending the indications, to fractures a little away from the isthmus.

Herzog modified Kuntscher nail with bend at the upper quarter of the nail for tibial fractures to accommodate the eccentric proximal portal of entry. This was a standard treatment for unstable fractures. Here, two transfixation pins are inserted in the proximal end and distal end of the tibia. Closed reduction is done and below knee plaster cast is applied. This method maintains the length, prevents rotation and allows the mobilization of knee. It is also used in case of open fractures and comminuted fractures. main aim was to weight bearing and were used after initial consolidation of fracture. A full-length weight –relieving caliper with a cylindrical shin-guard made out of molded leather of plastic has been used. External fixators: They are used in open fractures, as it allows for regular wound dressing and allows for skin grafting. It is used as both a temporary and definitive stabilization. They can be (1) Ring fixators (2) Frame fixators.

Internal Fixation

Cerclage Wiring : Applicable in spiral fractures. This was first devised by Goetz in 1993. However, this technique is an inefficient form of fixation and has to be supported externally. Also, if the fracture is widely displaced, percutaneous wiring has the danger of picking tendons and even vessels, unless displacement has been accurately reduced

Materials and Methods

All confirmed cases of fracture shaft of tibia in Department of Orthopedics at Patna medical college and Hospital Patna Bihar, India. Admitted between September 2019-May 2021 was taken up for the study. 30 cases including both males & females were studied. Cases were also followed up at an interval of 6 weeks, 3 months and 6 months.

COLLECTION OF DATA

Incidence rate of fracture shaft of tibia due to RTA is 37.5% (Rockwood Greens Fractures in adults 5th edition. Vol 2) at a permissible error 35%. Size of sample works out to be 30 using statistical formula $n = 4pq/l2$.

Inclusion criteria

Patient who has been diagnosed as fracture shaft of tibia. Age group of more than 20 years of either sex. Patient who are fit for surgery.

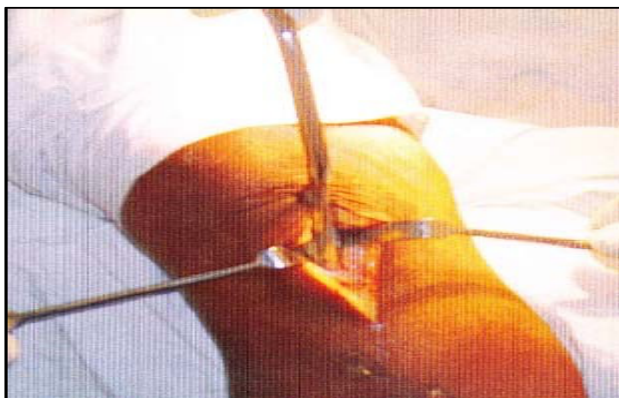
Exclusion criteria

Skeletally immature individual. Gustilo – Anderson classification of open fractures of shaft of tibia Type III. Neurovascular injury

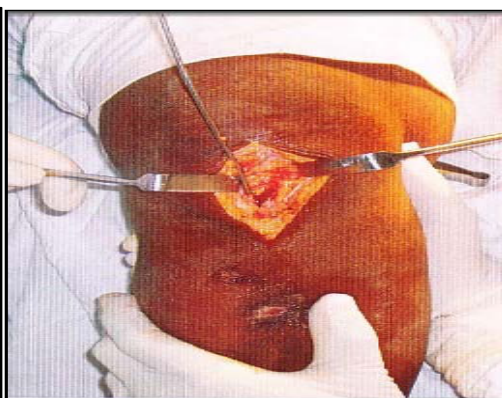
Pathological fracture. Nonunion, Segmental fracture, Preoperatively the length of the nail is calculated by subtracting 3 to 4cm from measurement taken from the knee joint line to tip of the medial malleolus clinically and medullary canal is measured at the isthmus on X-rays.,

Surgical technique

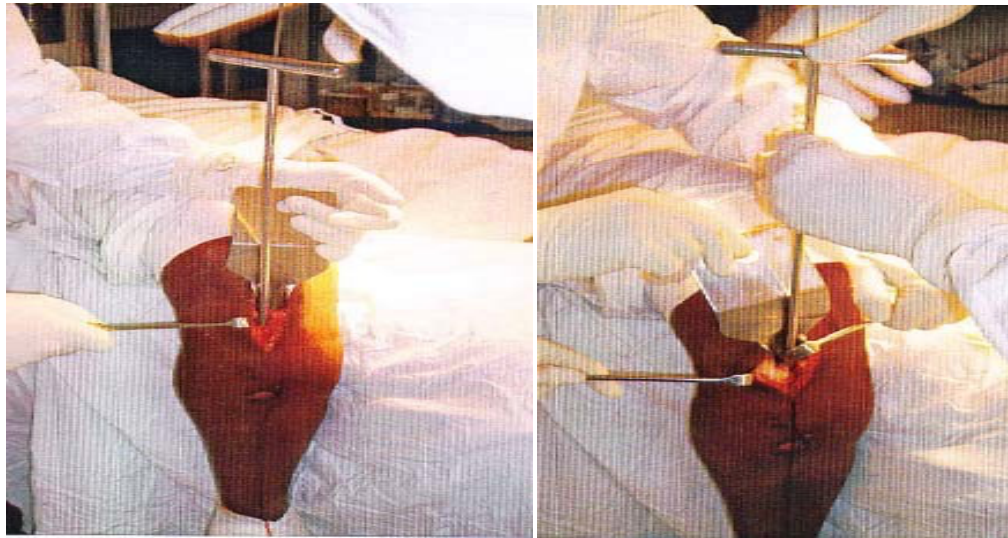
Patients were operated under spinal / general anesthesia. Patient was placed in supine position over a radiolucent operating table. The injured leg was positioned freely, with knee flexed 90° over the edge of operating table to relax the gastro-soleus muscle and allow traction by gravity. The uninjured leg was placed in abduction, flexion and external rotation to ensure free movements of the image intensifier from AP to lateral plane



Bone Awl used for opening medullary canal.



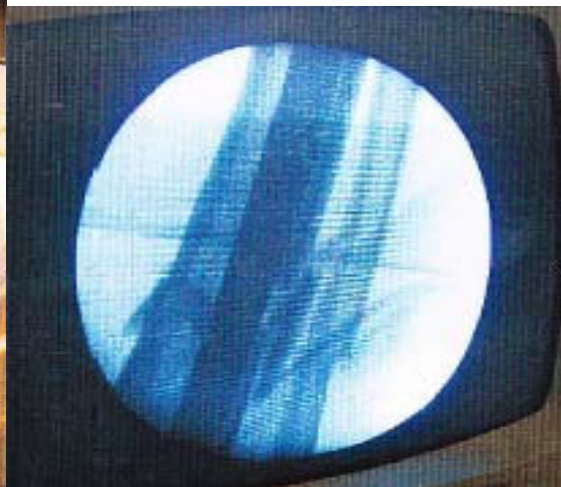
Guide wire introduced.



Reaming of medullary canal



Nail been inserted.



Nail position confirmed in c-arm

OBSERVATION AND RESULTS

30 patients with fracture shaft of tibia were treated with closed interlocking nailing.

56.67% of the patients in our study were between the age group of 20-30 years.

26.67% between 31-40 years & 16.67% between 41-50 years.

The results obtained were as follows:

Age wise Incidence

Age	No. of patients	Incidence
20-30	17	56.67%
31-40	8	26.66%
41-50	5	16.67%

Based on the involvement of Limb

Involved limb	No. of patients	Incidence
Right	21	70.00%
Left	09	30.00%
Both	0	0
Total	30	100

Tibial Fracture based on Anatomical location

Anatomical location	No. of patients	Incidence
Upper third	1	3.33%
Upper third and Middle third junction	1	3.33%
Middle third	17	56.66%
Lower third	11	36.66%
Total	30	100

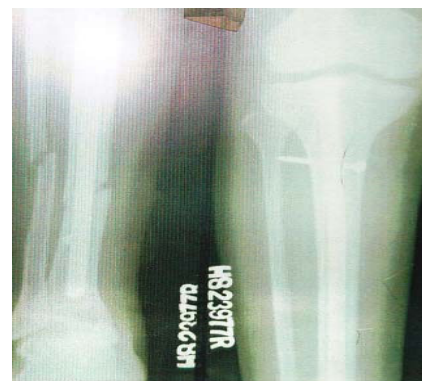
The commonest anatomical location of fracture was at the middle third of the Tibia. This constituted 56.66% of tibial shaft fractures. In our study, one patient had right sided middle-third fracture clavicle without displacement, which was treated with strapping and cuff collar sling. Two patients had right sided fracture Neck fibula without neurological complication, which was treated conservatively and one patient had left sided segmental fibular fracture which was again managed conservatively. Four patients had mild head injury and were managed conservatively.

Functional outcome

Functional outcome	No. of patients	Incidence
Excellent	23	76.66%
Good	05	16.66%
Fair	2	10.00%
Total	30	100



PRE-OP



IMMEDIATE POST-OP

Discussion

Fracture shaft of tibia is one of the most common fractures encountered by the orthopedic surgeon. Over the years, various modalities of treatment have been used. The principle of biological osteosynthesis is rightly applied in long bone fracture healing and hence the selection of closed intra-medullary interlocking nailing in this study. Age Incidence: Arne Ekeland *et al* (1988), in study series of 45 patients noted the average age of patients to be 35 years. Similar studies by Court Brown *et al*: (1990) noted the average age to be 32.4 years & Court Brown *et al* (1995) was 37 years. However, in our study, 56.63% of the patients were in the age group of 21-30 years and the average age being 30.8 years. Tibial shaft diaphyseal fractures were seen in the younger age group probably because they are the people who are physically active, Sex Incidence:

A study by Hooper *et al* (1991) showed that the incidence of fracture had male preponderance (82%). Similarly, Court Brown *et al* (1990) & Gaston *et*

al¹¹(1999), showed the incidence among males was 81.3% & 81%, respectively. In our study, incidence in male was 80% in concordance to the other studies. the anatomical location of the fracture was in the middle-third of the shaft of tibia in 17 (56.66%) patients, followed by the lower third in 11 (36.66%) of the cases. This is comparable to Lawrence B. Bone *et al* (1986) series, where 53.5% were middle – third fractures. Similarly Court Brown *et al* (1995), showed 44% were middle – third fractures Type of Fracture In our series Type A fractures were the most commonest, they constituted 26 (86.66%). Type A fractures are unifocal fractures and in our series the incidence is higher to the series of Court Brown *et al* (1995), who found that Type A accounted for 54% of all tibial fractures. Our series had a higher incidence of oblique fractures in 40.00% of cases, transverse fractures made up 23.33% cases and spiral fracture (23.33%), which was comparable to a study by Sankarsan Patroet *al* (1998), in whose series, there were 59% of these fractures. Court Brown *et al* reported 37.2% and Arne Ekeland (1988), reported 42% of transverse and oblique fractures. The Tscherne type of closed fracture in our series has been classified using the radiological criteria and in our series Tscherne CI fracture made up of 53.33% of closed fractures 16 patients. This is comparable to Tscherne CI fracture of about 53% in the series by Court Brown *et al* (1995). we have used intramedullary nails ranging from 8 to 10 mm in diameter and from 280 to 360 mm in length. Thirty closed reamed intramedullary nailing were done in our series. All the fractures were stabilized on a calcaneal traction till surgery. All patients in our series were given spinal anesthesia. In reamed nailing, the nail size in our series was 8mm. Static locking was done for all 30 cases in our series. Fracture Union was considered

when patient was full weight bearing without pain; fracture site was not tender on palpation and radiograph showed osseous union. Final assessment in our series was done at 6 months using the Johner and Wruh's criteria, taking into account of the following criteria, gait, pain, deformity, range of motion of knee, ankle and subtalar joints, shortening and Neurovascular disturbances, ability to do strenuous activities, radiological union and presence or absence of non-union.

Conclusion

Tibial diaphyseal fractures are commonly seen in physically active young male and are commonly seen as result of road traffic accidents. The interlocking nailing restores length, Alignment and controls rotation, preserves periosteal blood supply, some amount of endosteal blood supply and with biological osteosynthesis, lowers the rate of infection and malunion. The advantage of locking screws over the conventional methods reduces the rate of malunion, loss of alignment, angulation and shortening which are commonly found in a plaster cast or functional brace. The addition of locking screws extends its indications to within 5 cm of ankle and knee joint. The method of treatment employing closed intramedullary interlocking nailing to stabilize both principal fragments on the nail is an excellent one for closed fractures with comminution.

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