

A Study of Closed Reduction and Internal Fixation by Intramedullary Interlocking Nailing In Distal Tibia Fracture in Adult

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Abstract:

The rapid growth of technology and urbanization has led to enormous growth of new vehicles on road and rising incidence of high velocity trauma due to motor vehicle accidents usually resulting in fractures of long bones. Tibia is the most commonly fractured long bone in the body. On the basis of location, distal tibia fractures are second in incidence next to tibia diaphyseal fractures 1 . Open fractures are more common, because one third of its surface is subcutaneous throughout most of its length. Furthermore, the blood supply to the tibia is more precarious than that of bones enclosed by heavy muscles. The presence of hinge joints at the knee and ankle allows no adjustment for rotatory deformity after a fracture. Due to its frequency, topography and mode of injury it has become a major source of temporary disability and morbidity.

Materials& method: *Fifty patients with Distal Tibia fractures were treated surgically at Department of Orthopaedics.*

Results : *Majority of distal tibial fractures are as a result of road traffic accidents. Majority of these fractures are seen in young age groups. Majority of fractures occur in males.*

The most widely reported complication with Intramedullary Nailing is angulation in frontal plane, however, we consider that it can be managed very well intraoperatively by anatomically reducing the fragments under image intensification and with the use of poller pins where required.

Conclusion : *We conclude that intramedullary nailing is a better modality of treatment for distal tibial extra-articular fractures. It is more biological way of fixation and is done without disturbing the fracture hematoma, associated with minimal complications compared MIPO. Intramedullary nailing involves minimal surgical trauma and negligible blood loss. It provides negligible rates of infection, delayed union, non-union and malunion. There is less preoperative waiting and shortens the length of patient stay in the hospital. Closed intra-medullary nailing is a potentially cost-effective alternative to MIPO for the treatment of distal tibia fractures.*

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I. Introduction:

The rapid growth of technology and urbanization has led to enormous growth of new vehicles on road and rising incidence of high velocity trauma due to motor vehicle accidents usually resulting in fractures of long bones. Tibia is the most commonly fractured long bone in the body. On the basis of location, distal tibia fractures are second in incidence next to tibia diaphyseal fractures 1 . Open fractures are more common, because one third of its surface is subcutaneous throughout most of its length. Furthermore, the blood supply to the tibia is more precarious than that of bones enclosed by heavy muscles. The presence of hinge joints at the knee and ankle allows no adjustment for rotatory deformity after a fracture. Due to its frequency, topography and mode of injury it has become a major source of temporary disability and morbidity. The distal tibia due to its subcutaneous blood supply and tenuous blood supply pose a challenge to treating surgeons in terms of choosing an appropriate implant to achieve adequate union and

Return to early preinjury levels.

Hence special care and expertise is necessary when treating such fractures. It requires the widest experience, the greatest wisdom and the nicest of the clinical judgement in order to choose the most appropriate treatment for a particular pattern of injury.

The major goal in the treatment of fracture tibia is achieving functionally useful and stable extremity. Yet the spectrum of injuries to tibia is so great that no single method of treatment is applicable to all fractures.

Aims and Objectives:

It is a prospective study conducted in Tertiary Care Teaching Hospital for following aims:

- To evaluate clinical and functional outcome of operatively managed distal tibia fracture with intramedullary tibia nail in special reference to fracture anatomy, pattern and status of stability (Minimum 6 months Follow Up).
- To study fracture healing and union rates with closed intramedullary nailing.
- To assess the functional outcome with regarding to knee & ankle joint movements.
- To assess angulations, deformity and limb length equality.
- To hasten early mobilization of the patient.
- To reduce hospitalization time and to resume work early.
- To measure the rate of complication.
- To know How many patients required revision surgery in form of bone grafting, re-nailing , additional plating or debridement and its clinical and radiological outcome.

II. MATERIALS AND METHODS

CASE SELECTION

Patients of both sexes belonging to adult age group presenting with fracture distal tibia to Orthopaedic Department of are evaluated. Those satisfying our inclusion criteria and are surgically fit are included in the study. This includes a prospective study of 50 cases.

The patients in the study were included based on the following selection criteria.

Inclusion Criteria

The patient with injuries associated with fractures of the distal tibia.

Age limit : 18 years onwards

Both male and female

Skeletally mature patients with

Diaphyseal fractures of distal third of tibia

Extra articular metaphyseal fractures of distal tibia (simple, wedge or complex)

Exclusion Criteria

Patients with pathological fractures.

Patients with fractures within 5 cm of articular surface of the tibia were excluded

Patients with intraarticular Extension of fractures

Skeletally immature patients(age < 18 years)

Grade III C open fractures

Pathological fractures, fracture non-union and delayed union

Preoperative planning:

- Physician's advice regarding fitness for surgery is obtained in the form.
- In case of anaemia adequate transfusions of whole blood, packed cells and auto transfusions to improve the general condition is carried out.
- The limb is immobilized during the pre-operative stage by above knee POP slab.
- Preparation of part to be operated is done.
- Preoperative nail selection is done on the basis of preoperative X-ray to assess the width of nail by measuring the canal diameter at the narrowest portion in X-rays in the antero-posterior view.
- Length of the nail is assessed by measuring the normal leg from tibial tuberosity to medial malleolus and subtracting 2 cm from it. Bend in tibial nail takes into account the anatomic angle of 11 degrees formed by axis of access canal and the medullary canal.
- The instrumentation required is selected appropriate for the make of the nail.

Surgical Approach:

Principle of Intramedullary nailing:

As the nail extends from the one end of the bone to other end in the medullary canal, it act as an internal splint. It allows the axial forces to be transmitted to the opposed ends of the fragments. It prevents the angulation, translation, and to some extent rotatory movement. In this, the contact is occurring between the bone and the nail in the three points. The entry point, narrowest portion of the medullary canal(Isthmus) and at the cancellous epiphyseal bone at the opposite end are the three points.(Three point fixation).

Indications:

Conventionally interlocking nail is the gold standard treatment of the fractures in a zone of 5cm below the knee and 5cm above the ankle in fractures of tibia. As the fracture line extend into the metaphyseal zones of the tibia, the stability provided by any nail decreases precipitously. Recently the indication of nailing is extended to the metaphyseal region also. Locked intramedullary nailing currently is considered the treatment of choice for most type I, type II, and type IIIA open and closed tibial shaft/metaphyseal fractures.

Advantages:

In intramedullary nailing the fracture hematoma and periosteal blood supply is not disturbed which leads to early fracture healing. Even though the endosteal blood supply is disturbed in the reamed nailing, it improves the periosteal blood supply. These are the load sharing devices in compare to plate which are load bearing devices. So there is no chance for periprosthetic osteopenia and periprosthetic fractures

Duration of hospitalization: The average duration of hospital stay following surgery was 5 days ranging from 4-8 days

Follow up: After that patients were asked to follow up after 10 to 14 days for stitch removal. Subsequent follow up are done at 6 weeks, 3 months and 6 months.

The complaints were noted and evaluated in form of radiological and functional outcome.

Assessment of the patients were done, for pain, deformity, shortening, range of motion of knee, ankle and subtalar joints and radiological union by using Functional score of Olerud & Molander Score⁵³ and Knee Society Score. Pain was noted as none, occasional, moderate and severe.

Deformity was noted as none, anteversion-recurvatum, varus-valgus and rotation deformity in degrees.

Shortening was noted in the form of measurement and was noted in cms or was noted as nil if absent.

Range of motion of knee, ankle and subtalar joints was noted in percentage. 100% being normal. More than 80% for knee, more than 75% for ankle and more than 50% for subtalar joint was considered good.

Radiological assessment is done on the basis of whether there is callus, or union or if fracture is consolidated.

Radiological union is noted as consolidated for excellent and good results. Union for fair results and not consolidated for poor results at 6 months.

Angular alignment (varus-valgus, anterior and posterior angulation) was assessed radiologically. Varus-valgus was determined by measuring the angle between the line drawn perpendicular to bisecting the tibial plateau and proximal medullary canal with the line bisecting the distal medullary canal and tibial plafond.

Condition at discharge: All patients were advised non weight bearing mobilization with active toe mobilization physiotherapy.

III. OBSERVATION / RESULTS:

High incidence of soft tissue complications in the range of 10 to 15% are reported in many series. But the recent advances in plating like indirect reduction and percutaneous plating (LISS- Less Invasive stabilization System) is indicated in tibial metaphyseal fractures with periarticular metaphyseal comminution. The use of standard incisions according to Collinge and Sanders also improve the wound healing

MECHANISM OF INJURY:

- Sports related injuries are low-velocity injuries.
- Direct blow/ assaults are injuries associated with high and significant soft tissue damage.
- Motor vehicle accidents are high-velocity injuries.
- Gunshot injuries are both low and high-velocity injuries.
- The injuries is classified in the proforma enclosed.
- Sports injuries are usually closed injuries and simple injuries.
- In cases of fall, sports injuries and direct blow to tibia, a simple fracture configuration is present.
- Falls from a height and motor vehicle accidents have a more complex fracture pattern with open wounds.

IV. RESULTS

Evaluated by

1. FUNCTIONAL SCORE OF OLERUD AND MOLANDER
2. KNEE SOCIETY SCORE

V. DISCUSSION

This prospective study includes 50 patients who were admitted to the Department of Orthopaedics, Tertiary Care Hospital.

This study includes various patterns of fractures, closed as well as open injuries treated by closed method by using Intramedullary Tibia Nail.

In recent years, the indications for use of the intramedullary nail system were expanded to include the treatment of a wide spectrum of tibial fractures. This new, multidirectional locked intramedullary system involves multiple locking options in different planes at the distal ends. The system has an angular stability locking system that enhances the axial and lateral stability of the fracture fragments. Because of this modified design, the new system has advantages over the traditional tibial intramedullary nail in dealing with both proximal and distal tibial fractures. A biomechanical study showed that the addition of two proximal oblique screws significantly enhanced the stability of the intramedullary fixation construct compared with the original approach to fixation as in proximal tibia the medullary cavity is broad causing much instability which involved the use of two transverse screws fixation. In terms of varus – valgus and flexion – extension, the appendage of oblique screws increased the angular stability. In addition, there are 3 advanced distal locking options in this new tibial intramedullary nail. The set-up involved antero posterior locking option placed very distally, which allowed for optimized bone purchase and prevented damage to the soft tissue. These design modifications ensure that angular stability is retained and angle-stable locking reflects a potential to maintain fixation stability of distal tibia fractures. All of these design modifications allow for better fixation of metaphyseal tibial segments through multiple interlocking holes in close proximity to either end of the nail. The use of multidirectional interlocking screws ensures that alignment can be maintained and that stability can be preserved despite a short proximal segment. Non unions are important issues in the clinical treatment of tibial fractures.

A Prospective study with minimum 6 months follow up duration was taken up in which the cases were defined as adults having extra articular distal one third tibia fracture (open / close) and treated with close reduction and intramedullary tibia nailing.

The aim of the study was to study the outcome of intramedullary tibia nailing in distal tibia fractures.

They were evaluated on the bases Functional Score Of Olerud And Molander and Knee society Score and other intra op and post op findings which could provide a useful data.

Age distribution

In our study, the majority of the patients were in the age group of 31-45 years. There were 21 patients in this age group in our study. The average of the patient in our study was 44 years. Distal tibia fractures were seen in the younger age group as they are the persons who are physically active, were engaged in increased various outdoor activities and as a result most of the injuries sustained were high-velocity injuries and in elderly population due to low velocity injury such as domestic fall.

PNVSV Prasad et al in a study series of 147 patients noted the average age of patients to be around 39 years.

ASO Mohammed et al in a study series named INTRAMEDULLARY TIBIAL NAILING IN DISTAL THIRD TIBIAL FRACTURE : DISTAL LOCKING SCREWS AND FRACTURE NONUNION of 65 patient noted that the average age of patient was around 42 years .

Ramachandra N. Badami et al noted the average age to be 36 years in 2017 in a study titled “MANAGEMENT OF DISTAL TIBIAL METAPHYSEAL FRACTURES BY EXPERT TIBIAL NAIL”

Our study with an average age of 44 years is comparable to the study, with respect to the average age of the patient in fractures of the distal tibial metaphysis.

Sex distribution :

In our study, males predominated the females. There were 31 male patients (62%) and 19 female patients (38%). The incidence of males is higher because of their more outdoor activities, while women confined themselves to the domestic activities.

ASO Mohammed et al in their study noted the male incidence to be around 80 %, while the female incidence to be around 20%.

PNVSV Prasad et al noted male incidence at 69.38 % and female incidence at 30.6 %.

Mustafa Isik et al also noted the percentage of males to be around 70 %,while females around 30 %.

Our study of 62 % males, the incidence is lower when compared to above studies, whereas 38 % females in our study is higher when compared to other studies

Limitations of the study: The results of this study may be limited by measurement error. The physical measurements may be subject to both, observer’s errors and patient variability. The study is also limited to patients having surgical fixation for their fracture. These results therefore, cannot necessarily be compared to the outcome achieved with non-operative management or other modalities of treatment.

Conflict of interest: NIL

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