

## Operative Outcome of Interlocking Intramedullary Nailing With Reaming for the Treatment of Open Tibial Shaft fractures: A Clinical Study.

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### Abstract:

**Context:** Compound fractures of tibia pose a significant challenge to orthopaedic surgeons due to its precarious blood supply, subcutaneous location and poor soft tissue coverage, leading to various complications. This study evaluates the operative outcomes of interlocking intramedullary nailing with reaming for open tibial shaft fractures.

**Aims:** To study the clinical, radiological and functional outcomes, and complications associated with the procedure.

**Materials and methods:** Interlocking Intramedullary Nailing of 30 cases of open tibial diaphyseal fractures and evaluation of the results. Statistical Analysis Used: Patients evaluated clinically and radiologically, at regular intervals.

**Results:** Out of 30 patients, according to the Lysholm Knee Scoring system, 20 cases had excellent, 8 had good, and 2 had fair outcomes. Radiological union was achieved in 17-20 weeks. Complication rate was 16.67%.

**Conclusions:** Reamed intramedullary nailing for treatment of open tibial shaft fractures is an excellent option, producing biomechanical stability and facilitating rapid rehabilitation in compound diaphyseal tibial fractures.

**Keywords:** interlocking nail, tibia, reaming, open fractures

### I. Introduction

In modern times, the increased incidence of roadside accidents account for significant morbidity and mortality. These high-energy trauma commonly result in fracture of long bones of lower limbs and associated with varying degree of soft-tissue damage. Because of its location, tibia is exposed to frequent injury; it is the most commonly fractured long bone. Its subcutaneous location, precarious blood supply and decreased soft tissue coverage makes tibial fractures prone to delayed union, non-union and infection. Thus even today, the treatment of unstable shaft fracture of tibia is difficult. Various treatment modalities are used in the management of this fracture which include conservative management with cast and functional bracing to intramedullary fixation, plating and external fixation. Locked intramedullary nailing is currently the preferred method for surgical treatment of tibial diaphyseal fracture. It provides more stable fixation and prevents rotation.<sup>[1]</sup> Other advantages of intra-medullary nailing includes closed fixation, good alignment without periosteal stripping, early ambulation and load sharing.<sup>[2]</sup> It may be done with or without reaming. The method needs specific instruments and facilities like image intensifier and a complete set of nails, screws, and insertion devices. This study aims to study the operative outcomes of interlocking intramedullary nailing with reaming for open tibial shaft fractures.

### Aims And Objectives

1. To assess the clinical and radiological outcome of the patients .
2. To assess the functional recovery of the patients.
3. To assess the complications associated with Interlocking intramedullary nails for open tibial shaft fractures.

### II. Materials And Methods:-

**1.1. Study Area:** The present study was performed in Department of Orthopaedics and Department of Radiodiagnosis at a tertiary care centre catering to a rural based population.

**1.2.Study Population:** This study will be conducted among the adult patients attending outpatient department and emergency department of our institute with open tibialdiaphyseal fracture with following-

**Inclusion criteria**

- All patients having tibial diaphyseal fracture.
- All open fracture (Gustilo- Anderson type I,II,III-A fracture)
- Patient medically physically and mentally fit.
- Absence of any major co-morbid illness and absence of any fracture line extending up to the knee joint or down to the ankle joint.

Exclusion criteria:

- Patients having concomitant fracture in ipsilateral limb .
- Serious medical co-morbidities (Cardiological, Metabolic diseases etc...).
- Pathological fracture.
- Fracture more than 3 week old.
- Open fracture of Gustilo-Anderson type III-B,III-C.
- Comminuted fracture (42-C).

**1.3.Study Period:** 1 year

**1.4.Sample Size** = 30 patients.

**1.5.Sample Design:** Patients matching this inclusion criteria will be consecutively included in this study till the desired sample is obtained.

**1.6.Study Design:** Institution based prospective study of case series.

**1.7.Parameters To Be Studied**

**A. Parameters of specific objective no.1**

- Clinical union time.
- Radiological union time.
- Radiological deformities, eg. valgus/varus , procurvatum/ recurvatum, etc...
- Weight bearing time, both partial and complete .
- Range of movements (ROM) of hip and knee joints.
- Deformity and limb length discrepancy (LLD)

**B. Parameters of specific objective no.2**

- Operative time.
- Blood loss
- Fluoroscopy exposure (C-ARM shot).

**C. Parameters Of Specific Objective No.3**

- Infection
- Delayed union
- Mal union
- Non-union
- Implant failure

**1.8. Study Techniques:** Open tibialdiaphyseal fracture in patients will be treated by Intramedullary interlocking nail with reaming. The outcome of the treatment will be evaluated clinically by Lysholm Knee Score and radiologically.

**1.9.Plan For Analysis Of Data:** The patient will be evaluated in details in pre and post-operatively both clinically and radiologically in a regular interval. The results will be analysed by appropriate statistical test.

**1.10. Operative Procedure:-Interlocking nail**

Spinal, epidural or general anaesthesia was given and patient was placed supine on the operation table. The limb is prepared and draped with the standard aseptic technique. Nailing was done using a standard radiolucent operating table. A longitudinal incision, 5cm long, was made medial to the patellar tendon and the patellar tendon was retracted laterally. The medullary canal was opened with the curved bone awl in the mid line just proximal to the tibial tubercle at the level of the tip of the fibular head (approximately 1.5 cm distal to the knee joint) behind the patellar tendon and in line with the centre of the medullary canal on the antero-posterior

view. After the entry point was connected to the medullary canal an olive tipped guide wire was passed. The fracture was reduced by longitudinal traction and manipulation. Rotational alignment was obtained by aligning the iliac crest, patella, and second toe of the foot. After reduction, the guide wire was passed in the distal fragment and centred in antero-posterior and lateral projections. After sequentially incremental reaming, the guide wire was exchanged and appropriately sized nail, mounted on aiming device, was inserted. The appropriate nail length was determined using a graduated guide wire. The Tibial Tubercle And Medial Malleolar Distance( TMD ) was determined. The tibial nails of 9mm or 10 mm diameter were used most frequently. Distal locking was done first by freehand technique. Proximal locking was done by means of the jig.

**Post-operative and rehabilitation**

- Patients were kept under strict observation for the first 24 hours Post operative period.
- Intravenous fluid, 3<sup>rd</sup> generation cephalosporin were administered to the patients routinely.
- After recovery from anaesthesia patients were instructed do active toes movement.
- Parenteral antimicrobials withdrawn after 3 days then oral antimicrobials were started and continued for a variable period of time depending on the wound condition.
- Stitch removal done after 2 week post operatively.

**1.11. Rehabilitation**

- From the 2<sup>nd</sup> post operative day patients were encouraged to do mild mobilization exercises of the joints concerned.
- Stitches were removed after 2<sup>nd</sup> week.
- Quadriceps exercises and ankle exercises were encouraged aftersubsidence of pain (2-3 days).
- Considering fracture pattern and method of fixation full weight was allowed only after evidence of clinical and radiological union.

**1.12: Follow Up:**

- All patients were followed up for a minimum of one year.
- Fracture union was assessed clinically and radiologically at an interval of 4 weeks for first two months and 6 weekly thereafter.
- Complications were identified and treated accordingly.

**III. Results**

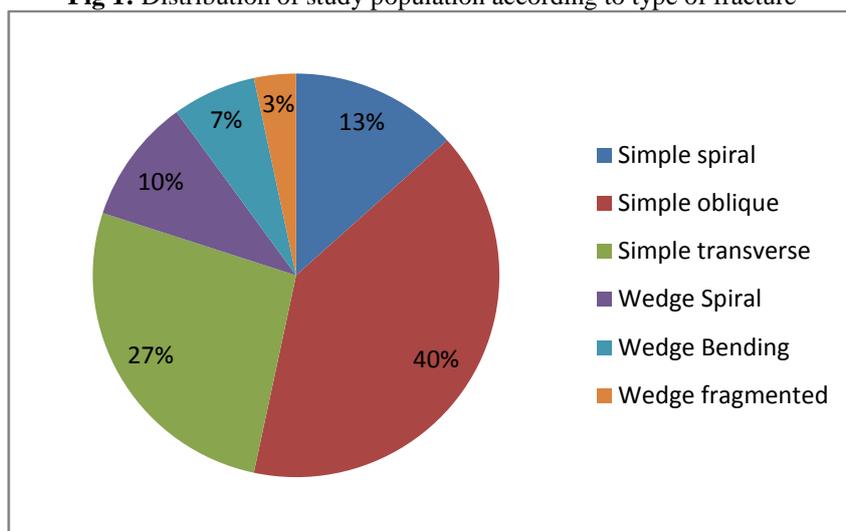
**Table 1:** Distribution of study population according to Mechanism of Injury

Mode of Trauma	Male		Female		Total	
	No. of pts	Perc %	No. of pts	Perc %	No. of pts	Perc %
MVA	14	58.33	4	66.66	18	60
Fall	5	20.83	1	16.67	6	20
Assault	3	12.5	1	16.67	4	13.33
Sports	2	8.33	0	0	2	6.67
TOTAL	24	100	6	100	30	100

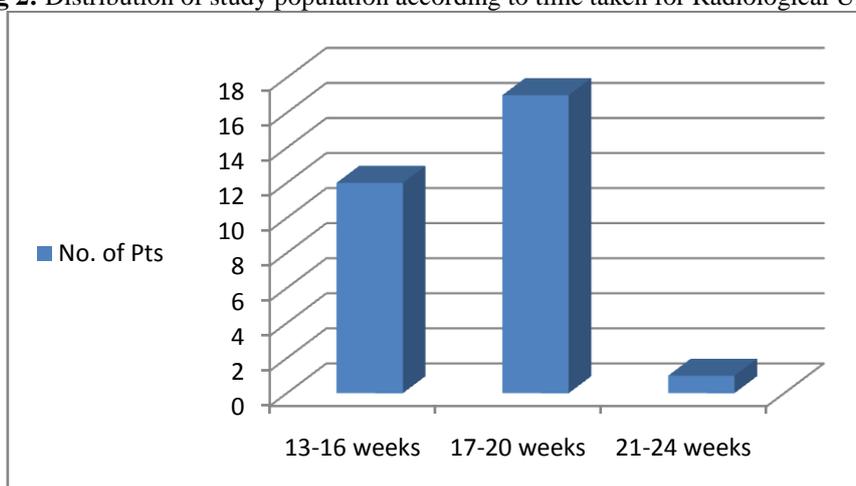
**Table 2:** Time of partial and full weight bearing

Time of wt bearing (weeks)	Partial	Full	
2-4	24		
5-6	6		
13-16		28	
17-20		2	

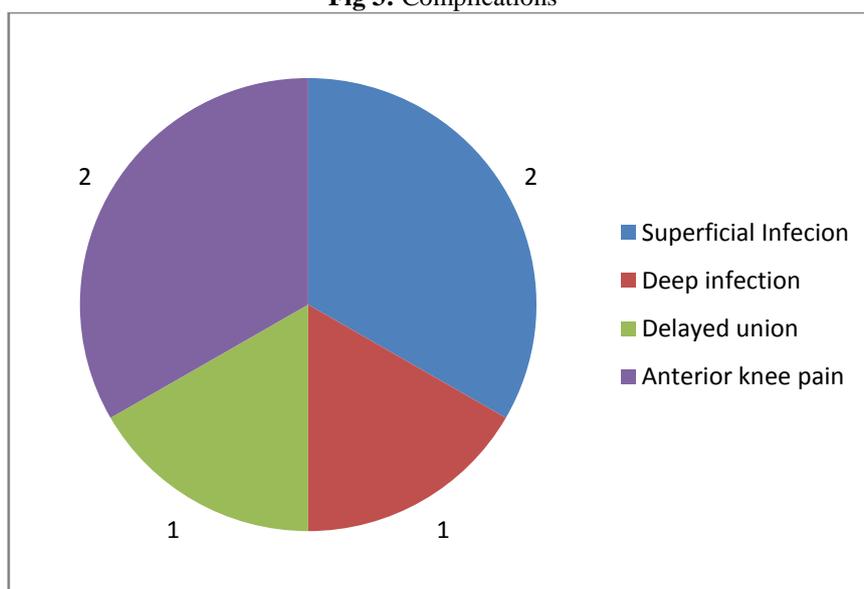
**Fig 1:** Distribution of study population according to type of fracture



**Fig 2:** Distribution of study population according to time taken for Radiological Union

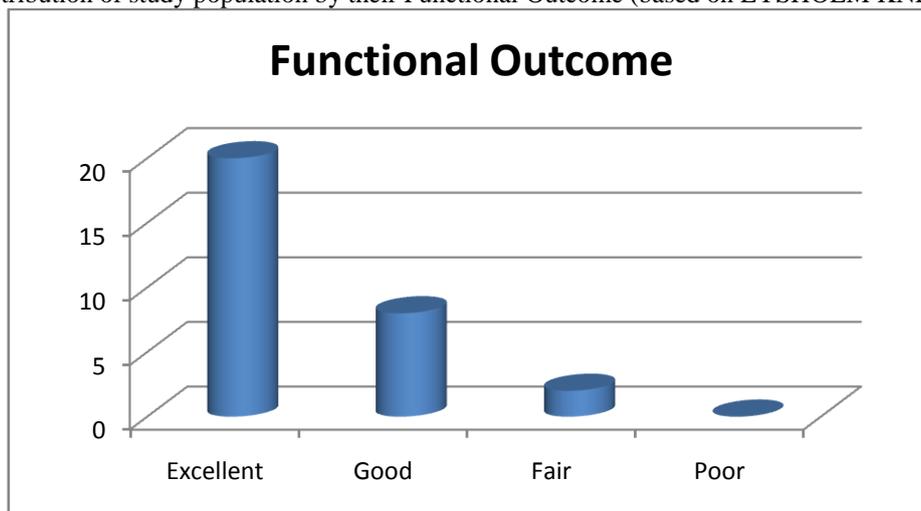


**Fig 3:** Complications



#1 case had both superficial and deepinfection

**Fig 4:** Distribution of study population by their Functional Outcome (based on LYSHOLM KNEE SCORE)



**Fig 5:** Skiagrams



#### IV. Discussion

##### **To Study The Operative Outcome Of Intramedullary Interlocking Nailing With Reaming For The Treatment Of Open Tibial Shaft Fractures:-**

In our study, the majority of the patients were in the age group of 21-30 years. There were 12 patients in this age group in our study. The average age of the patient in our study was 31.43 years. In the study conducted by Court Brown mean age 37 year and Sakaki MH et al reported average age 32.75 year.

In the present study, 80% were male in both the group. The incidence of male is higher because they are more involved in outdoor activity and thus more prone to MVA. Court-Brown et al. in their study noted the male incidence to be around 81.3% while Female incidence to be around 18.7%.<sup>[3]</sup> Sakaki MH reported 90.9% male patient in their study.<sup>[5]</sup>

##### **In This Study Right Side Tibia Fracture Predominance To The Left Side.**

In our study 60% of tibia fracture is due to motor vehicle accident and 20% due to fall. Incidence of fracture tibia due to MVA is higher in our study series compared to court Brown et al in which series incidence was around 37.5% due to MVA and 4.5% due to direct blow. In present study only 42-A and 42-B fracture were included in the study. In our study simple fracture pattern (42-A) is more common than wedge fracture (42-B). A simple fracture constituted 79% in our study. Incidence is higher to the series of Court Brown et al who found simple type account for 54% of all tibia fracture. In most of the patients (66.66%) nailing was done in 2nd week of injury.

Delay of more than 7 days was due to late presentation of patient often referred from remote area, delay in pre anaesthetic fitness. Operation after two weeks often led to difficulty in closed reduction and increased

operative time. Average operative time for interlocking nail was  $72 \pm 12.42$  min. Average blood loss in interlocking nailing was 142ml. Chong jian et al.

Reported average blood loss of 122ml (100-350 ml) in interlocking nail group. Partial weight-bearing allowed as soon as the pain subsides. Locked intramedullary nail provides more stability hence partial weight-bearing was allowed earlier post-operatively as early as 2 weeks. The union criterion adopted was the presence of at least 3 healed cortices seen in 2 radiographs (AP and lateral), in addition to the absence of pain and mobility at the fracture site. In the present study average time of union in interlocking nail group is 19.53 weeks. In our study 100% patients treated with interlocking nail achieved union. In our study series superficial infection rate was 2 cases (6.66%) in interlocking nail and it healed with dressings and antibiotics. In one case it progressed to deep infection, which was healed with repeated debridement of wound and antibiotics. In the literature, delayed union is designed at 12 to 30 weeks after a tibial shaft fracture, 20 weeks being the most commonly cited cut off time (Oni et al 1988,<sup>[6]</sup> Uhlin and Hammer 1998,<sup>[7]</sup> Coles and Gross 2000).<sup>[4]</sup> In our study, we consider cut off time for delayed union as 24 weeks. With this criterion, we found 1 case (3.33 %) of delayed union, which is due to locked fixation that prevents compression at fracture site. Dynamization was performed in 1 case of interlocking nailing.

## V. Summary

The present work, —” A CLINICAL STUDY FOR OPERATIVE OUTCOME OF INTERLOCKING NAILING WITH REAMING FOR THE TREATMENT OF OPEN TIBIALSHAFT FRACTURES” was intended to study and evaluate the efficacy of interlocking intramedullary nail in the treatment of diaphyseal fractures of tibia. The study was carried out in 30 patients with open tibial shaft fracture in department of orthopaedics, of a rural based tertiary care institute.

### The following observations and inferences were made:-

- The average age of patients in this study was 31.43 years.
- Incidence of tibial shaft fracture was higher in males (80%).
- Right sided tibial fractures were more common than left.
- Motor vehicle accident was most common mode of injury in our study accounting for 60% of cases. Other modes of injury were fall from height, assault and sports injury. [Table 1]
- In our study, simple fracture pattern (42-A) was more common than wedge fracture (42-B). [Fig 1]
- Average operative time for interlocking nail was  $72 \pm 12.42$  min.
- All patients of interlocking nail were allowed partial weight-bearing in post-operative period, often as early as 2 weeks. [Table 2]
- Most cases achieved radiological union by 17-20weeks. Average time of union in interlocking nail is 19.53 weeks.
- Considering cut off time for delayed union as 24 weeks, 1 case of delayed union was reported. [Fig 2]
- 2 cases of superficial infection were found.
- Most superficial infection resolved on antimicrobial therapy except in 1 case that developed deep infection.
- Complication rate in our study was 16.67%. Anterior knee pain was the commonest complication in locked intramedullary tibial nailing. [Fig 3]
- The final evaluations of patients were done at one year. Based on Lysholm Knee Scoring, 66.66% cases had excellent, 26.66% had good result, 6.66% had fair results. [Fig 4]

## VI. Conclusion

From the analysis of our results, we can conclude that sequential protocol for treating exposed tibial shaft fractures of Gustilo and Anderson Grade I, II and IIIA comprising initial treatment with thorough debridement, IV antibiotics and bony stabilisation followed by osteosynthesis with intra medullary interlocking nailing, presented with high consolidation rates and low non-consolidation and infection rates. Only the presence of infections showed a statistically significant relationship with the time taken to consolidate. So, the present study concluded that reamed intramedullary nailing for treatment of open tibial shaft fractures to be a satisfactory procedures producing biomechanical stability and facilitating rapid rehabilitation with early weight bearing and resulting in predictable fracture healing in good alignment.

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