

Outcome of Compound Tibia Fractures with Unreamed Intramedullary Interlocking Nailing

Rajib Debnath¹, Abantika Nath², Chayan Sarkar³, Biswaraj Sarkar⁴

¹Associate Professor, Department of Orthopaedic, Tripura Medical College & DR BRAM Teaching Hospital, Hapania

²Senior Resident, Department of General Surgery, Agartala Government Medical College, Agartala

³Assistant Professor, Department of Paediatrics, Agartala Government Medical College, Agartala

⁴Associate Professor, Department of General Surgery, Tripura Medical College & DR BRAM Teaching Hospital, Hapania

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Corresponding Author: Dr. Rajib Debnath

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Abstract

To evaluate the incidence of union, nonunion, deep infection and factors influencing the time of bone healing in the treatment of open tibial shaft fractures Gustilo and Anderson types II, IIIa, IIIB treated by an unreamed intramedullary locked nail. It is a prospective study of 60 compound grade II, IIIa, IIIB tibial diaphyseal fractures. According to the Gustilo and Anderson classification type II with 33 fractures (55%), type IIIA 15 fractures (25%) and type IIIB 12 fractures (20 %). For the definitive stabilization of the fracture were used an unreamed intramedullary locked nail. Bone healing was achieved in 48 patients (80%) of the cases, 9 patients (15%) reported delayed union and nonunion reported in 3 patients (5%) full range of knee movement achieved in 36 patients (60%), >80% knee movement were achieved in 18 patients (30%) and <75% movement achieved in 6 patients (10%) full range ankle movement achieved in 48 patients (80%), >75% movement in 9 cases (15%) and <50% movement in 3 cases (5%) achieved. Results were excellent in 33 patients (55%), Good in 21 patients (35%), fair in 3 patients (5%) and poor in 3 patients (5%) of patients assessed by John & Wruhscriterianly the presence of complications were statistically significant to the time of bone healing. The treatment of open tibial shaft fractures with unreamed intramedullary locked nail allows high rates of bone healing, low rates of nonunion and deep infection, and only the presence of complications is statistically significant to the time of bone healing.

Keywords: Compound Tibia Fracture, Unreamed Intramedullary Interlocking Nail

Mesh Term: Tibia, Fracture, Compound.

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Introduction

The annual incidence of open fractures of long bones has been estimated to be 11.5 per 100 000 persons [1] with 40% occurring in the lower limb, commonly at the tibial diaphysis.[2] Due to the precarious blood supply and poor soft tissue coverage these fractures are frequently complicated by delayed union, malunion, non-union and infection. "Every fracture is an individual problem, and the decision to treat it conservatively or by internal fixation should be based on a realistic assessment of the advantages and the hazards of each method in the circumstances of that particular case. This calls for a high degree of clinical judgement which is harder to acquire or to impart than technical virtuosity in the operating theatre" [5] With recent advances in treatment, use of antibiotics, improvement in wound care, drainage

and surgery skill[6], the aim in severe open fracture treatment has moved from the "era of limb preservation" to the "era of the preservation of function" (Tscherne, 1984). Studies have shown that reaming disrupts the cortical blood flow to a greater extent than the Unreamed nails thereby increasing the susceptibility to infection. When comparing the Unreamed IM nail to the Reamed IM nail, the Unreamed nail with interlocking may provide the same stability as a closely fitting tubular nail but without the danger of jamming. Thus, considering all these studies, the Unreamed IM Nail can be used for the management of Compound fractures of Tibia. The most widely used is that of Gustilo and Anderson [14] which describes three groups of increasing severity based on the size of the open wound, the degree of its contamination and the

extent of soft-tissue injury. The major disadvantage of the original classification was that the type-III category included a broad spectrum of open injuries of differing severity and, subsequently, of variable prognosis. Therefore in 1984 Gustilo et al [15] reclassified the type-III injuries into three subgroups based on the extent of bone exposure, the requirements for adequate soft-tissue cover of the exposed bone and the need for vascular repair. The revised system has been used widely, [16] but its reliability has been challenged in a survey conducted by Brumback and Jones [17] which showed a moderate to poor interobserver agreement, even among experienced orthopaedic surgeons [18].

Aim of the Study

It was done to compare the advantage of using an interlocking intramedullary nailing without reaming in the treatment of compound fractures of tibia with various studies in terms of time required for union, rate of malunion and malrotation, infection and range of motion of knee and ankle

Materials and Methods

Between OCT 2011 to MARCH 2015, 60 compound tibial fractures in skeletally mature patients were treated in the Department of Orthopaedic in a tertiary care hospital, Karnataka with an unreamed interlocking intramedullary nail after attaining ethical clearance.

All the cases selected were fresh fractures and traumatic in nature. The procedure was done as early as possible and the secondary procedures of Dynamisation, skin grafting and musculocutaneous flap were done as and when needed. The cases were followed up for an average period of 18 months with 4 visits (6 weeks, 3 months, 6 months and 12 months). The Criteria for selection of the cases:

Inclusion criteria

- Gustilo and Anderson Grade II, Grade IIIa, IIIb compound tibia fracture.
- Age limit: 20 years to 60 years
- Both males and females

Exclusion criteria

- Patients with head and chest injuries.
- Gustilo and Anderson Grade IIIc compound tibia fracture.
- Pathological fractures
- Fractures proximal to tibial tuberosity
- Fractures within 5cm of the distal articular surface of tibia
- Intraarticular extension of fractures
- Fracture significant bone loss
- Associated other bone fractures.

Results & Discussion

Compound fractures of the tibia managed using an unreamed interlocking intra medullary nail shows better functional results and patient satisfaction. It involved minimal surgical trauma and less blood loss because of unreamed procedure. It provides the advantage of early ambulation, lower rates of infection, nonunion, mal union and delayed union compared to other treatment modalities. It allows early weight bearing and shorter hospital stay. 60 compound fractures of the tibia were treated with wound debridement and unreamed interlocking nail during the period from Oct 2011 to March 2015. All the cases were fresh fractures and traumatic in nature.

They were followed up for a period of 18 months. Our aim was to treat these fractures by closed reduction internal fixation using an unreamed interlocking nail.

There was a bimodal distribution of age of patients between 20 to 30 and 41 to 50 years and among those 52 males (86%), 8 females (13%).

Majority of compound fractures are usually sustained as a result of high velocity trauma as seen in motor vehicle accidents, in our study we observed that 60% of them occurred as a result of motor cycle accidents which can be attributed to the fact that our study was done in a rural setup where majority of the people use motorcycles.

In our series most of the fractures were of Gustilo type II with 33 fractures (55%) followed by type IIIA 15 fractures (25%) and type IIIB 12 fractures (20 %).

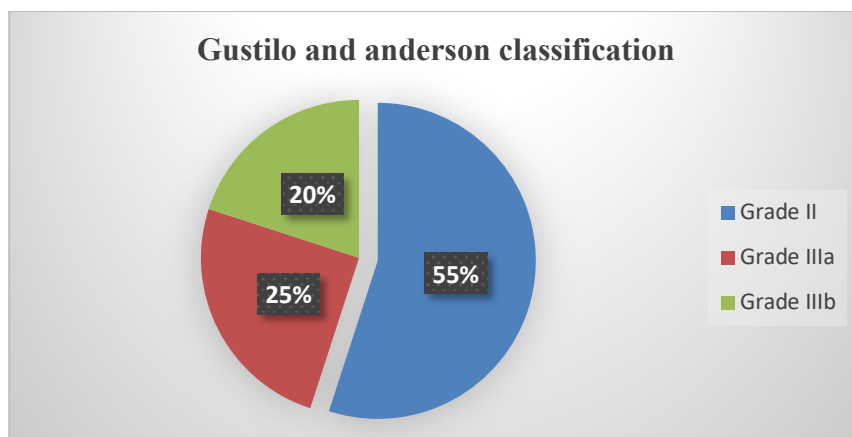


Figure 1: Gustilo and anderson classification

24 fractures were comminuted followed by 21 oblique fractures, 6 fractures spiral, 9 fractures were transverse. Most of the fractures 60% occurred at the junction of middle –distal third of tibia which reinforces the fact that high velocity is

needed to sustain such kind of a fracture pattern and subcutaneous area of the tibia exposes the limb to a fracture most common at the middle and distal junction.

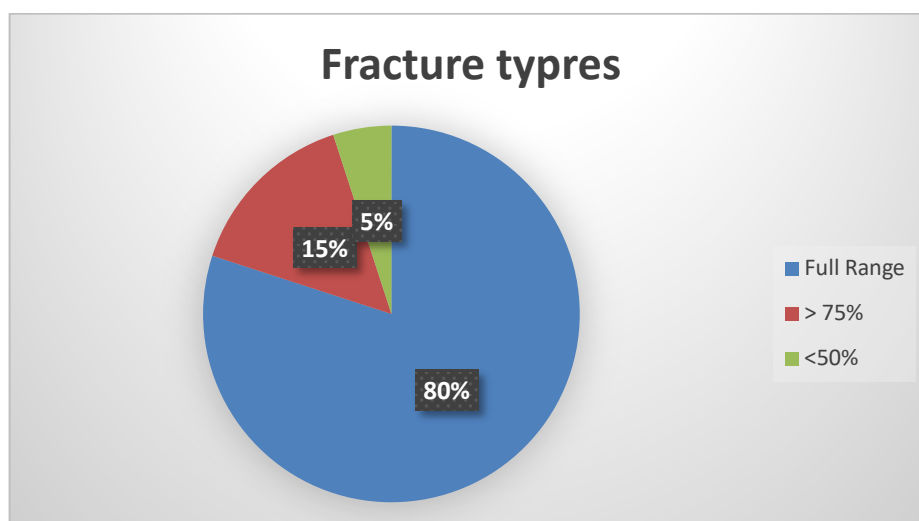
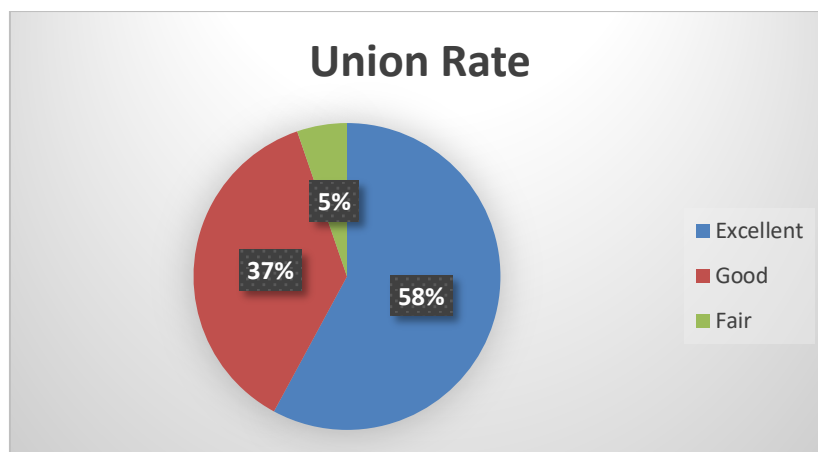


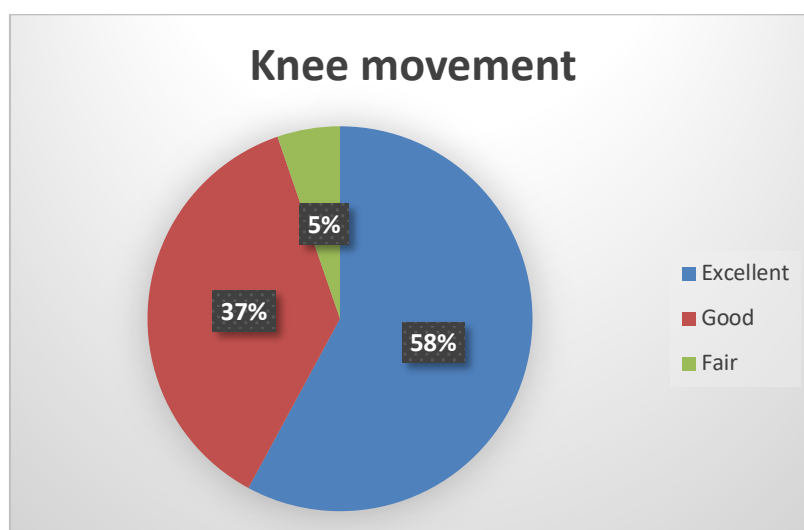
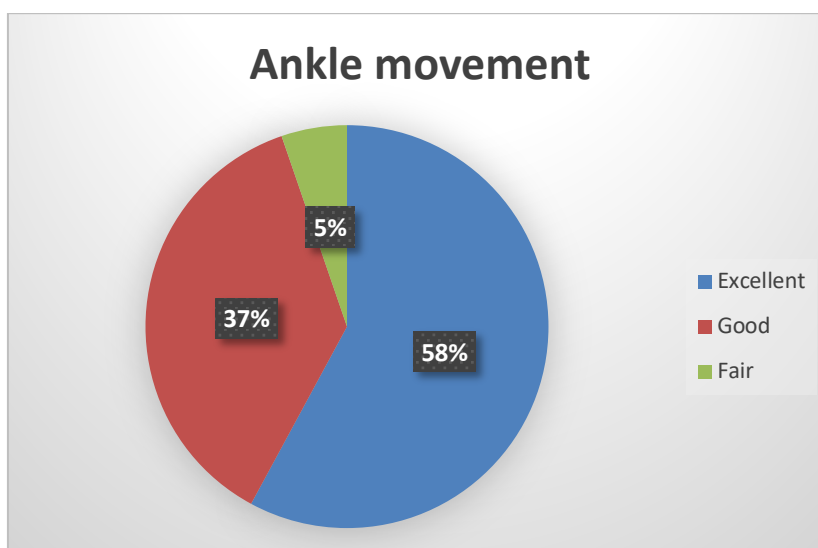
Figure 2: Fracture types

Emergency irrigation and immediate debridement of the compound fracture was done. Patients were operated as early as possible within 6 hrs of presentation (65%) once the general condition of the patients was stable and fit for surgery. In all of the cases a midline patellar tendon splitting approach was used for nail insertion. Our mean operating time was 90 minutes (range 60 min to 120 min). Post operatively all the patients were mobilized as early as possible depending upon the fracture stability, tolerance level and general

condition of the patient. 48 fractures united within 6 months of injury, and 9 cases of delayed union were reported which eventually united within 36 weeks. 3 patients with a Gustillo IIIB fracture eventually went to nonunion 10 months after the injury which can be attributed to the fact that he had a comminuted fracture and there was a delay in the initial management of the case as the patient was taken up for surgery 1 week after the trauma due to preexisting co morbidities and monetary constraints.

**Figure 3: Union rate**

In 36 patients (60%) full range of knee motion was attained by 12 weeks. More than 80% of knee motion was seen in 18 cases. In 6 cases less than 75% of knee motion was achieved (10%). In 48 patients (80%) full range of ankle motion attained at 12 weeks, more than 75% of ankle motion in 9 cases (15%). In 3 cases less than 50% of ankle motion (5%).

**Figure 4: Knee movement****Figure 5: Ankle movement**

6 patients developed superficial infection. All which healed with oral antibiotics. One patient with Gustilo type II open fracture developed a deep infection. 3 patients noticed pain at the left knee joint which could be attributed to the use of a

longer nail in the patient. Results were excellent in 33 patients (55%), Good in 21 patients (35%), fair in 3 patients (5%) and poor in 3 patients (5%) of patients assessed by Johner & Wruhs criteria.

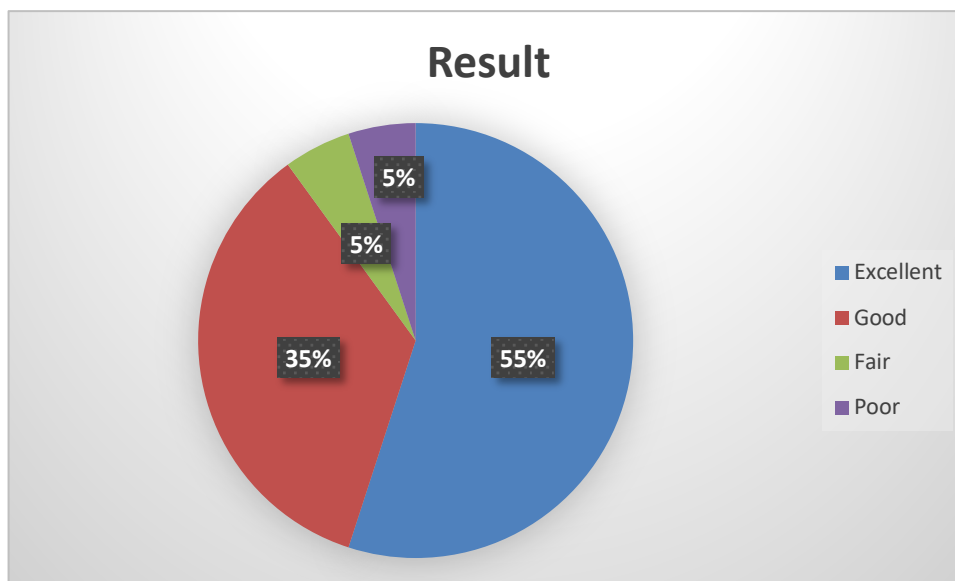


Figure 6: Result

Intramedullary nailing without reaming is a feasible option in compound fractures of tibia up to Gustilo type IIIB. The present series shows that compound fractures of the tibia, managed well with unreamed intramedullary nailing, involves minimal surgical trauma and minimal blood loss.

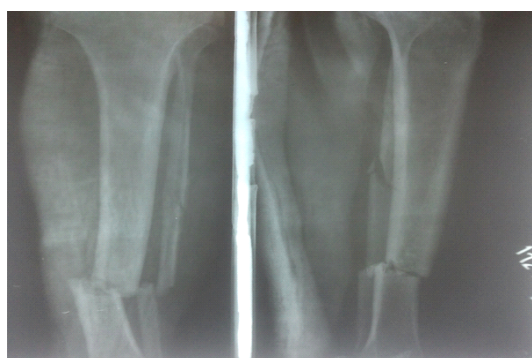
It provides the advantages of early mobilization, lower rates of infection, delayed union, mal union, and nonunion compared to other modalities of treatment. To achieve these goals, we recommend an early and immediate debridement followed by

skeletal stabilization with an unreamed interlocking nail and early wound coverage.

If union does not progress by 8 to 10 weeks, then we recommend dynamization to prevent the unwanted complications like nonunion or delayed union. Advantage of interlocking nails is early mobilization of the patient which helps in reducing fracture disease and reduces sickness absenteeism.

Functional Results

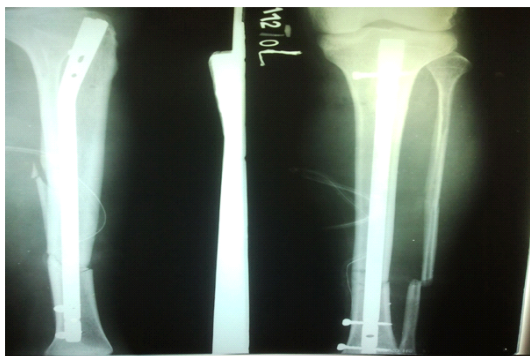
Case 1



Preoperative X ray



Wound – preoperative



Immediate postop X ray



Wound – post debridement



Wound 6 weeks post SSG



ROM- Flexion at 6 weeks



Extension – 6 weeks



Partial weight bearing



ROM Knee flexion 3 months



3 months old compound wound scar

**ROM plantar flexion 3 months****Knee extension 3 months****Healed entry point scar 6 months****Dorsiflexion 3 months****Fracture union at 6 months****Figure 7:**

Conclusion

Unreamed interlocking nailing with the help of an image intensifier results good outcome in compound fractures of tibia. Interlocking intramedullary nailing procedure promotes early fracture union as it does not further compromise vascularity of the fracture site. Early mobilization of the patient helps in reducing fracture disease and reduces sickness absenteeism.

There was minimal blood loss intra operative period and associated with low risk of infection. Early soft tissue coverage, fracture dynamization at 8-10 weeks if union does not progress, to avoid the complications such as nonunion or delayed union.

Strict adherence to technical principles during nailing might have prevented some of the complications that developed in this series.

Early mobilization of patients reduces hospital stay and helps in early return to activities. Acceptable

complication rates as compared to other modalities of treatment. Unreamed nailing has low incidence of compartment syndrome, peroneal nerve palsy and is acceptable in compound fractures as compared to reamed nailing.

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