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## Outcomes of intramedullary nailing in Tibial shaft fracture

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### Abstract

**Objective:** For studying outcomes of intra-medullary nailing in tibial shaft fracture: Tibial fractures that need intramedullary nailing; follow up of tibial fracture after intramedullary nailing; and complications of intramedullary nailing

**Study Design:** Prospective study. Place and Duration of Study: Imam AL Hussain Teaching hospital, this study was done in one year from first of March 2023 until first of April 2024.

**Patient and Method:** Thirty patients of 18-55 years of age, both male and female are included, with tibial shaft fractures (closed type and gustilo type I open fractures). all fractures were fixed with intramedullary nailing.

**Results:** About 86.6% (26 cases) fractures had achieved union within six months while 10% (3 cases) fractures completed their union among seven and nine months which means delayed union and 3.3% (1 case) did not united till 9 months, and this is mean non-union.

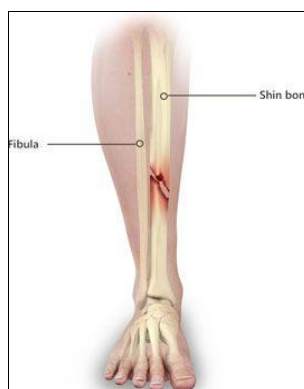
**Conclusion:** One of the best methods for management of tibia shaft fractures (closed type and gustilo type I open fractures) is intra-medullary nailing unless there is contraindications for it.

**Keywords:** Intra-medullary nailing, tibial shaft fracture, complications

### Introduction

Tibial shaft fractures commonest long bone fracture <sup>[1]</sup>. Tibia fracture occurs in people who are exposed to road traffic accidents or workers who fall from the top of buildings. when the injury is severe, such as exposure to a gunshot or war injuries, or road traffic accidents this often leads to damage to the tissues surrounding the bone, including muscles and skin and increase the incidence of open fractures <sup>[2]</sup>. Destruction of tissue surrounding the bone leaves the bone exposed, leading to its exposure to the external environment and infection and increase fracture non-union <sup>[3]</sup>. This type of fracture is very dangerous and may lead to complications that affect the future activity of the affected person and his quality of life.

Orthopedic surgeons treats a fracture of the tibia through surgical intervention (intramedullary nail and plate and screws and external fixation) because it reduces possible complications and returns the patient to his work and motor activity as quickly as possible. The surgical stabilization in adults is best way for treatment of tibia fractures.



**Fig 1:** Tibia shaft fracture

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## Diagnosis

Accurate diagnosis of the condition requires listening carefully to what the patient says, because in most of cases, patients are capable for illustrate the mechanism of the accident. Understanding the nature and circumstances of the accident and the health conditions of the patient before the accident occurs is very necessary.

The physical examination, through inspection of leg, palpation of the pulse, and neurological examination, gives a clear picture of the seriousness and severity of the injury, in addition to all of that, radiography remains the cornerstone of diagnosis, as the use of x-rays (anterior-posterior view and lateral view), which represent the quickest and easiest method. Radiograph for tibia fractures should show also the knee joint and ankle joint. On the other hand, a high Index of suspicion is very important for the diagnosis of compartment syndrome. Compartment syndrome should be expected in any patients with tibial fractures.

## Desired goals of treatment

- The patient returns to work and activity as soon as possible
- Reducing the incidence of potential complications
- Achieving the highest possible degree of fracture union.

## Non-operative management

If the fracture is stable, non-displaced, it is possible to treat it conservatively by using a thigh plaster for four weeks and then using a functional brace for a period ranging from eight to twelve weeks [4]. Follow-up by X-ray should take place no more than two weeks.

Conservative treatment increases the duration of immobilization, which leads to an increased possibility of venous thrombosis, especially in the elderly, also it increases regional compartment syndrome and chronic regional pain syndrome [5].

Conservative management had minimal infection risk but it is associated with high risk of delayed union, malunion, non-union [6].

## Surgical management

Surgical management is the most ideal, best, and most common treatment method. as explained previously, the use of conservative treatment makes the patient more liable to serious complications that can be avoided by performing surgical treatment as quickly as possible [7].

The surgeon has many methods available to stabilize the fracture surgically, including external fixation, Plate and screw and intramedullary nail [8].

When the fracture is open or the patient has suffered multiple injuries to the head, abdomen, or chest, in this case the surgeon stabilize the fracture by external fixation.

Surgical intervention is required as soon as possible in patients with open fractures, or have neurovascular damage and in polytrauma patients [9].

## Intramedullary nailing

Intramedullary nailing is one of the best available methods for stabilizing and fixating a tibial fracture. Küntscher was the first surgeon used this method to treat a tibial fracture in the early 1940s [10].

this technology has developed so that reaming and interlocking screws entered field of work within ten years and in the last decade of the last century, titanium nail became popular [11, 12].

Immediate intramedullary nailing cannot be done for multitrauma patients and those patients with infected fractures and massive soft tissue destruction [13].

Achieving fracture stability and minimal invasive procedure are the best benefit of intramedullary nailing also gives the maximum degree of stability and healing because preserve hematoma when compared with other methods, another benefit of intramedullary nailing is that it permits early mobilization of knee and ankle joint and does not increase the soft tissue injury [14-16].

Pain in knee joint is the main adverse effects of this procedure, other side effects including Surgical site infection and deep infection, deep vein thrombosis and Compartment syndrome, and nonunion of the bone or delayed union or malunion are also possible complications [17].



**Fig 2:** AP and lateral radiograph of leg, there's Fracture of tibia before and after intramedullary nailing of tibia.



**Fig 3:** Fracture of tibia before and after intramedullary nailing of tibia.



**Fig 4.** Fractures of tibia and fibula with intramedullary nailing of tibia.

### Patients and methods

This study was conducted in Imam AL Hussain Teaching hospital, following clearance by the institution's ethical committee. The research was ended in one year, from first of March 2023-first of April 2024. It includes patients, whose ages between 18-55 years of age, both male and female, with closed tibial shaft fractures and open fractures (Gustilo type I) are included in this study. tibial fractures in pediatric age group and those fractures was get infection and patients who are unsuitable for surgery were eliminated from study. assessment of patients start initially with using advance trauma life support (ATLS), patients who met inclusion criteria admitted from Emergency department and also from Orthopedic outpatient department to be operated for fracture fixation with Intramedullary nail. after surgery, patients are regularly checked up clinically and with biplane radiographs for monitoring of fracture union and for complications of intramedullary nailing at 1st day after surgery and after two weeks, one month, two months, three months, six months, nine months and bone healing was clinically evaluated according to pain and mobility scale provided by Sikorski and barrington\*. Radiographically, bone healing evaluated according to the hammer *et al.*\*. Radiographical evaluation of callus formation. Microsoft Excel was used for data entry and analysis. analysis of variables which include demographic data (age, gender), pain, mobility, formation of Callus. Union duration was measured by days and patients were classified as Union, nonunion or delayed union. Postoperative complications including pain, infection, breakage of nail was followed and informed as frequency distribution.

### Surgical technique

1. Position of patients: Patients Positioned in supine Position with small salient below thigh on the same side.
2. Surgical approach: Medial Parapatellar which is most common approach.

3. Introduce Guidepin
4. Reduction and Reaming of fractures
5. Advance guidewire
6. After that we assess if the wire is in canal or no by Taking biplane image.
7. Calculate the length of the nail using ruler. Start with reamer of 9 mm size, with each reamer, ream up to 0.5 to 1.0 mm, before initiating reamer, press down through initiating open into the bone, this impedes eccentric reaming of initiating points. Ream 1mm over the size of final nail.
8. Proximal Interlocking Screws
9. Distal interlocking screws
10. Check the total length of tibia (Proximal third, middle, and distal one-third) by fluroscopic images.
11. Examine the limb for alignment, any rotation, and measure the length of limb.
12. Examine ligaments of knee joint.
13. Close the wound.

### Results

This study was conducted in Imam AL Hussain Teachings Hospital including 30 patients during one year from first of March 2023 to first of April 2024.

Twenty four (75%) patients were below forty-five year old and six (25%) patients were above forty-five year old.

From 30 patients, 26 (87%) of them were men while 4 (13%) were women.

27 (90%) patients are with tibial shaft fractures of closed type, and 3 (10%) patients are with gustilo type I open tibial fractures.

Scores revealed that as time went and fracture was cured, there was relieving in pain (sometimes or no painkillers were required). At three months, 60% of cases were free from pain, and at six months, 76% of cases were free from pain, and at nine months, 86% of cases were free from pain (Figure 5).

As pain decreased, mobility was enhanced and patients became able for walking with walking aids and 57% of patients became able for full load carrying at three months and this was increasing to 83% at six months and 90% at nine months (Figure 6).

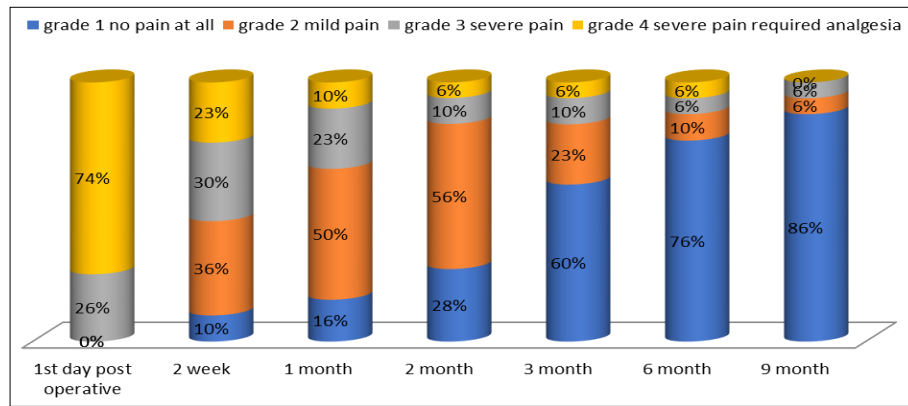
About union and union rate, radiological assessment showed that 66% of patients showed bridging callus at fracture site on three months, at six months, 86.6% of patients had achieved union.

At nine months, 10% of cases showed homogeneous bone at fracture site and 86.6% of cases showed enormous bone trabeculae bridging fracture and line of fracture was Hardly recognizable (Figure 7).

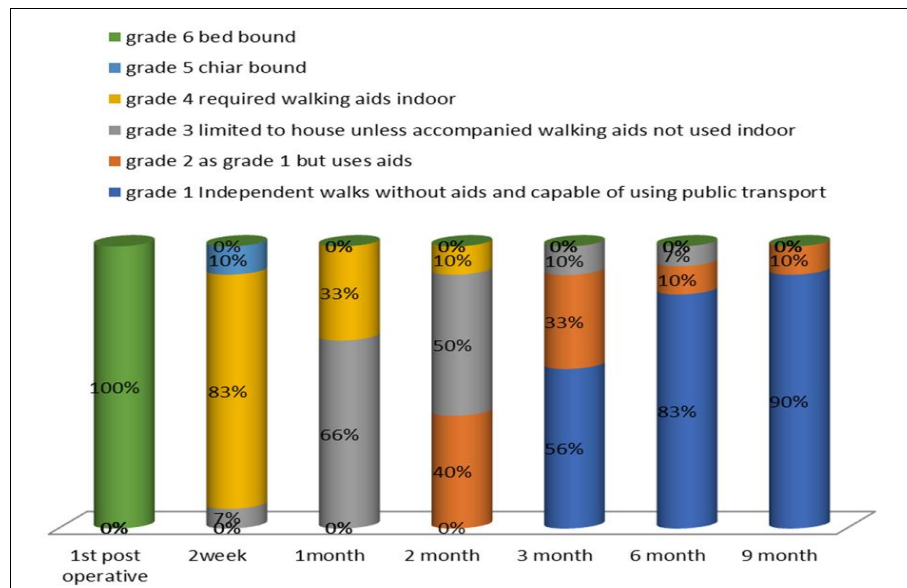
26 (86.6%) achieved patients union within six months, and 3 (10%) patients had delayed union and 1 (3.3%) didn't patients achieved union (non-union).

Mean duration for union was thirty-three weeks ( $160 \pm 30$  days).

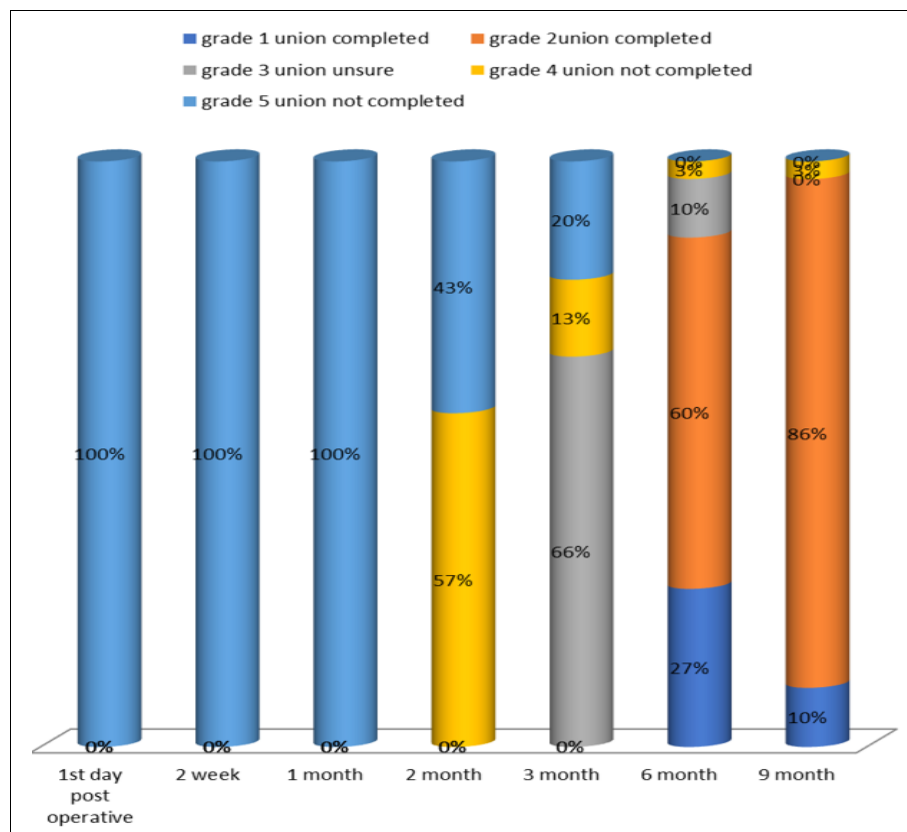
Infections didn't occurred in any case. Nail was not broken in any patients.



**Fig 5:** Grades of pain in patients according to time



**Fig 6:** Grade of mobility according time.



**Fig 7:** Grade of callus formation according time



## Discussion

Management choices ready for use for tibia shaft fracture involve conservative and surgical methods. In adults, all cases of tibial shaft fracture surgically managed nowadays. We have many methods for surgical fixation of tibial shaft fractures include plate and Screws, intramedullary nailing, external fixation. Intramedullary nailing is best option for management of tibial shaft fractures unless it is contraindicated, this is because the intramedullary nailing is weight-bearing device, decrease non-union, malunion, and accelerate healing of fractured bone because it preserves the hematoma at fractured site, also allows early mobilization and good patient compliance.

In this study, we managed 30 patients with tibial shaft fractures by intramedullary nailing. Of those, 27(90%) are closed fractures and 3(10%) are open fractures, GUSTILO type I. Range of motion exercises for knee joint and ankle joint were initiated once pain permitted, while load bearing was permitted according to the configuration of the fracture.

In cases of short oblique and transverse fractures, we permitted early load bearing while we wait until callus bridges fracture site on radiograph for long oblique and comminuted fractures.

Pain and mobility was assessed in each follow-up visit. Majority of patients needed occasional or no painkillers and became Capable to gait indoor and outdoor, initially with walking aids and without it Subsequently.

Union rate was 96.6% and mean duration of union was parallel to prior studies.

Nork *et al.* Who managed thirty six patients by intramedullary nailing and reported mean union time of 23.5 weeks. In another research, Droses *et al.* Operated 157 patients by intramedullary nailing and had overall union rate of 97.5% with mean duration of union was 25.8 weeks. In another research, the overall union rate was 90.6% with mean duration of union was 24 weeks. Another study show 59 high velocity war injuries fracture 11 closed and 48 open fixed by external fixation in AL Yarmouk teaching hospital. Average fracture healing time was 6.25 month based on Johner and Wruh criteria there were (37 case excellent 62.7%) (18 good 30%), (2 fair 3.3%), (2 poor results 3.3%). Complications included pin tract infection (17 case 28.8%), knee joint stiffness (9 case 15%), shortening (7 case 11.8%), and ankle joint stiffness (4 case 6.7%)<sup>[17, 18]</sup>.

In this research, 86.6% (26 cases) of patients achieved union by six months at the same time that 10% (3 cases) of patients achieved union between seven and nine months and this indicates delayed union while 3.3% (1 case) of patients did not achieved union by 9 months, and this is mean non-union.

## Conclusion

In this study, thirty patients with tibial shaft fractures (closed type and gustilo type I open fractures) were treated by using intramedullary nail, and the results showed (26 patient) had achieved union within six month and (23 patient) free from pain within six month and (27 patient) became able for full load bearing within nine month that mean intramedullary nail one of best methods to treat tibial shaft fracture.

## Recommendations

1. Providing logistical support to hospitals so that surgeon can use intramedullary nail in cases that require it.
2. Providing an accurate schedule for patients follow-up in order to make the data more accurate.

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