

ORIGINAL ARTICLE

Frequency of Union in Intramedullary Solid Nailing (SIGN nailing) Via Open Reduction for the Treatment of Fracture Shaft of Tibia

SYED MUHAMMAD TAYYAB HASSAN¹¹Orthopedic Surgery Department, Allied Hospital Faisalabad, Pakistan.Correspondence to: Dr. Syed Muhammad Tayyab Hassan, E-mail: Tayyab.casper@gmail.com**ABSTRACT**

Introduction: Fractures involving the shaft of long bones are common worldwide and tibial fractures are among the most common lower limb injuries to be treated by an orthopedic surgeon.

Objective: The objective of this study was to find frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia.

Study Design: This Randomized controlled trial was conducted in Department of Orthopedic Surgery, Allied Hospital, Faisalabad from July 1st 2014 to December 31st 2014. After taking approval from hospital ethical committee, patients coming through emergency fulfilling the inclusion criteria were enrolled and informed consent was taken. After initial treatment following ATLS protocol, x-ray was taken from hospital radiology department and then patients were treated with intramedullary nailing. Both the procedures were performed by consultant orthopedic surgeon. Union of bone was assessed on x-ray (as in operational definition) at 6th month.

Results: A total of 130 cases fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia. Mean age of the patients was calculated as 35.38±12.49 years. Frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia was done which shows union in 78.46%. P value was calculated as 0.05 which shows a significant difference.

Conclusion: It is concluded that that the frequency of union was significantly lower in intramedullary solid nailing (SIGN nailing) for the treatment of fracture shaft of tibia as compared to cannulated nailing.

Keywords: Fracture shaft of tibia, management, intramedullary solid nailing (SIGN nailing), cannulated nailing via open reduction.

INTRODUCTION

Tibia is the most frequently fractured long bone due to its superficial position. Tibial fracture is common in all ages and is a major source of morbidity in patients with lower edge injuries. Generally these fractures are sustained during high energy trauma, such as motorcycle accidents, pedestrian accidents, fall from height, motor vehicle accidents and rarely gunshot injuries.¹ Delayed union, malunion, nonunion and infections are general complications of tibial shaft fractures. In modern trauma care the treatment of unstable distal tibia fractures is still challenging.² Fractures treatment options available for diaphyseal tibial fracture include plaster cast immobilization, dynamic compression plate, external fixation and intramedullary interlocking nail.³ In the last years intramedullary nailing has become the treatment of choice for most displaced diaphyseal tibia fractures, because it provides a high mechanical stability as it provides higher resistance to axial and torsional forces⁴ and can be performed in a minimally invasive manner but accompanied by complications like decreased biomechanical stability due to the anatomical conditions of the distal tibia,⁵ superficial wound infection, deep wound infection, compartment syndrome, deep vein thrombosis, delayed union, non-union and implant failure.¹ By using cannulated intramedullary nailing union was observed in 96% patients.⁵ The Surgical Implant Generation Network (SIGN) solid, stainless steel nail was designed for use in the tibia and it is strong enough for slots rather than holes to accommodate the interlocking screw.⁶ Solid nail like SIGN nail has advantage of less chances of implant failure as nail is more stronger. Jigs for both proximal and distal interlocking screws decrease dependence on image intensifier and also decreases operating time. Union rate by intramedullary solid nailing was 82%.⁷ Fractures of the tibia may result from significant trauma or be the consequence of repetitive use. The latter mechanism leads to stress fractures. An understanding of the diagnosis and treatment of tibial shaft fractures is of importance to primary care physicians and orthopedic surgeons alike. Often, the primary care provider first comes into contact with tibial shaft fractures and must make the diagnosis and early treatment decisions.⁸ High-speed lifestyles with motor vehicles, snowmobiles, and motorcycles, as well as the growing popularity of extreme sports, contribute to the increasing occurrence of tibial shaft fractures in today's society. In

fact, the tibia is currently the most commonly fractured long bone in the body.⁹

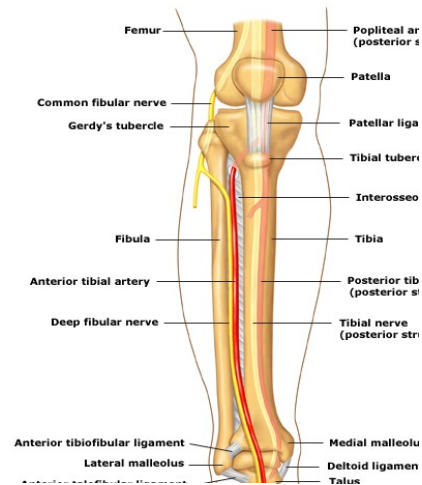


Figure 1: Anterior Anatomy of Tibia and Fibula

Objective: The objective of this study was to find frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia.

Study Design: This Randomized controlled trial was conducted in Department of Orthopedic Surgery, Allied Hospital, Faisalabad from July 1st 2014 to December 31st 2014. Data was collected through non-probability consecutive sampling technique.

Inclusion Criteria:

- Gender: both male & female
- Age: 14-60 years
- All the patients with closed diaphyseal fracture shaft of tibia (confirmed on x-ray) and type 1 open fractures (Gustillo Anderson classification) confirmed clinically with wound size < 1cm (as per operational definition) located 7cm below the knee joint and 7 cm above the ankle joint.

Exclusion Criteria:

- Fractures previously treated with external fixator.
- Patients with type 2 open fractures (wound size > 1cm but < 10cm) and type 3 open fracture (wound size > 10 cm with neuromuscular damage) confirmed clinically (Gustillo Anderson classification).
- Pathological fractures confirmed by history and x-ray.
- Multi fractured patients confirmed clinically.

Data Collection Procedure: After taking approval from hospital ethical committee, patients coming through emergency fulfilling the inclusion criteria were enrolled and informed consent was taken. After initial treatment following ATLS protocol, x-ray was taken from hospital radiology department and then patients were treated with intramedullary nailing. Both the procedures were performed by consultant orthopedic surgeon. Union of bone was assessed on x-ray (as in operational definition) at 6th month. X-ray was performed from hospital radiology department and it was reported by radiologist. The patients were followed for 6 months by taking their contact number. All the information was collected on a specially designed proforma (attached) by me.

Data Analysis: The collected information was entered in SPSS version 16. Descriptive statistics including mean and standard deviation of quantitative variables like age were evaluated. Gender and union of bone were presented as frequency and percentage. Union of bone was compared by using chi-square test between both groups. P-value less than 0.05 was considered significant.

RESULTS

A total of 130 cases fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia. Mean age of the patients was calculated as 35.38+12.49 years.

Table 1: Demographic Data of Patients

Age (in years)	Group-A (n=65)	
	No. of patients	%
14-30	32	49.23
31-60	33	50.77
Total	65	100
Mean±SD	35.38+12.49	

Frequency of union in intramedullary solid nailing (SIGN nailing) via open reduction for the treatment of fracture shaft of tibia was done which shows union in 78.46%. P value was calculated as 0.05 which shows a significant difference.

Table 2: Frequency of Union in Intramedullary Solid Nailing (Sign Nailing) Via Open Reduction for the Treatment of Fracture Shaft of Tibia (n=130)

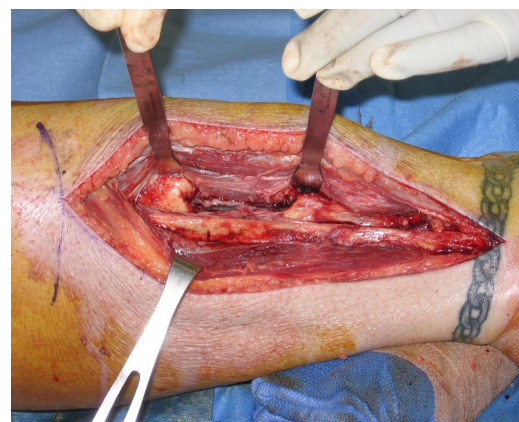
Union	SIGN nailing	
	No. of patients	%
Yes	51	78.46
No	14	21.54
Total	65	100

P Value=0.05

Conversion from external fixation to an intramedullary nail has received considerable attention in the literature. Original reporting of this conversion had alarming results with infection and nonunion rates of 44 and 50%, respectively. Subsequent studies have demonstrated better results. Conclusions from these studies seem to indicate that conversion from external fixation to an intramedullary nail is safe given two parameters: conversion in less than 2 weeks and absence of pin site infections. Conversion after pin site infections may require additional time and antibiotic treatment after removing the external fixator and placement of the intramedullary nail. We use this conversion frequently for complex trauma and Type III open fractures. See the following images



A: An Open Tibia Fracture with Bone Loss, A Tibial Nail was Placed



(B) Eight Weeks Later, the Defect was Approached from a Lateral Incision to Avoid the Previous Medial Open Fracture Wound

DISCUSSION

Fractures involving the shaft of long bones are common worldwide and tibial fractures are among the most common lower limb injuries to be treated by an orthopedic surgeon. The most common fracture of the lower limb occurs at the tibial diaphysis. There are different methods of achieving skeletal stabilization that could vary considerably, depending on the configuration of the fracture line and the geographical location of the surgeons' practices.¹⁰⁻¹² This study was planned to compare union rate between intramedullary solid nailing with cannulated nailing for the treatment of fracture shaft of tibia. In literature a lot of work has been done on intramedullary nailing but there is no local study in comparison of both of these types of intramedullary nailing as per my knowledge.¹³ A recent study evaluated clinical and radiological outcome of closed diaphyseal fracture of tibia by doing open reduction and fixation by inter-locking intramedullary (SIGN) nail without using image intensifier and recorded that union rate by intramedullary solid nailing was 82% is comparable with our study.¹⁴ Another study recorded that by using cannulated intramedullary nailing union was observed in 96% patients.¹⁵ Juan Paulo L. Panti and colleagues determined whether there is a difference in clinical outcomes of patients with isolated femoral shaft fractures treated with S.I.G.N intramedullary nails versus Cannulated intramedullary nails and recorded that union rate for the S.I.G.N group is 68.8% while for the Cannulated group is 80%.¹⁶⁻¹⁸

CONCLUSION

It is concluded that the frequency of union was significantly lower in intramedullary solid nailing (SIGN nailing) for the treatment of fracture shaft of tibia.

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