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Original Research

Management of fractures of the femur and the tibia with surgical implant generation network (SIGN) solid intramedullary interlocking nail

[1]Patel Chittranjan Parimal, [2]Vikas Kumar Singh

[1]Associate Professor, Department of Orthopaedics, Venkateshwara Institute of Medical Sciences, Amroha, Uttar Pradesh, India;
[2]Assistant Professor, Department of Radio Diagnosis, Venkateshwara Institute of Medical Sciences, Amroha, Uttar Pradesh, India

ABSTRACT:
Background: Fractures involving the shaft of long bones are typically referred to as diaphyseal fractures. The present study was conducted to assess management of fractures of the femur and the tibia with surgical implant generation network (SIGN) solid intramedullary interlocking nail in the lower extremity. **Materials & Methods:** 76 shaft fractures of the femur and the tibia of both genderswere managed with surgical implant generation network (SIGN) solid intramedullary interlocking nail. Post operative radiographs were taken at regular interval to evaluate union and healing. **Results:** Out of 76 patients, males were 42 and females were 34. Type of fracture was closed (52), Gustilo I (10), Gustilo II (8) and Gustilo III a (6). Side was right in 40 and leftin 36 cases. Bone affected was fibulain 28 and tibiain 48 cases. Location of fracture was proximal shaft in 9, mid shaft in 15 and distal shaft in 52 cases. The difference was significant (P< 0.05). **Conclusion:** SIGN nail shows promising results because of its better strength, better accuracy.
Keywords: diaphyseal fractures, Gustilo, surgical implant generation network

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Corresponding author: Vikas Kumar Singh, Assistant Professor, Department of Radio Diagnosis, Venkateshwara Institute of Medical Sciences, Amroha, Uttar Pradesh, India

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INTRODUCTION

Fractures involving the shaft of long bones are typically referred to as diaphyseal fractures. The long bones most commonly affected include the femur (thigh bone), tibia and fibula (lower leg bones), humerus (upper arm bone), radius and ulna (forearm bones). These fractures can result from various types of trauma, ranging from high-energy impacts like car accidents to low-energy falls, especially in individuals with weakened bones.[1]

Skeletal stabilization can be achieved by a variety of techniques. External splints may be used as treatment for certain long-bone fractures of the tibia and femur: The plaster of paris, fiber cast, external fixation (fixator), skin traction, and internal splints include interlocking nails, Rush nails, Kuntschner nails, plates, and screws.[2]The majority of long-bone diaphyseal and certain metaphyseal fractures are now treated with intramedullary nails or rods, which are frequently utilized for long-bone fracture stabilization. Internal splints, such as intramedullary nails, facilitate the healing of subsequent fractures. The locking screws play a major role in the axial and rotational stability of traditional hollow interlocking nails.[3]The locking screws play a major role in the axial and rotational stability of traditional hollow interlocking nails. In 1999, the Surgical Implant Generation Network (SIGN) was established with the goal of bringing fracture treatment parity to all countries. The SIGN procedures and implants have been employed in disaster relief contexts, in addition to the system's widespread use in low-income countries across the globe.[4] Designed to be used in the tibia, the SIGN solid stainless steel nail is robust enough to fit through slots rather than holes to hold the interlocking screw. The nail is straight, however it has a 1.5 degree apex posterior bend at its distal end and a 9 degree bend at its proximal end.[5] The nail is also utilized for femoral intra-medullary (IM) nailing, and the effective radius of curvature created by these two bends is quite similar to the natural human femur. Less than 0.5% of SIGN interlocking nail procedures had one of the

interlocking screw's four iterations break.[6] The present study was conducted to assess management of fractures of the femur and the tibia with surgical implant generation network (SIGN) solid intramedullary interlocking nail in the lower extremity.

MATERIALS & METHODS

The present study was conducted on 76 shaft fractures of the femur and the tibiaof both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. A careful examination was carried out. All underwent AP and lateral radiographs of involved bones. CT scan was also advisable. Fractures were classified on the basis of the Gustilo- Anderson classification. All cases were managed with surgical implant generation network (SIGN) solid intramedullary interlocking nail. Post operative radiographs were taken at regular interval to evaluate union and healing. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 76		
Gender	**Male**	**Female**
Number	42	34

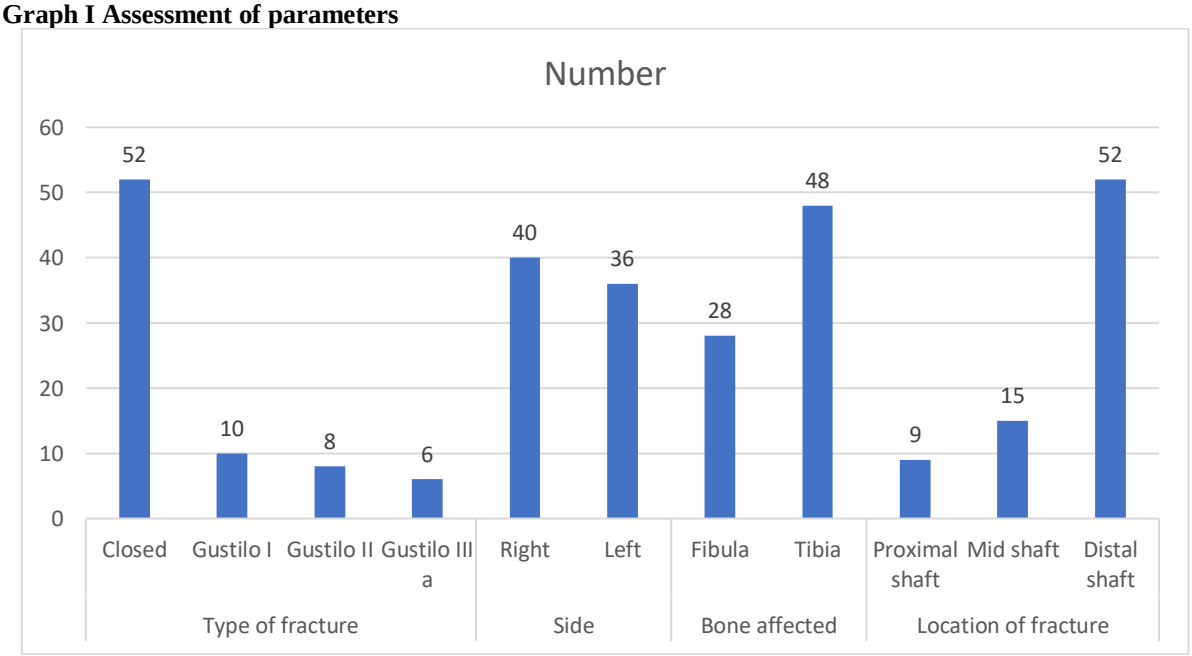
Table I shows that out of 76 patients, males were 42 and females were 34.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Type of fracture	Closed	52	0.05
	Gustilo I	10	
	Gustilo II	8	
	Gustilo III a	6	
Side	Right	40	0.90
	Left	36	
Bone affected	Fibula	28	0.04
	Tibia	48	
Location of fracture	Proximalshaft	9	0.01
	Midshaft	15	
	Distalshaft	52	

Table II shows that type of fracture was closed (52), Gustilo I (10), Gustilo II (8) and Gustilo III a (6). Side was right in 40 and left in 36 cases. Bone affected was fibula in 28 and tibia in 48 cases. Location of fracture was proximal shaft in 9, mid shaft in 15 and distal shaft in 52 cases. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

Since motor traffic accidents and fall injuries are on the rise, long bone fractures are rather prevalent during the most productive stage of life.[7,8] Most patients with these fractures are between the ages of 20 and 50, and men are more susceptible to trauma than women. The widely accepted fixing method for closed diaphyseal fractures of the long bones is an interlocking intramedullary nail. It is a load-sharing implant, and users have consistently reported excellent outcomes from its use.[9] Although intramedullary nailing with reaming is currently recognized as the best treatment for close femur fractures, its application to open tibial fractures is still debatable.[10]The present study was conducted to assess management of fractures of the femur and the tibia with surgical implant generation network (SIGN) solid intramedullary interlocking nail in the lower extremity.

We found that out of 76 patients, males were 42 and females were 34.Chakraborty et al[11]evaluated the efficacy of SIGN nailing in the long bones of the lower extremity. A total of 24 cases with fractures of the femur and the tibia were studied. Both closed and open types of fractures were included and the fracture fixation was done by using SIGN interlocking solid nails and instrumentation. Out of the 24 patients, 16 (66.7%) were males and 8 (33.3%) were females. The average age of the patients was 29.58, with a range of 13-60 years. An intra-medullary interlocking SIGN nail was performed in 18 (75%) tibial and 6 (25 %) femoral fractures, with 41.7 % being right sided and 58.3% being left sided. The types of fractures which were included were closed= 66.67 % and open fractures= 33.33%. According to the Gustilo-Anderson classification, 4.17 % were Gustilo I, 25 % were Gustilo II and 4.17 % were Gustilo III a. Open reduction was done in 58.3 % and closed reduction was done in 41.7 % of the cases. Reaming was done in all the cases and no post-operative infections were noted. There was a significant relationship between the type of fracture and factors like the affected side, the method of the fracture reduction and the location of the fracture.

We found that type of fracture was closed (52), Gustilo I (10), Gustilo II (8) and Gustilo III a (6). Side was right in 40 and leftin 36 cases. Bone affected was fibulain 28 and tibiain 48 cases. Location of fracturewas proximal shaft in 9, mid shaft in 15 and distal shaft in 52 cases. Kapoor et al[12]analyzed 32 simple fractures of shaft of femur and tibia treated by self-locking expandable nail.Intramedullary fixation was done by using self-locking, expandable nail in 32 patients of closed diaphyseal fractures of tibia (n = 10) and femur (n = 22). The various modes of injury were road traffic accidents (n = 21), fall from height (n = 8), simple fall (n = 2), and pathological fracture (n = 1). Among femoral diaphyseal fractures 16 were males and six females, average age being 33 yrs (range, 18- 62 yrs). Seventeen patients had AO type A (A1 (n = 3), A2 (n = 4), A3 (n = 10)) and 5 patients had AO type B (B1 (n = 2), B2 (n = 2), B3 (n = 1)) fractures. Eight patients having tibial diaphyseal fractures were males and two were females; average age was 29.2 (range, 18- 55 yrs). Seven were AO type A (A1 (n = 2), A2 (n = 3), A3 (n = 2)) and three were AO type B (B1 (n = 1), B2 (n = 1), and B3 (n = 1)). The average operative time was 90 min (range, 55-125 min) for femoral fractures and 53 min (range, 25-115 min) for tibial fractures. Radiation exposure was minimum, average being 84 seconds (range, 54-132) for femoral fractures and 54 seconds (range, 36-78) for tibial fractures. All fractures healed, but few had complications, such as infection (one case with tibial fracture) bent femoral nail with malunion (n = 1), and delayed union (n = 3; 2 cases in femur and 1 case in tibia). Mean time of union was 5.1 months (range, 4-10½ months) for femoral fractures and 4.8 months (range, 3-9 months) for tibial fractures.

Shah et al[13]treated 36 open tibial fractures (32 patients) by primary intramedullary nailing and debridement and treatment of open wounds. There were 13 grade I, 14 grade II and 9 grade III according to Gustilo-Anderson classification. After a minimum follow-up of 8 months, there were two cases of superficial infection and one of deep infection. Thirty-one fractures united within 6 months with a mean period to union of 22 weeks. There were four delayed unions and one non-union. There was a longer union time and a higher rate of delayed or non-union in the complex and/or comminuted grade IIIB fractures. Intramedullary nailing, with appropriate soft-tissue treatment, gives good results in the treatment of open tibial fractures.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that SIGN nail shows promising results because of its better strength, better accuracy.

REFERENCES

1. O'Brien PJ, Meek RN, Powell JN, Blachut PA. Primary intramedullary nailing of open femoral shaft fractures. J. Trauma 1991; 31:113-16.
2. Fairbank AC, Thomas D, Cunningham B, Curtis M, Jinnah RH. Stability of reamed and unreamed intra-medullary tibial nails: a biomechanical study. Injury 1995;26:483-85.
3. Whittle AP, Wester W, Russell TA. Fatigue failure in small diameter tibial nails. Clin Orthop1995;315:119-28.
4. Bhandari M, Guyatt GH, Swiontkowski MF, Schemitsch EM. Treatment of open fractures of the shaft of the tibia: a systematic overview and meta-analysis. J Bone Joint Surg [Br] 2000;82-B:62-68.
5. Lepore L, Lepore S, Maffulli N. Intramedullary nailing of the femur with an inflatable self locking nail: comparison with locked nailing. J Orthop Sci. 2003;8:796–801.
6. Shasha N, Blumberg N, Tauber M, Dekel S. An Expandable Intramedullary Nail for Fixation in Osteoporotic Bone. In: An YH, editor. Internal

Fixation in Osteoporotic Bone. New York: Thieme; pp. 301–9.
7. Steinberg EL, Geller DS, Yacoubian SV, Shasha N, Dekel S, Lorich DG. Intramedullary Fixation of Tibial Shaft Fractures Using an Expandable Nail: Early Results of 54 Acute Tibial Shaft Fractures. J Orthop Trauma. 2006;20:303–9.
8. Lepore S, Capuano N, Lepore L, Jannelli P. Clinical and Radiolographic Results with the Fixion Intramedullary Nail: A Inflatable Self-Locking System for Long Bone Fractures. Osteo Trauma Care. 2002;10:S32–5.
9. Frank WM, Olivieri M, Jannasch O, Henning FF. An expandable nailing system for the management of pathological humerus fractures. Arch Orthop Trauma Surg. 2002;122:400–5.
10. Chakraborty MK, Thapa P, Sathian B. Surgical Implant Generation Network (SIGN) Solid Intramedullary Interlocking nail in the lower extremity: an observational study from Western Nepal. J Clin DiagnResea. 2011 Dec;5(8):1614-7.
11. Kapoor SK, Kataria H, Boruah T, Patra SR, Chaudhry A, Kapoor S: Expandable self-locking nail in the management of closed diaphyseal fractures of the femur and the tibia. Indian J Orthop. 2009 Jul–Sep; 43(3): 264–70.
12. Shah RK, Moehring HD, Singh RP, Dhakal A. Surgical Implant Generation Network (SIGN) intramedullary nailing of open fractures of the tibia. Int Orthop 2004:(28):163-66.