ORIGINAL RESEARCH PAPER

Orthopaedics

FUNCTIONAL OUTCOME OF COMPOUND FRACTURES OF TIBIAL SHAFT TREATED WITH UNREAMED SOLID INTERLOCKING INTRAMEDULLARY NAILING: A PROSPECTIVE OBSERVATIONAL STUDY

KEY WORDS: Compound tibial fracture, Open tibia fracture, Unreamed nail, Interlocking nail, Functional outcome.

Dr. Abhishek Singh Shaktawat Junior Resident, Department of Orthopaedics, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India
*Correspondence Author

Dr. Akhilesh Solanki Junior Resident, Department of Orthopaedics, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India

Dr. Grishm Raj Pandey Department of Orthopaedics, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India

ABSTRACT

Background: Open fractures of the tibial shaft remain one of the most challenging injuries in orthopaedic trauma because of extensive soft tissue damage, contamination, infection, delayed union, and non-union. Unreamed solid interlocking intramedullary nailing preserves endosteal blood supply while providing stable fixation and facilitating early mobilization.**Methods:**A prospective observational study was conducted in the Department of Orthopaedics, Index Medical College Hospital and Research Centre, Indore, over a period of 18 months. Forty patients with compound fractures of the tibial shaft (Gustilo-Anderson Grade I, II, and IIIA) were treated with unreamed solid interlocking intramedullary nailing. Clinical, radiological, and functional outcomes were evaluated during follow-up using Johner and Wruhs criteria.**Results:** The majority of patients belonged to the 28–37 years age group (35%). Males constituted 67.5% of the study population. Road traffic accidents accounted for 67.5% of injuries. Gustilo Type II fractures were the most common injury pattern (50%). Fracture union was achieved in 90% of patients. Functional outcomes were excellent in 57.5%, good in 25%, fair in 7.5%, and poor in 10% of patients. Overall excellent-to-good results were achieved in 82.5% of cases.**Conclusion:** Unreamed solid interlocking intramedullary nailing is a safe, reliable, and biologically favorable method for the treatment of compound tibial shaft fractures. It provides high union rates, satisfactory functional outcomes, and acceptable complication rates.

INTRODUCTION

Tibial shaft fractures are among the most common long bone fractures encountered in orthopaedic practice. Due to its subcutaneous location and limited soft tissue coverage, the tibia is particularly susceptible to open injuries following high-energy trauma. Open fractures pose significant treatment challenges because of contamination, infection, delayed union, malunion, and non-union.

The management of compound tibial shaft fractures has evolved considerably over the years. Although external fixation and cast immobilization were traditionally used, intramedullary interlocking nailing has become the preferred treatment modality because it provides stable fixation while preserving soft tissue integrity and allowing early mobilization.

Unreamed solid interlocking nails preserve endosteal blood supply and minimize thermal necrosis associated with reaming. The present study was conducted to evaluate the functional and radiological outcomes of compound tibial shaft fractures managed with unreamed solid interlocking intramedullary nailing.

AIMS AND OBJECTIVES

1. To assess fracture union following unreamed solid interlocking intramedullary nailing.
2. To evaluate functional outcomes using Johner and Wruhs criteria.
3. To assess complications associated with the procedure.
4. To determine the effectiveness of early fixation in compound tibial shaft fractures.

MATERIALS AND METHODS

Study Design: Prospective observational study.

Study Centre:
Department of Orthopaedics, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh, India.

Study Duration: 18 months.

Sample Size:
40 patients.

Inclusion Criteria:
- Patients aged 18–70 years.
- Gustilo-Anderson Grade I, II, and IIIA compound fractures of the tibial shaft.
- Patients willing for regular follow-up.

Exclusion Criteria:
- Pathological fractures.
- Fractures within 5 cm of the distal articular surface.
- Fractures with intra-articular extension.
- Gustilo-Anderson Grade IIIC injuries.
- Severe systemic illness affecting fracture healing.

Methodology
After initial assessment and resuscitation, all patients underwent wound debridement and stabilization with unreamed solid interlocking intramedullary nailing. Appropriate antibiotic therapy and wound care were provided according to institutional protocol. Patients were followed clinically and radiologically at regular intervals. Functional outcome was assessed using Johner and Wruhs criteria.

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using descriptive statistics. Results were expressed as frequencies and percentages.

RESULTS

Table 1: Demographic Profile

Age Group (Years)	Number	Percentage
21–27	6	15.0
28–37	14	35.0
38–47	12	30.0
48–53	5	12.5
54–62	3	7.5

Table 2: Injury Characteristics

Variable	Number (%)
Male	27 (67.5)
Female	13 (32.5)
Right Tibia	27 (67.5)
Left Tibia	13 (32.5)
Pedestrian Automobile Accident	27 (67.5)
Motorcycle Accident	7 (17.5)
Motor Vehicle Accident	3 (7.5)
Fall	3 (7.5)

Table 3: Fracture Characteristics

Variable	Number (%)
Gustilo Type I	13 (32.5)
Gustilo Type II	20 (50.0)
Gustilo Type IIIA	7 (17.5)
Comminuted	17 (42.5)
Oblique	10 (25.0)
Transverse	7 (17.5)
Spiral	3 (7.5)
Segmental	3 (7.5)

Table 4: Time to Union

Time to Union	Number	Percentage
<12 weeks	7	17.5
12–18 weeks	23	57.5
18–24 weeks	2	5.0
24–30 weeks	2	5.0
30–36 weeks	3	7.5
«36 weeks	3	7.5»

Table 5: Functional Outcome

Outcome	Number	Percentage
Excellent	23	57.5
Good	10	25.0
Fair	3	7.5
Poor	4	10.0

Table 6: Complications

Complication	Number	Percentage
Superficial Infection	3	7.5
Deep Infection	3	7.5
Screw Breakage	3	7.5
Anterior Knee Pain	3	7.5
Malunion	6	15.0

DISCUSSION

The present study demonstrated a fracture union rate of 90%, with most fractures uniting within 18 weeks. The findings are comparable with previously published studies evaluating unreamed interlocking intramedullary nailing in compound tibial shaft fractures.

The majority of patients were young males involved in road traffic accidents, reflecting the high-energy mechanism commonly associated with open tibial fractures. Gustilo Type II injuries formed the largest subgroup. Comminuted fractures represented the most common fracture configuration.

Functional outcomes assessed using Johner and Wruhs criteria showed excellent-to-good results in 82.5% of patients. The complication profile was acceptable, with malunion being the most common complication. Infection rates remained low and were manageable with appropriate treatment.

CONCLUSION

Unreamed solid interlocking intramedullary nailing is a safe, reliable, and biologically advantageous treatment modality for compound tibial shaft fractures. The procedure provides high union rates, satisfactory functional outcomes, early mobilization, and acceptable complication rates. It remains an effective treatment option for Gustilo-Anderson Type I, II, and selected Type IIIA open tibial shaft fractures.

LIMITATIONS

1. Small sample size.
2. Single-centre study.
3. Absence of a comparative control group.
4. Limited duration of follow-up.

ETHICAL APPROVAL

The study was conducted after approval from the Institutional Ethics Committee, and informed written consent was obtained from all participants.

SOURCE OF FUNDING

Nil.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Kalamegam A, Narayanasamy B, Kadirvelu S, et al. Retrospective cohort study of functional outcome of fracture shaft tibia treated with tibial intramedullary nailing under figure of four technique. J Evid Based Med Healthc. 2019;6(8):555-559.
2. Namsha BR, Meghnathi UH, Hasan AN. Result of closed interlocking intramedullary nail in tibial shaft fracture. Natl J Clin Orthop. 2019;3(1):67-69.
3. Pankaj AK, Goyal VK. Unreamed solid interlocking nail for management of compound tibial diaphyseal fracture: A prospective study. J Orthop Dis Traumatol. 2020;3(2):83-89.
4. Manikandarajan A, Balakamesh M. Study on functional outcome of primary closed nailing in compound diaphyseal fractures of tibia. Int J Orthop Sci. 2020;6(4):335-342.
5. Patel VA, Amritbhai V, et al. Unreamed tibia intramedullary interlocking nails to prevent complications and fat embolism. Saudi J Med. 2021;6(9):295-302.
6. Alam MN, et al. Tibial shaft fracture using intramedullary interlocking nailing technique. Glob Acad J Med Sci. 2021;3(6):219-224.
7. Wali D, K D, Ravoof D, Sagar D. Surgical management of compound fracture tibia using an unreamed interlocking intramedullary nail. Int J Orthop Sci. 2021;7(2):417-422.
8. Al-Sharaa MB, Hashim FW, Al-Edanni MS, et al. Functional outcome of interlocked intramedullary nailing fixation in management of tibial shaft fractures. Rawal Med J. 2022;46:890-893.
9. Khan M, Jain M, Thory KR, Sathiyaseelan N, Jain HK. Prospective study on management and outcomes of compound tibia fractures using unreamed solid tibia nails. Res J Med Sci. 2023;17:150-156.
10. Patil AC, Bindusar, Shivaraj AC, Patil S. Outcome evaluation of unreamed closed interlocking intramedullary nailing in management of open tibial shaft fractures. J Popul Ther Clin Pharmacol. 2023;30(19):1073-1080.