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A PROSPECTIVE STUDY ON THE FUNCTIONAL AND RADIOLOGICAL OUTCOME OF INFECTED TIBIAL NON-UNION MANAGED WITH ILIZAROV RING FIXATOR

Dr. Siddavaram Sudhakar	3rd Year Post Graduate, Dept. of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal-518501
Dr. P. Sujith Devaprasad	D.N.B, Professor & Hod, Dept. of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal-518501
Dr. Lakkam Bhargavi*	M.S., Assistant Professor, Dept. of Orthopaedics, Santhiram Medical College & General Hospital, Nandyal-518501 *Corresponding Author

ABSTRACT **Background:** Infected non-union of the tibia remains one of the most difficult challenges in orthopaedic surgery because of associated infection, bone loss, deformity, and soft tissue compromise. The Ilizarov ring fixator offers simultaneous control of infection, stable fixation, deformity correction, and limb length restoration through the principle of distraction osteogenesis. **Materials and Methods:** A hospital-based prospective study was conducted on 50 patients with infected tibial non-union treated at Santhiram General Hospital, Nandyal, between April 2024 and March 2026. Patients aged above 20 years with infected tibial non-union were included. Clinical and radiological outcomes were assessed using the ASAMI scoring system. Complications and infection eradication rates were also analysed. **Results:** The majority of patients were males (82%), and road traffic accidents were the most common mode of injury (56%). Infection eradication was achieved in 98% of cases. According to ASAMI bone results, 52% had excellent outcomes and 30% had good outcomes. Functional results were excellent in 56% and good in 22% of patients. Pin tract infection was the most common complication (22%). Younger patients demonstrated significantly better bone healing outcomes ($p < 0.001$). **Conclusion:** The Ilizarov ring fixator is an effective and reliable method for managing infected tibial non-union. It provides excellent infection control, high union rates, early mobilization, and satisfactory functional recovery with manageable complications.

KEYWORDS : Infected Tibial Non-union, Ilizarov Fixator, ASAMI Score, Distraction Osteogenesis, External Fixation.

INTRODUCTION

Non-union of tibial fractures continues to represent a major orthopaedic problem, especially when associated with infection. The tibia is highly vulnerable to open injuries because of its subcutaneous location and limited soft tissue coverage. Infection following fracture fixation compromises bone healing and may result in chronic osteomyelitis, deformity, limb shortening, and disability.

Management of infected non-union is challenging because treatment should simultaneously eradicate infection, achieve bone union, correct deformity, and restore limb function. Conventional treatment methods often require multiple procedures and prolonged immobilization.

The Ilizarov technique, developed by Gavriil Ilizarov, introduced the principle of tension-stress and distraction osteogenesis. The circular external fixator provides stable fixation while permitting controlled micromotion, compression, and distraction. This method allows early weight bearing, correction of deformity, management of bone defects, and control of infection.

The present study evaluates the radiological and functional outcomes of infected tibial non-union treated with the Ilizarov ring fixator in a prospective series of patients.

Aim & Objectives:

- To evaluate the functional and radiological outcomes of infected tibial non-union treated using the Ilizarov ring fixator.
- To attain complete eradication of infection.
- To attain bony union, limb length, alignment and range of motion.

MATERIALS AND METHODS

Study Design: Hospital-based prospective study.
Study Period: April 2024 to March 2026.
Study Setting: Department of Orthopaedics, Santhiram General Hospital, Nandyal.
Sample Size: 50 patients.

Inclusion Criteria

- Patients aged above 20 years.
- Infected tibial non-union with duration more than 9 months.
- Presence of deformity, infection, or bone loss.
- Patients willing to provide informed consent.

Exclusion Criteria

- Non-infected tibial non-union.
- Peripheral vascular disease.
- Congenital pseudoarthrosis.
- Severe psychiatric illness.
- Recent compound fractures.

Surgical Technique

All patients underwent radical debridement followed by Ilizarov ring fixator application. Depending on the defect and deformity, compression, docking, followed by corticotomy and distraction osteogenesis, or bone transport techniques were performed where necessary.

Figure: Intraoperative Image

Postoperative Protocol

- Early weight bearing encouraged.
- Daily pin tract care.
- Physiotherapy for adjacent joints.
- Regular follow-up with radiological assessment.

Outcome Assessment

Bone and functional outcomes were evaluated using ASAMI criteria. Infection eradication and complications were also documented.

RESULTS

Demographic Distribution

Among 50 patients, 41 (82%) were males and 9 (18%) were females. The majority belonged to the 31–40 years age group.

Mode of Injury

Road traffic accidents accounted for 56% of cases, followed by falls (22%), industrial injuries (16%), and sports injuries (6%).

Infection Eradication

Infection was eradicated successfully in 98% of patients.

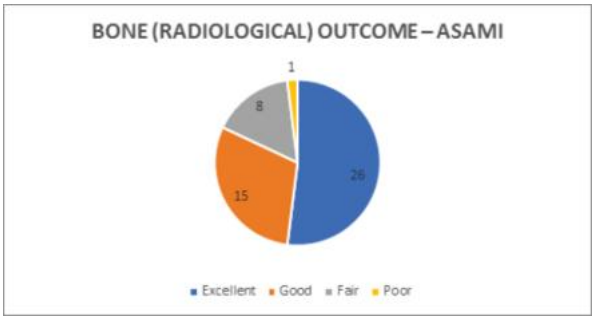
Bone Outcome (ASAMI)
- Excellent: 52%
- Good: 30%
- Fair: 16%
- Poor: 2%
- Overall, 82% achieved good-to-excellent bone outcomes.

Functional Outcome (ASAMI)
- Excellent: 56%
- Good: 22%
- Fair: 18%
- Poor: 4%

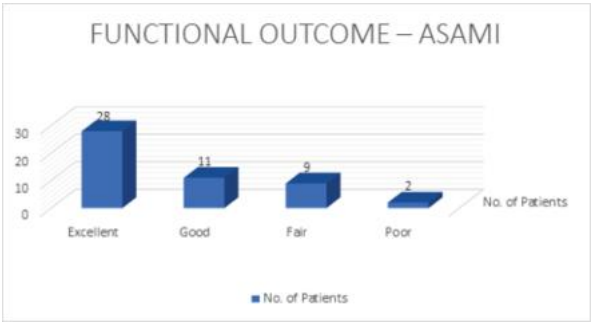
A total of 78% achieved good-to-excellent functional outcomes.

Table: Bone (Radiological) Outcome – ASAMI & Functional Outcome – ASAMI

	Bone (Radiological)Outcome - ASAMI		Functional Outcome - ASAMI	
Outcome	No. of Patients	%	No. of Patients	%
Excellent	26	52	28	56
Good	15	30	11	22
Fair	8	16	9	18
Poor	1	2	2	4



Pie Chart : Bone (Radiological) Outcome – ASAMI



Bar Chart : Functional Outcome – ASAMI

Complications

Pin tract infection was the most common complication (22%), followed by wire breakage (10%), joint stiffness (6%), and equinus deformity (6%). Half of the patients experienced no complications.

Statistical Analysis

A significant association was observed between age and bone healing outcomes ($p < 0.001$), with younger patients showing better healing potential.

DISCUSSION

Infected tibial non-union is difficult to manage due to infection, instability, bone loss, and deformity. The Ilizarov technique addresses all these factors simultaneously by providing stable fixation and biological stimulation for bone regeneration.

The predominance of male patients and road traffic accidents in this study is comparable to previous literature, reflecting increased exposure of males to high-energy trauma. Infection eradication was achieved in 98% of patients, demonstrating the effectiveness of radical debridement combined with stable circular fixation.

Bone union rates in the present study were comparable with those reported by Jimmy Joseph Meleppuram et al. and Mukesh Dwivedi et al., who demonstrated successful union rates exceeding 80%. Functional outcomes were slightly lower than radiological outcomes because restoration of mobility often lags behind bone healing due to stiffness and muscle weakness.

Pin tract infection was the most common complication, which is consistent with other Ilizarov studies. However, most cases were minor and responded well to local care and antibiotics.

The significant relationship between age and bone healing observed in this study supports the concept that younger patients possess better osteogenic potential and regenerative capacity.

Overall, the Ilizarov ring fixator proved highly effective for limb salvage, infection control, deformity correction, and restoration of function.

CONCLUSION

The Ilizarov ring fixator is a dependable and effective treatment modality for infected tibial non-union. It provides excellent infection eradication, high union rates, early mobilization, and satisfactory functional outcomes. Despite minor complications such as pin tract infection, the technique remains highly valuable in complex limb reconstruction procedures. Younger age was associated with better healing outcomes. The Ilizarov method continues to be an important limb-salvage technique in modern orthopaedic practice.

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