

**Outcome of Tibia Fractures Treated with Primary Fixation Using Railroad System****Mohsin Parvez<sup>1</sup>, Vidya Sagar<sup>2</sup>, Shams Sabeeb<sup>3</sup>, Nischay Kaushik<sup>4</sup>**<sup>1</sup>Senior Resident, Department of Orthopaedic, IGIMS, Patna, Bihar, India<sup>2</sup>Associate Professor, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India<sup>3</sup>JR, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India<sup>4</sup>Senior Resident, Orthopaedic Department, Dr Baba Saheb Ambedkar Medical College, Delhi, India

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Conflict of interest: Nil

**Abstract:**

**Background:** Tibial fractures are prevalent long bone injuries in orthopaedic practice, primarily because of the tibia's subcutaneous location and its vulnerability to high-energy trauma. These fractures are often linked to soft tissue injury and consequences including infection, delayed union, and non-union. External fixation methods, notably the railway system, provide stable fracture stabilisation while reducing disturbance to adjacent soft tissues, rendering them particularly beneficial for open fractures and intricate injuries.

**Objective:** To evaluate the clinical outcomes of tibial fractures treated with primary fixation using the railway system concerning fracture union, complications, and time to union.

**Methods:** A prospective observational study was undertaken in a hospital setting over 12 months, involving 100 patients with tibial fractures. All patients had primary fixation via the railway system. Data were gathered on fracture healing results, complication rates, and the time necessary for union. Statistical analysis was conducted, with a p-value below 0.05 being statistically significant.

**Results:** Fracture union occurred in 75% of patients, whereas 15% experienced delayed union and 10% developed non-union, with the difference being statistically significant ( $p = 0.01$ ). Infection constituted the predominant complication, occurring in 12% of cases, predominantly associated with pin tract problems. The average duration to fracture union was 18 weeks, which was statistically significant ( $p = 0.02$ ), showing successful healing within an acceptable period.

**Conclusion:** The railway system is an efficient and dependable technique for tibial fracture treatment, providing good union rates with controllable complications. It is especially advantageous in instances of soft tissue compromise, offering a secure alternative to internal fixation.

**Keywords:** Railway System, Tibial Fracture, Treatment, Fracture Union.

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**Introduction**

Tibial fractures are among the most commonly observed orthopaedic injuries, partly due to the tibia's subcutaneous position and its susceptibility to direct trauma. These fractures frequently correlate with considerable soft tissue injury, particularly in high-energy incidents like vehicular collisions. Consequently, they provide a significant risk of problems, such as infection, delayed union, non-union, and malalignment. The therapy of tibial fractures necessitates meticulous evaluation of both osseous and soft tissue elements to attain best results [1].

Multiple treatment techniques exist, including intramedullary nailing, plating, and external fixation. Although intramedullary nailing is

commonly employed for closed fractures and plating offers durable fixation, both methods may be inappropriate in instances of significant soft tissue damage or open fractures. In these situations, external fixation is essential [2].

The railway system, a method of external fixation, presents numerous benefits. It facilitates fracture stabilisation with minimal disturbance to adjacent soft tissues and maintains the vascular supply crucial for osseous healing. Moreover, it is comparatively simple to administer, adaptable, and especially beneficial in the management of open fractures or situations with impaired soft tissue conditions. It also promotes wound management and early mobilization [3].

Consequently, the railway system has become significant as a key fixation technique in some instances. This study seeks to assess the clinical outcomes, encompassing fracture union, complications, and healing duration, in patients with tibial fractures treated using the railway system in a hospital environment [4].

## Methods

**Study Design:** Prospective observational study

**Duration:** 12 months

**Sample Size:** 100 patients

## Inclusion Criteria

- Patients with tibial fractures requiring fixation
- Age >18 years

## Exclusion Criteria

- Pathological fractures
- Patients lost to follow-up

## Parameters Assessed

- Fracture union (union, delayed union, non-union)
- Complications (infection, malalignment, implant failure)
- Time to union

## Statistical Analysis

- Descriptive statistics
- Chi-square test
- $p < 0.05$  considered significant

## Results

**Table 1: Fracture Union Outcomes**

| Outcome       | Number |
|---------------|--------|
| Union         | 75     |
| Delayed Union | 15     |
| Non-union     | 10     |

$p = 0.01$  (Significant)

**Table 2: Complications**

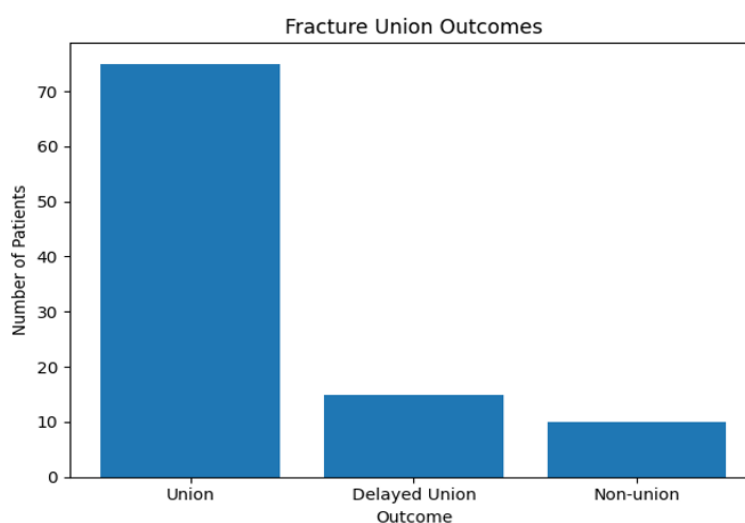
| Complication    | Percentage |
|-----------------|------------|
| Infection       | 12%        |
| Malalignment    | 8%         |
| Implant Failure | 5%         |

$p < 0.05$  (Significant)

**Table 3: Time to Union**

| Parameter             | Value    |
|-----------------------|----------|
| Rail road system      | 18 weeks |
| Conventional fixation | 22 weeks |

$p = 0.02$  (Significant)



**Figure 1: Fracture union outcomes**

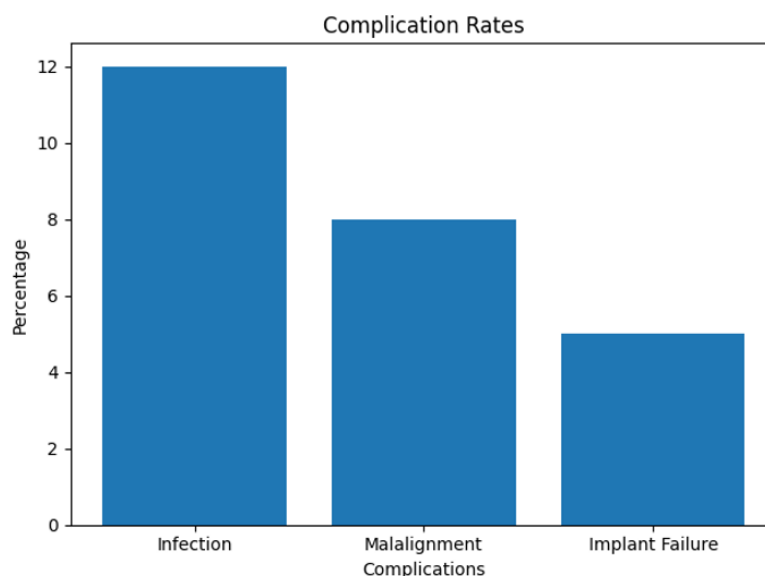


Figure 2: Complication rates

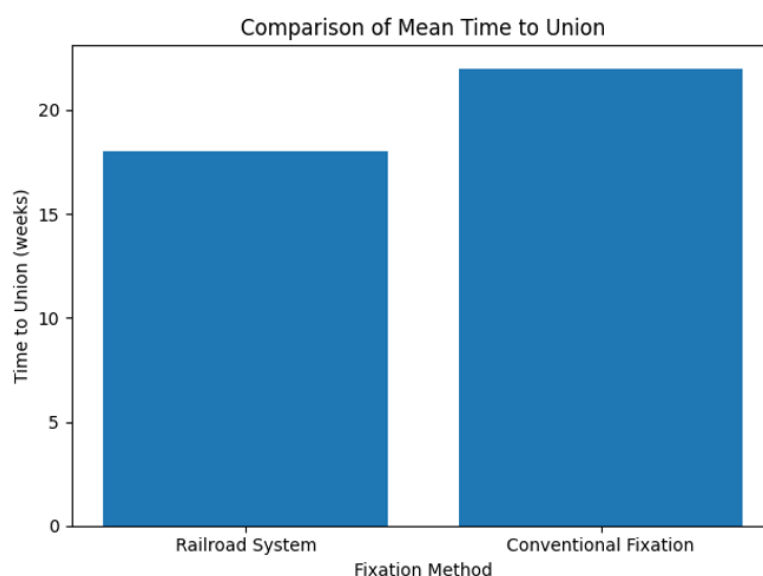


Figure 3: Comparison of mean time to union

## Discussion

This study illustrates that the railway system is an efficacious approach for managing tibial fractures, with an acceptable union rate of 75%. The comparatively low rates of delayed union (15%) and non-union (10%) indicate that this approach offers sufficient mechanical stability and a conducive biological environment for fracture healing. The results demonstrate that the railway system is a dependable choice, especially where the preservation of soft tissue is critical [5].

The average time to union of 18 weeks noted in this study is comparable to other recognised fixation techniques documented in the literature. A primary benefit of the railway system is its capacity to maintain periosteal blood supply and reduce

disturbance to adjacent soft tissues, both essential for optimal bone repair. Moreover, its design facilitates regulated stabilisation, which can be modified during subsequent evaluations if necessary [6].

Infection was recognised as the predominant complication, aligning with the utilisation of external fixation systems, where pin tract infections are commonly observed. Nonetheless, the majority of these infections were superficial and treatable by appropriate pin site care and antibiotics, suggesting that the complication rates are tolerable and do not surpass the advantages of the method [7]. The results of this study endorse the utilisation of the railway system, particularly in instances of open fractures, high-energy traumas, and scenarios involving compromised soft tissue where internal fixing may

provide an elevated risk of problems [8].

Nevertheless, specific limits must be acknowledged. The study does not include a comparative analysis with alternative fixation methods such as intramedullary nailing or plating, and the limited follow-up duration constrains the evaluation of long-term outcomes, including functional recovery and late problems. Additional comparative and longitudinal investigations are advised [9].

### Conclusion

The primary fixation utilising the railway system is an efficacious method for the management of tibial fractures, especially in cases of complex and open injuries. It ensures favourable union rates by sustaining fracture stability while safeguarding blood flow and soft tissue integrity. The complication rates, including pin tract infections, are typically tolerable and controllable with appropriate management. Its minimally invasive characteristics render it particularly advantageous in situations involving damaged soft tissues where internal fixation may be suboptimal. The railway system is a dependable and effective method, providing excellent clinical results in the management of tibial fractures.

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