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# Study on functional outcome of non-union of tibial fractures managed by Ilizarov technique

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**Abstract**
**Background:** Non-united and infected fractures of tibia are challenging to orthopedicians. These cases are best managed by Ilizarov technique. The present study was done to assess outcome in these cases.
**Methods:** The present observational study included 19 cases of non-united fracture of tibia. Clinical details and findings of outcomes were noted.
**Results:** 57.9% of the cases had excellent outcome, 26.3% showed good result while poor result was seen in 5.3%. Functional outcome assessment showed that 68.4% had minimal disability, 15.8% had moderate disability while 5.3% had severe disability.
**Conclusion:** Ilizarov technique has good outcome in non-united fractures of tibia. Pin site infection of common but can be managed adequately.

**Keywords:** Functional outcome, Ilizarov technique, Non-union, Tibial fracture

## Introduction
Tibial fractures frequently result in non-union or malunion and is one of the challenging problems faced by an orthopaedic surgeon [1]. They are complicated by infection. 2.5% of closed tibia fractures have non-union. Poor stabilisation of fractures leads to poor contact between the fracture surfaces, bone defects or infection. Internal fixation with or without bone grafting can be done to treat these fractures. However, it cannot be done if non-union is associated with infection, bone deformity or bone exposure [2]. Ilizarov technique depends upon distraction osteogenesis by gradual stretching of bone and soft tissues. Immediate weight bearing is achievable due to stability of the fixator without compromising the soft tissue attachment and vascularity of fragments. Delayed weight bearing and difficulty in internal fixation can cause longer times to healing [3]. Ilizarov circular fixation is advocated for fracture with extensive dissection, deficiency of bone stock, and comminuted fracture [4].
This technique partly depends upon motivation of patient and self-care. Researchers have explored the outcome of Ilizarov fixation in non-union of tibial fractures [5–11]. Very few studies have been conducted in this area and hence, this study was done.

**Aims & Objectives:** The present study was conducted to assess the outcome of Ilizarov circular fixation method of treatment for the management of non-united fractures of tibia.

## Material and Methods
- **Study design:** The present study was hospital- based observational.
- **Study place:** The present study was conducted at the department of Orthopaedics, Mata Gujari Memorial Medical College and Lions Seva Kendra Hospital, Kishanganj.
- **Period of study:** The present study was conducted between November 2017 to October 2019.
- **Study population:** The study population included adult patients found to be suffering from non-united fractures of tibia.
- **Inclusion criteria:** The patients above 18 years of age found to be suffering from non-united fractures of tibia were included.

- **Exclusion criteria:** Patients having intra-articular fracture and having injury to neurovascular bundle were excluded.
- A total of 19 patients reporting during the study period were included.
- **Study tools:** Pre-tested proforma was used for data collection. It included questions related to demographic profile of the study subjects, their clinical history and the details of management and outcome.
- **Data collection procedure:** The study subjects were recruited from the orthopaedics department of the institute. Demographic, clinical and surgical details of the patients were obtained. Thorough irrigation and debridement of wound was done for all the patients with open wound followed by fracture fixation. Prophylactic antibiotics were given. Comminuted fractures were managed by gradual distraction at the rate of ½ mm/day for 3 weeks followed by compression. Articular surface congruency was maintained in Juxta-articular fractures. Weight bearing was allowed as per the tolerance of the patient. Pin site infection was managed by regular dressing. Post-operative follow-up was done at every 3 weeks and radiographs were also taken until the fracture healed. All patients were advised early range of motion exercises which were started after 2 to 4 days. Outcome was assessed using bone score and lower extremity functional scale.
- **Data analysis:** Data entry was done using Microsoft Excel 2010 and analysis was done using Statistical Package for Social Sciences (SPSS) v 20.0. Numerical data was summarized as mean and SD while categorical data was presented as frequency and percentage. p-value <0.05 was considered to be statistically significant.
- **Ethical consideration & permission:** Informed consent was taken from all the study subjects. Permission was obtained from Institutional Ethics Committee. Confidentiality of records was maintained.

## Results

A total of 19 patients were included in the present study. It was seen that 84.2% of the cases were males. Mean age was found to be 29.3 years. Right limb was involved in 3/4th of the cases. Road traffic accident was responsible in most of the cases.

**Table 1:** Showing characteristics of the patients

| Characteristics | Values | Frequency | % |
|---|---|---|---|
| Sex | Male | 16 | 84.2 |
| | Female | 3 | 15.8 |
| Age (in years) | | 29.3 | |
| Side | Right leg | 14 | 73.7 |
| | Left leg | 5 | 26.3 |
| Mode of injury | RTA | 16 | 84.2 |
| | Assault | 3 | 15.8 |

Table-2 shows the bone score among these cases. 57.9% of the cases had excellent outcome, 26.3% showed good result while poor result was seen in 5.3%.

**Table 2:** Showing bone score

| Bone score | Frequency | % |
|---|---|---|
| Excellent | 11 | 57.9 |
| Good | 5 | 26.3 |
| Fair | 2 | 10.5 |
| Poor | 1 | 5.3 |

Table-3 shows the functional outcome. 68.4% had minimal disability, 15.8% had moderate disability while 5.3% had severe disability.

**Table 3:** Showing functional outcome

| Functional outcome | Frequency | % |
|---|---|---|
| Minimal disability | 13 | 68.4 |
| Moderate | 3 | 15.8 |
| Severe | 2 | 10.5 |
| Crippled | 1 | 5.3 |
| Bedbound | 0 | 0 |

Table-4 shows the complications of management by Ilizarov technique. Pin site infection was seen in 78.9% cases, angulations in 31.6% and shortening in 10.5%.

**Table 4:** Showing complications

| Complications | Frequency | % |
|---|---|---|
| Pin track infection | 15 | 78.9 |
| Angulations | 6 | 31.6 |
| Restriction of ROM | 5 | 26.3 |
| Shortening | 2 | 10.5 |

Table-5 shows the time taken for radiological union. In 68.4% cases, union was seen within 20 weeks while 10.5% cases needed more than 30 weeks.

**Table 5:** Showing time taken for radiological union

| Duration (in weeks) | Frequency | % |
|---|---|---|
| 10-20 | 13 | 68.4 |
| 20-30 | 4 | 21.1 |
| 30-40 | 2 | 10.5 |

## Discussion

The present study was conducted to assess the outcome of management of non-united cases of tibial fracture managed by Ilizarov technique. A total of 19 patients were included. It was seen that 84.2% of the cases were males. Mean age was found to be 29.3 years. Right limb was involved in 3/4th of the cases. Road traffic accident was responsible in most of the cases.

According to bone score, 57.9% of the cases had excellent outcome, 26.3% showed good result while poor result was seen in 5.3%. Functional outcome assessment showed that 68.4% had minimal disability, 15.8% had moderate disability while 5.3% had severe disability. Pin site infection was seen in 78.9% cases, angulations in 31.6% and shortening in 10.5%. In 68.4% cases, radiological union was seen within 20 weeks while 10.5% cases needed more than 30 weeks.

Ali *et al*. found that 25% cases had excellent, 45% had good, 30% had fair result based on bone score and 30% had excellent, 55% had good, 5% had fair and 10% had poor result based on functional score. The mean age of the study group was 25.5 years [4].

Daragad *et al*. found that mean age of patients was 37.55 years. 95% patients were male and 5% were female. They noted 80% excellent, 15% good, 5% fair bone results and 85% excellent, 10% good, 5% poor functional results [2].

Gudapati *et al*. reported that there were 23 males and 3 females with an average age of 32 years. The time required for lengthening varied from each category of case from 80 to 298 days. The most frequent complications were muscle contractures and joint stiffness in 5 cases, anterior bowing of femur in one case and intolerance to fixator in one case [12].

Magadum *et al*. found that the mean lengthening achieved

was 10 cm, mean union time 6.3 months, and mean duration of consolidation 10.2 months. Functional results were excellent in 19 patients and good in 5. The union time was longer in older patients [13].

Wani and Syed found that all fractures united and infection eradicated completely. There were 13 excellent, nine good, and four fair results. Functional results were excellent in nine, good in 11, fair in five and poor in one. Pin site inflammation was the most common problem and occurred in 88% patients. There were no major complications or neurovascular complications [1].

Results were assessed by Nesari *et al*. using bone score (ASAMI) and lower extremity functional scale. 68.4% had excellent, 15.8% patients had good, 5.3% patients had fair, and 10.5% patients had poor result. 57.9% patients had minimal disability, 26.3% patients had moderate disability, 10.5% patients had severe disability, and 1 patient crippled [3].

It is seen that the results of the present study are similar to findings of other researchers. Differences in outcome may be associated with literacy of the patients and quality of selfcare.

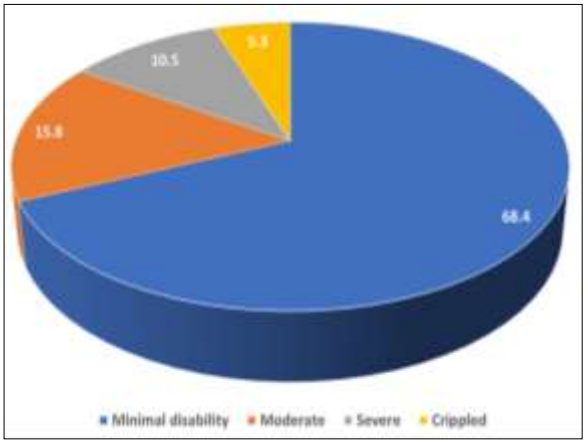


**Chart 1:** Showing functional outcome

## Conclusion

Ilizarov fixator achieves stable fixation in cases with comminuted fractures and initial distraction increases soft tissue tension to help indirectly stabilize the fracture. It is recommended if there is extensive dissection and internal fixation is contraindicated. It was seen in the present study that 57.9% of the cases had excellent outcome and 26.3% showed good result. 68.4% had minimal disability while only 5.3% had severe disability. 68.4% cases showed radiological union within 20 weeks.

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