

# Comparative Study of External Fixator versus Internal Fixation Using Interlocking Nail in Open Diaphyseal Fractures of Tibia: An Hospital Based Prospective Study

Jitendra Singh Rathore<sup>1</sup>, Surendra Singh Rathore<sup>2\*</sup>, Mohd. Arif Khan<sup>3</sup>

<sup>1</sup>Junior Specialist, Department of Orthopaedics, MDM Hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.

<sup>2</sup>Medical Officer, District Hospital, Jaisalmer, Rajasthan, India.

<sup>3</sup>Senior Resident, Department of Orthopaedics, MDM Hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.

## ABSTRACT

**Background:** External fixation and internal fixation using intramedullary nails are two well-accepted and effective methods, but each has been historically related to complications. We therefore performed a prospective study to compare the early functional recovery and overall results with these two methods of management.

**Materials & Methods:** This prospective randomized study was carried out on the patients admitted in the Department of Orthopaedics, Dr S.N. Medical College, Jodhpur. The study included 30 patients of Open Diaphyseal Fractures of Tibia. Of these, 15 patients were treated by intramedullary interlocking nailing and the remaining 15 patients by External Fixator as primary fixation method. Patient able to walk without support without pain were considered union clinically. Johner And Wruhs Criteria, 1983 were used to evaluate functional outcome.

**Results:** Our study showed that the mean age was 32.4 years in ILN group and 34 years in external fixation group. The male to female ratio was approximate 4:1. In present study showed that the road traffic accident were most of the injury (80%) in group A as compared to group B (93.33%). The farmer & labor was higher incidence of tibial fractures, which are higher demanding activity and lower incidence of fractures was

occurred in low demanding activity occupation. The outcome of our study showed that excellent in 73.33% cases in group A as compared to 53.33% in group B. Poor outcome maximum in group B was 20% cases as compared to 6.66% in group A.

**Conclusion:** We concluded that in open tibial shaft fracture intramedullary interlocked nailing is excellent modalities, leading to accepted union with a mild delay but permissible early weight bearing and low patient morbidity.

**KeyWords:** Diaphysis, Tibia, Fracture, Interlocking Nail, External Fixator, Internal Fixation.

## \*Correspondence to:

**Dr Surendra Singh Rathore,**  
Medical Officer,  
District Hospital, Jaisalmer, Rajasthan, India.

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## INTRODUCTION

Compound fractures of leg is a great dilemma. This is more common in tibia than any other long bone because one third of its surface remains subcutaneous throughout most of its length. Preventing infection, obtaining union, and returning the involved limb to normal function often remain elusive goals. High energy trauma has resulted in complex or comminuted fractures, which are frequently open with significant loss of skin and soft tissues and may be associated with compartment syndrome or neurovascular injury. Such fractures, when associated with vascular injuries, historically had a very poor outcome.<sup>1</sup> The conventional method in our country was long period of immobilization in Groin to Toe cast which itself invites well known fracture disease and on the other hand the commonest cause of delayed union after

tibial shaft fracture was found to be inadequate immobilisation (Watson-Jones). So other methods of treatment have been tried so far but none has proven as the best fixation method over others.<sup>2</sup>

The surgical treatment of fractures has evolved a great deal since the development of the original "open reduction and internal fixation" technique by the AO group. To obtain maximal mechanical stability in order to achieve primary (endosteal) bone healing, exact anatomical reduction and strict rigid fixation were emphasized in the beginning. This however can rarely be obtained without significant dissection of the fracture and the surrounding soft tissues. Well-known complications like infection and delayed or non-union are frequently attributed to the devitalisation of bony

fragments and additional damage to the soft tissues. In order to improve fracture healing, more “biological” methods have been developed over the last decades trying to lessen the surgical dissection, preserving the blood supply to the bony fragments and containing at least partially the fracture haematoma. As such, intramedullary fixation devices for example have become the gold standard for the treatment of diaphyseal fractures in the lower limb.<sup>3</sup>

External fixation has also proven to be a valuable method for treating open tibia fractures. The ability of the frame to stabilize a fracture, provide compression at the fracture site, and allow access to the soft tissues makes it an integral tool in the management of severe tibia fractures. Many surgeons reported good outcomes because they relied on aggressive and repeated debridement of devitalized tissue, including large fragments of bone. Because vascular soft tissue and bone are essential for resisting infection and providing bed for reconstruction, the tibia should be stabilized with as little additional devascularization as possible.<sup>4-6</sup>

External fixation and internal fixation using intramedullary nails are two well-accepted and effective methods, but each has been historically related to complications. Mal-alignment and knee pain are frequently reported after nailing, whereas pin tract infections, pin loosening, malunion have been reported after external fixation. According to our knowledge of literature regarding management of tibial fracture, there were no randomized studies which compared the results of the application of intramedullary nailing and external fixation. We therefore performed a prospective study to compare the early functional recovery and overall results with these two methods of management.

**MATERIALS & METHODS**

This prospective randomized study was carried out on the patients admitted in the Department of Orthopaedics, Dr S.N. Medical College, Jodhpur. The study included 30 patients of Open Diaphyseal Fractures of Tibia. Of these, 15 patients were treated

by intramedullary interlocking nailing and the remaining 15 patients by External Fixator as primary fixation method.

**Inclusion Criteria**

- Patient having grade 1 and 2 open fracture of tibia
- Age group between 18 to 65 irrespective of sex

**Exclusion Criteria**

- Patients below 18 years or above 65 years of age
- Close fracture
- Grade 3 Open fracture
- Pathological fracture
- Patient not fit for anesthesia

**Methods**

Patients were divided under two groups having 15 patients each – Group A will have patients treated by Intramedullary nail and group B will have patients treated by external fixator. Except for the selection of the fixation device, open fracture care will be similar in the two treatment groups. All patients were undergone operation within 24 hours involving irrigation and debridement with concomitant skeletal stabilization. Antibiotics along with Tetanus prophylaxis were administered perioperatively.

Radiological union were assessed by using RUST Score (Whelan et al, 2010).<sup>7</sup>

Score Per Cortex	Callus	Fracture Line
1	Absent	Visible
2	Present	Visible
3	Present	Invisible

Patient able to walk without support without pain were considered union clinically. Johner And Wruhs Criteria<sup>8</sup>, 1983 were used to evaluate functional outcome.

**Statistical Analysis**

Data were entered in Microsoft Office Excel worksheet. Appropriate statistical tests were used to find significant association. P<0.05 were considered statistically significant.

**Table 1: Profile of patients**

Parameters	Group A (Nail) N=15	Group B (External fixation) N=15	P-value
<b>Age (yrs)</b>			
18-30	8 (53.33%)	7 (46.66%)	0.9760
31-40	3 (20%)	4 (26.66%)	
41-50	3 (20%)	3 (20%)	
≥50	1 (6.66%)	1 (6.66%)	
<b>Gender</b>			0.6242
Male	12 (80%)	13 (86.66%)	
Female	3 (20%)	2 (13.33%)	
<b>Mode of Injury</b>			
RTA	12 (80%)	14 (93.33%)	0.4754
Fall from Height	2 (13.33%)	1 (6.66%)	
Fall of heavy object	1 (6.66%)	0 (0%)	
<b>Occupation</b>			
High demanding activity	9 (60%)	8 (53.33%)	0.7125
Low demanding activity	6 (40%)	7 (46.66%)	

Table 2: John &amp; Wrush Criteria

Parameters	Group A (Nail) N=15	Group B (External fixation) N=15	P-value
<b>Varus/ Valgus</b>			
2-5°	1 (6.66%)	2 (13.33%)	0.2615
6-10°	0 (0%)	2 (13.33%)	
>10°	0 (0%)	1 (6.66%)	
Normal	14 (93.33%)	10 (66.66%)	
<b>Rotational deformity</b>			0.3091
Present	0 (0%)	1 (6.66%)	
Absent	15 (100%)	14 (93.33%)	
<b>Shortening of length</b>			
1 cm	1 (6.66%)	2 (13.33%)	0.8297
≥1.5 cm	1 (6.66%)	1 (6.66%)	
No shortening	13 (86.66%)	12 (80%)	
<b>Ankle Mobility</b>			
Terminal dorsiflexion loss (10°)	2 (13.33%)	2 (13.33%)	0.6788
Terminal planter flexion loss (10°)	1 (6.66%)	2 (13.33%)	
Plant flexion absent	0 (0%)	0 (0%)	
Dorsiflexion absent	0 (0%)	1 (6.66%)	
Full	12 (80%)	10 (66.66%)	
<b>Knee mobility</b>			
Stiff knee	0 (0%)	1 (6.66%)	0.3073
Functional	1 (6.66%)	3 (20%)	
Full ROM	14 (93.33%)	11 (73.33%)	
<b>Pain</b>			
Occasionally	4 (26.66%)	2 (13.33%)	0.5724
Moderate	1 (6.66%)	2 (13.33%)	
Severe	0 (0%)	1 (6.66%)	
No	10 (66.66%)	10 (66.66%)	
<b>Gait</b>			
Normal	13 (86.66%)	10 (66.66%)	0.3343
Insignificant Limp	1 (6.66%)	4 (26.66%)	
Significant Limp	1 (6.66%)	1 (6.66%)	
<b>Strenous activity</b>			
Possible	12 (80%)	8 (53.33%)	0.3430
Limited	2 (13.33%)	3 (20%)	
Severely limited	0 (0%)	2 (13.33%)	
Impossible	1 (6.66%)	2 (13.33%)	

Table 3: Outcome

Outcome	Group A	Group B
Excellent	11 (73.33%)	8 (53.33%)
Good	2 (13.33%)	3 (20%)
Fair	1 (6.66%)	1 (6.66%)
Poor	1 (6.66%)	3 (20%)

Chi-square test (Fisher exact test), 3 degree of freedom, P =0.6428

## RESULTS

Our study showed that the mean age was 32.4 years in ILN group and 34 years in external fixation group. The male to female ratio was approximate 4:1. In present study showed that the road traffic accident were most of the injury (80%) in group A as compared to group B (93.33%). The farmer & labor was higher incidence of tibial fractures, which are higher demanding activity and lower incidence of fractures was occurred in low demanding activity occupation (table 1). The comparison of clinical evaluation in between groups by Johner and Wruhs Criteria<sup>8</sup> was shown in table 2. The outcome of our study showed that excellent in 73.33% cases in group A as compared to 53.33% in group B. Poor outcome maximum in group B was 20% cases as compared to 6.66% in group A (table 3).

## DISCUSSION

Our study showed that the mean age was 32.4 years in ILN group and 34 years in external fixation group. Young generation was more prone as they are the individuals who were physically energetic, engaged in increased multiple outdoor activities, and thus are subjected to high-velocity injuries. Our study were supported by Bonatus et al<sup>9</sup>, in which the mean age was 30.3 years, C.M. court – Brown et al<sup>10</sup> found that mean age of unreamed group was 36.1 years & of the reamed group 35 years.

The prevalence of males is higher because of their more outdoor activities, while women are mostly involved in the domestic activities. A lower that our results by Arne Ekeland<sup>11</sup> which male to female ratio was 2:1. In present study showed that the road traffic accident were most of the injury (80%) in group A as compared to group B (93.33%). This finding is confined by Lawrence et al<sup>12</sup> study showing 90% prevalence. Court Brown et al<sup>13</sup> study, also found that the commonest mode of injury was road traffic accidents. This high incidence in India can be assign to the lack of road traffic sense and poor quality of road infrastructures.

The present study showed that the farmer & labor had higher incidence of tibial fractures, which are in high demanding activity and lower incidence of fractures was occurred in low demanding activity group. This was due to more exposure to frequent travelling and lack of traffic sense. The outcome of our study showed that excellent in 73.33% cases in group A as compared to 53.33% in group B. Poor outcome maximum in group B was 20% cases as compared to 6.66% in group A.

P. Slati and P. Rokkanen (1967)<sup>14</sup> found that no significant differences between the two groups as regards the length of time elapsing before the patient could walk without a stick of the interval between trauma and return to the work. Two years later, residual joint stiffness in the knee and ankle joints was seen in the nailed group of patients.

Goran Karlstrom and Sven Olerud (1975)<sup>15</sup> found that treatment also varied depending on nature of injury, personally and demands of patients, and available therapeutic resources.

## CONCLUSION

We concluded that in open tibial shaft fracture intramedullary interlocked nailing is excellent modalities, leading to accepted union with a mild delay but permissible early weight bearing and low patient morbidity. It contribute strong fixation, rotational stability and earliest return to resumption of work, as the rate of healing is suitable with this method.

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