

# Elastic Intra-Medullary Nailing For Fracture Shaft Femur in Children.

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## ABSTRACT

**Background:** Most diaphyseal shaft femur fractures in the paediatric age group can be treated conservatively but when operative stabilisation is needed, titanium elastic nail (TEN) is the standard treatment. **Methods:** This is a retrospective study done on 52 children with displaced fracture shaft femur treated with 2 titanium elastic nails with an average follow up of 4 years. **Results:** 50 patients were available for follow up. Radiological union occurred in all cases in 8 weeks. Results were excellent in 39 patients (78%) with normal/near normal length and no complications. Satisfactory result was obtained in 11 patients (22%) with a few complications-1cm shortening in 6 cases and hardware irritation in 5 cases. **Conclusion:** TEN is an effective treatment option in children with few complications.

**Keywords:** Titanium elastic nail, diaphyseal fracture, children.

## INTRODUCTION

Fracture shaft femur is one of the most common fractures in children.<sup>[1]</sup> Most of these fractures in children of less than 5 years are treated conservatively by traction or hip spica with excellent results owing to great remodelling potential in these children. In children of 5-15 years, potential of healing decreases and chances of complications increase with conservative treatment. Titanium elastic nail has emerged as a good treatment choice in this age group. The technique of intramedullary nailing by titanium elastic nails was developed by Dr. Metaizeau et al. in France.<sup>[2]</sup> TEN provides a load sharing internal splint maintaining stable reduction till hard callus formation. It does not damage the physis, can be carried-out at all levels between subtrochanteric and supracondylar areas and results in rapid recovery. It avoids prolonged immobilisation and prevents joint stiffness. Our study aims to evaluate the role of TEN in the outcome of fracture shaft femur in children of 5-15 years.

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## MATERIALS AND METHODS

This is a retrospective study of 52 cases of fracture shaft femur treated with TEN, between 2016 and 2017 at Hi-Tech Medical College and Hospital, Rourkela. All cases were operated within 72 hrs and followed up over next 3 years.

### Inclusion criteria

1. 5-15 years of age
2. Diaphyseal /metaphyseal fractures
3. Closed fractures

### Exclusion criteria

1. Open fractures
2. Pathological fractures

### Surgical Technique

Two retrograde TENs were used. They work on a double frame model-inner frame consisting of medullary canal with the nails and cortical bone and outer frame consists of the surrounding muscles, both being essential to provide necessary stability. TEN works on three-point fixation principle counteracting axial, rotational, bending and translational forces.<sup>[3]</sup>

Patient was laid on fracture table but ordinary operation table with radiolucent top was used for smaller children.

Two 0.5 mm incisions were made 2 cm proximal to the distal femoral physis. Entry was made with a

3.2 drill bit under fluoroscopy guidance. Nail diameter chosen was 40% of the narrowest canal diameter. Two nails of same size were chosen (available from 2 mm to 4.5mm). Pre-bending was done to make the curvature of nail thrice the canal diameter. The nails were introduced using T-handle. Image guidance was used to check proper reduction, rotation and length. Traction was released after crossing of second nail across the fracture site. Lateral nail was inserted up to greater trochanter and medial one into femoral neck obtaining a divergent C configuration. Nails were cut flush to the supracondylar flare. Closure was done.

Post operatively knee range of motion exercises were started. Three point touch-down exercises started under the guidance of a physiotherapist. Weight bearing increased gradually with signs of callus formation. Full weight bearing allowed only after fracture union.

### RESULTS

50 patients were available for the study (2 patients were lost to follow up). 28 were males and 22 females. 30 fractures were on right side and 20 were on left. Fracture was in upper third in 12 (24%), middle third in 27 (54%) and in lower third in 11 (22%). Mean body weight was 22 kg (range, 10 to 45 kg).

Clinical and radiological follow up was done in immediate post op period, at 4 weeks, 8 weeks, 12 weeks, 24 weeks, 36 weeks, 48 weeks, 1.5 years and 2 years.



Figure 1: TEN AP view.



Figure 2: TEN lateral view

Table 1: Flynn outcome score<sup>4</sup>

Outcome	No. of patients	Percentage
Excellent	39	78%
Satisfactory	11	22%
Causes:		
1-2 cm shortening	6	
Hardware irritation.	5	
Poor	0	0%

Union was achieved in a mean time of 8.1 weeks. Nails were removed at a mean time of 8.6 months.

### DISCUSSION

A number of treatment modalities are available for fracture shaft femur in children of 5-15 years. They can be treated conservatively with hip spica but it is inconvenient to the patient and parents and requires long immobilisation period. External fixators, plates and locking nails can be used but each has its own disadvantage. External fixator may lead to pin tract infection and refracture.<sup>[5]</sup> Plating may lead to infection and blood loss. Locking nails may damage the physis.<sup>[6]</sup>

TEN has several advantages. It does not damage the physis, has little chance of infection, provides for early mobilisation and relatively inexpensive. A prospective study comparing TEN and hip spica found faster recovery with TEN than spica with less complications (21%) than spica cast (34%).<sup>[7]</sup> Flynn et al found excellent result in 67%, satisfactory in 31% and poor in 2% in their study on TEN.<sup>[4]</sup> Luhmann et al found excellent results in 27%, satisfactory in 60% and poor in 11% cases.<sup>[8]</sup>

### CONCLUSION

Titanium elastic intramedullary nailing for fracture shaft femur in children of 5-15 years is an easy procedure providing excellent results with fewer complications, shorter hospital stay and decreased overall costs.

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