



## STUDY OF NAILING (TENS) IN ISOLATED, CLOSED DIAPHYSEAL FRACTURES OF FEMUR IN CHILDREN

### Orthopedics

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### ABSTRACT

**BACKGROUND-** We evaluated the clinical and radiological outcome of titanium elastic nailing system in isolated, closed diaphyseal fractures of femur in children.

**METHODS-** A total of 22 children between 5-16 years of age with isolated close; diaphyseal fractures of femur undergoing closed reduction and internal fixation with TENS was followed for six months. The clinical as well as radiological outcomes were analyzed.

**RESULTS-** The mean angulations was 4+10 (0-6). 6° Valgus deformity was observed in 2/22 (9.09%) patients and 12° varus in 1/22 (4.54%) patient. Shortening of limb was seen in 2/22 (9.09%) and irritation at entry site in 16/22 (54.54%) of patients. None of the patients required early removal of the nails. When we analyzed outcome using Flynn's criteria at week 24, we found that 12/22 (54.54%) had excellent grade where as 8/22 (36.36%) good and 2/22 (9.09%) had poor grades.

**CONCLUSION:** Isolated, closed, diaphyseal femoral shaft fracture in children achieves 90% success rates with minimal complications when treated with titanium elastic nails.

### KEYWORDS

Pediatric femur fractures, Titanium elastic nailing system (TENS), Flynn's criteria.

### INTRODUCTION-

Conservative treatment for diaphyseal fractures of femur desires a long wait in hospital for traction and following immobilization in an uncomfortable cast. In addition, as mal union is no longer correctable by next to the end of growth, precise reduction is essential (1). Titanium elastic nailing system (TENS) is a contemporary technique which allows safe reduction, maintenance of reduction of skeletally immature long bone fractures (2). TENS uses two flexible nails, which were introduced percutaneously either through lower metaphyseal or subtrochanteric areas. It works on the principle of – three point fixation- providing flexural, axial, translational and rotational stability. It also aims to build up early bridging of callus and contributes to in rapid restoration of bone continuity and allows timely mobilization. J.M. Flynn et al (3) studied 230 fractures of shaft of femur in children between 3 and 18 years using TENS, the outcome was good in 150 (65%), satisfactory in 57 (25%), and poor in 23 (10%). To this reason we studied the clinical and radiological outcome of femur diaphyseal fractures in children managed with titanium elastic nailing system (TENS).

### METHODS-

A total of 22 children between 5-16 years of age with isolated, closed; diaphyseal fractures of femur undergoing closed reduction and internal fixation with TENS nails were studied. Patients were excluded from the study if they had metaphyseal fractures, compound fractures, pathological fractures and fracture with head injury. All patients underwent surgery within two days of their injury. The mean nail diameter used was 3.42±0.4mm. (3-5mm).

Post-operatively long leg cast applied, mobilized without weight bearing on 5<sup>th</sup> to 7<sup>th</sup> day, partial weight bearing started at four weeks. Between 8-12 weeks full weight bearing was advised, depending on the fracture pattern and callus reaction. Patient was assessed at week 4, 12 and 24. At each visit, patient was evaluated clinically, radiologically and complications are noted. The final outcome was assessed at week 24 using Flynn's criteria.

### STATISTICAL ANALYSIS-

Statistical analysis was performed using SPSS direct software. Clinical and radiological parameters were described using numbers and percentages. Chi-square test was used as the test of inference.

**RESULTS-** All patients were discharged home postoperatively between 8-15 days. After 6 weeks of surgery casts were removed. Duration of hospital stay was 9±2.4 days. Time to radiological union was 11.2±2.8 weeks. The mean angulations was 4+1° (0-6). 6° Valgus deformity was observed in 2/22 (9.09%) patients and 12° varus in 1/22

(4.54%) patient. Shortening of limb was seen in 2/22 (9.09%) and irritation at entry site in 16/22 (54.54%) of patients. None of the patients required early removal of the nails. When we analyzed outcome using Flynn's criteria at week 24, we found that 12/22 (54.54%) had excellent grade where as 8/22 (36.36%) good and 2/22 (9.09%) had poor grades.

### DISCUSSION-

Fixation of fractures with TENS promotes faster external bridging callus formation with less risk of infection. Nevertheless, it is crucial to assess the efficacy and safety of TENS in pediatric long bone fractures of lower limbs. Flynn JM et al in his multicentric study (4) TENS proved to be the model implant to stabilize various pediatric femur fractures, avoiding the lengthened stay and complications related to traction and POP spica casting. The results of additional prospective analysis (5), using TENS showed less interference to family life and a shorter hospitalization. In L.A. Moroz study (6), outcome was excellent in 150/220 (65%), satisfactory in 57/220 (25%), and poor in 23/220 (10%) and complications occurred in 80/220 (36.36%) of fractures. KC Saikia et al observed that 13 patients (59.0%) has excellent results, good in six (27.2%) and poor in three patients (13.6%) of Flynn's criteria (7). Jalan D et al, observed 20/30 (66.66%) patients had excellent and 10/30 (33.33%) had satisfactory results and none had poor result with irritation at the site of nail entry as most common complication. Clinically, outcome wise lengthening was noticed in four out of thirty cases, while no patient had shortening. (8). Success rates of all these studies were in parallel with our study, however rates of complications varied from these studies.

### CONCLUSION-

Isolated, closed, diaphyseal femoral shaft fracture in children achieves 90% success rates when treated with titanium elastic nails. Additionally, TENS allowed rapid mobilization, minimizes the probability of physeal infections, injury and offer quick healing.

### CONFLICT OF INTEREST – None

**Table-1- CLINICAL, RADIOLOGICAL OUTCOMES OF NAILING (TENS) IN ISOLATED, CLOSED DIAPHYSEAL FRACTURES OF FEMUR IN CHILDREN (N=22)**

Age (yrs)	12.4±1.8 yrs
Gender	
Male	16 (72.72%)
Female	6 (27.27%)
Cause of Fracture	
Fall	10 (45.45%)

RTA	12 (54.54%)
Fracture Location	
Middle 1/3	20 (90.90%)
Lower 1/3	2 (9.09%)
Time to radiological union (weeks)	11.2+2.8
Length of hospital stay (days)	9+2.4
Complications	
Angulations	4+10 (0-6)
Valgus	60 in two patients
Varus	120 in one patient
Shortening of limb	2 patients
Irritation at entry site	16 patients
Flynn's criteria at 24 wks	
Excellent	12 (54.54%)
Good	8 (36.36%)
Poor	2 (9.09%)

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