ORIGINAL ARTICLE

Diaphyseal Fractures of Femur in Children: Functional Outcome of Intramedullary Fixation with Titanium Elastic Nails

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ABSTRACT

Aim: The main objective of this study was to evaluate the functional outcome of intramedullary fixation with titanium elastic nails in diaphyseal fractures of femur in children.

Study Design: Prospective/Observational Study.

Place and Duration: This study was conducted at the Department of Orthopedics, Quaid-e-Azam Medical College/BV Hospital/ Civil Hospital Bahawalpur, Pakistan from March, 2018 to February, 2020.

Methods: In this study total 36 patients of both genders presenting with diaphyseal femur fractures were included. Patients' ages were ranging from 04 to 15 years. After taking written consent from parents/guardians, detailed demographics including age, sex, and mode of injury, side and type of fractures were recorded. Nail size was decided per-operatively according to Flynn's Formula (Nail Diameter= 80% of Cavity diameter/02. Post-operative Back-slab was applied for 03 to 04 weeks. Patients were discharged on second post-operative day and followed up at 02 weeks, 06 weeks, 12 weeks and 24 weeks after surgery. Data was analyzed by SPSS 20.0.

Results: Out of 36 patients, 27 (75%) were males while 09 (25%) were females. Majority 24 (66.67%) patients were ages <10 years. RTA was the most common mode of injury in 16 (44.44%) patients followed by fall in 14 (38.89%) patients. Mean time to bone union was 3.62±1.44 months. At final follow-up, 26 (72.22%) patients had excellent 06 (16.67%) had good, 03 (8.33%) patients had fair and 01 (2.78%) patient had poor functional outcomes.

Conclusion: Titanium elastic nails is a simple, safe, minimal invasive technique in children with diaphyseal fracture of femur with fewer complications.

Keywords: Paediatric Diaphyseal Femur Fracture, Titanium Elastic Nail

INTRODUCTION

An optimal treatment to monitor the length, alignment, comfy for the patient and comfortable for the family is for femoral diaphisal fractures in pediatrics. Treatment ranges from nonoperative (e.g. closed decrease with casting spica or casting followed by casting) to surgical (intramedullary, external or internal fixing with plates and screws) stabilisation[1-3]. The treatment of isolated femoral fractures in pre-school children remains preferred with and without traction[4].

In the last few decades the advantages of operative fixation and rapid mobilisation have become increasingly apparent to paediatric orthopedists[5]. The risks of certain complications such as infection with the pin-tract and re-fracture after outer fixation or avascular necrosis following strong anterior of IM nailing prevented the best treatment[6].

As a fixation option for paediatric femoral shaft fractures, Titanium's elastic nailing system (TENS) has gained popularity because it allows early mobilization and good functional results [7-8]. The flexible intramedullary nail acts as an internal break that maintains the length and length at least theoretically thus allowing adequate fracture site mobility for the development of callus. The aim of this study was to evaluate the post-operative functional outcome in paediatric patients with femoral diaphyseal fractures undergoing closed titanium elastic nailing.

MATERIALS AND METHODS

The study was conducted at Department of Orthopaedics Quaid-e-Azam Medical College/BV Hospital/ Civil Hospital, Bahawalpur, Pakistan from March, 2018 to February, 2020. Total 36 patients of both genders presenting with diaphyseal femur fractures were included. Patients ages were ranging from 04 to 15 years. After taking written consent from parents/guardians, detailed demographics including age, sex, and mode of injury, side and type of fractures were recorded. Children less than 04 years of age, patients with open fracture, pathological fractures were excluded.

All patients underwent standard pre-operative protocols according to the institutional policy. Surgery was carried out within 03 days of injury by a qualified orthopaedic surgeon with minimum of 02 yearexperience. Nail size was decided per-operatively according to Flynn's Formula (Nail Diameter= 80% of Cavity diameter/02)[6,7]. C-arm image intensifier was used in all cases and titanium elastic nails were inserted using retrograde fixation technique by moulding both rods in 'C' configuration and applying three point pressure technique principle. Post-operative Back-slab was applied for 03 to 04 weeks. Patients were discharged on second post-operative day and followed up at 02 weeks, 06 weeks, 12 weeks and 24 weeks after surgery. Clinical and radiological union were assessed at each visit, Full weight bearing was allowed

after substantial evidence of callus formation, and patients were evaluated for any angular deformity and limb length discrepancy after 06 months of surgery.

RESULTS

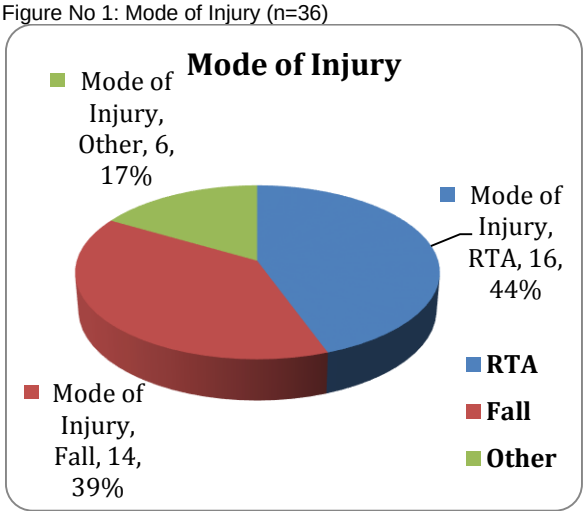
Out of 36 patients, 27 (75%) were males while 9 (25%) were females. Majority 24 (66.67%) patients were ages <10 years while 12 (33.33%) were ages above 10 years. 16 (44.44%) fractures were on left side while 20 (55.56%) patients had right side fractures. 25 (69.44%) patients had transverse, 6 (16.67%) had spiral 3 (8.33%) had oblique and 2 (5.55%) had comminuted fractures. (Table 1)

RTA was the most common mode of injury in 16 (44.44%) patients followed by falling in 14 (38.89%) patients and 6 (16.67%) had others. (Figure 1)

Table No 1. Baseline details of all the patients (n=36)

Characteristics	Frequency No.	% age
Gender		
Male	27	75
Female	9	25
Age-wise		
≤10 years	24	66.67
>10 years	12	33.33
Fracture Side		
Right	20	55.56
Left	16	44.44
Fracture Type		
Transverse	25	69.44
Oblique	6	16.67
Spiral	3	8.33
Comminuted	2	5.55

Figure No 1: Mode of Injury (n=36)



Time of union raged from 06 to 16 weeks. Mean time to bone union was 3.62±1.44 months. The mean time for full weight bearing was 2.10±0.62 months. Delayed union was found in 03 (8.33%) patients. 01 (2.78%) patient had non-union. Shortening was found in 02 (5.55%) patients, 03 (8.33%) patients had superficial infection which subsided with appropriate antibiotics. (Table 2)

At final follow-up, 26 (72.22%) patients had excellent 06 (16.67%) had good, 03 (8.33%) patients had fair and 01 (2.78%) patient had poor functional outcomes.

Table No 2: Union time, delayed union and complication

Variables	Frequency No.	%age
Bone Union	3.62±1.44	-
Full Weight Bearing	2.10±0.62	-
Complication		
Superficial Infection	3	8.33
Delayed Union	3	8.33
Limb Shortening	2	5.56
Non-union	1	2.78

Table No 2: Final outcomes according to Flyn;s Criteria

Characteristics	Frequency No.	%age
FLYN's Score		
Excellent	26	72.22
Good	6	16.67
Fair	3	8.33
Poor	1	2.78

DISCUSSION

Femoral shaft fractures are among the most common diaphyseal fractures in children with an estimated annual incidence of 19 fractures per 100,000 children. Several observational studies have identified a bimodal age distribution for femoral shaft fractures with peaks in the toddler age group, where falls are the predominant cause of injury, and in the adolescent age group, where motor vehicle collisions cause most of the fractures.[9-10] In our study duration 36 cases of diaphyseal fracture of femur in children were treated with titanium elastic nails in which majority of patients were males 66.67% with age group 04 to 15 years. In a study conducted by Khajotia BL et al[11] regarding TENS for diaphyseal femur fractures reported 84% patients were males with ages ranging from 06 to 15 years and most common mode of injury (60%) was road traffic accident followed by fall from height (36%). In our study 56.25% fractures were due to fall from height followed by road traffic accident 43.75%. Many of other studies regarding diaphyseal fracture of femur in pediatric patients illustrated that the road traffic accidents and fall from height were the most commons causes of injuries.[12-13] Children ages <15 years had high prevalence of diaphyseal fracture of femur and we analyzed that the rate of road traffic accidents in adult children 12 to 15 years of ages was high.

In our study the most common fracture type was transverse 69.44 %. This was similar to another study in which transverse fracture type was the most common type of fracture.[14]

In present study we found that time of union ranged from 06 to 16 weeks. Mean time to bone union was 3.62±1.44 months. The mean time for full weight bearing was 2.10±0.62 months. A study conducted by Saikia et al[15] reported that radiological union in all cases was achieved in a mean time of 8.7 weeks. Full weight bearing was possible in a mean time of 8.8 weeks.

In recent study, Delayed union was found in 03 (8.33%) patients. 01 (2.78%) patient had non-union. Shortening was found in 02 (5.55%) patients, 03 (8.33%) patients had superficial infection which subsided with appropriate antibiotics. A study conducted by Hossain MM et al[16] reported Leg length inequality of about 0.5 cm present in three patients.

In our study the final outcome were analyzed by the Flynn Criteria at final follow-up, 26 (72.22%) patients had excellent 06 (16.67%) had good, 03 (8.33%) patients had fair and 01 (2.78%) patient had poor functional outcome. These results were similar to several studies conducted regarding TENs for diaphyseal fractures of femur in children rated excellent 80 to 90% with very low rate of poor results 05 to 10%.[17-20]

CONCLUSION

We concluded that Titanium Elastic Nails is a simple, safe, minimal invasive technique in children with diaphyseal fractures of femur with fewer complications.

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