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A prospective study on the functional and radiological outcome of paediatric shaft of femur fractures treated with TENS nailing: A case series of 22 cases

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Abstract

Introduction: Shaft of femur fracture are one of the most common diaphyseal fractures in children with an incidence of about 19/1 lakh population. The aim of treatment is mainly anatomical reduction and realignment with proper functioning of hip and knee joints. TENS is now the preferred treatment of choice because it involves the insertion of two or three titanium nails.

Aim of Study: The aim of this study was to assess functional and radiological outcome of paediatric shaft of femur fractures treated with TENS nail.

Materials and Methods: The study has been conducted in Department of Orthopaedic, K.R. Hospital December 2017 and December 2018. Patients underwent operative treatment on table with manual traction. After proper reduction of fracture, small skin incision was given on either side of distal thigh around 2 cm proximal to distal epiphyseal plate. Titanium elastic nail of the correct size with curve ends were introduced from both medial and lateral side simultaneously till fracture site after it one nail was passed across the already reduced fracture site followed by another one. Postoperatively patients were encouraged quadriceps strengthening and knee bending exercises as soon as patients could tolerate (Usually within 24 hours of surgery) and for few days, patients were kept non-weight bearing following which partial weight bearing allowed depending on the stability of fracture and callus formation but full weight bearing was allowed only after radiological evidence of firm union.

Results: Total 22 patients with shaft femur fracture were operated between December 2017 and 2018 with TENS nail in the Department of Orthopaedics K.R Hospital. There were 15 boys and 7 girls aged between 5-15 years who were taken. Most of the cases were due to RTA (54%) and self-fall accounted for 46%. Out of the fractures, proximal accounted for 9%, mid-shaft fractures 68% and remaining were distal. The most common side affected in our case series was right which was in 17 kids (77%). Out of all types of fractures, transverse accounted for 31%, spiral 22% and the remaining were oblique. Closed reduction and internal fixation was done with negligible blood loss. Our patients underwent an average stay of 5 days in the hospital with minimum of 2 days and maximum of 8 days.

Union in our study was achieved at an average of 9.2 weeks and cases were followed up at 2, 6, 12, 16 weeks.

Conclusion: TENS is a good method of choice for paediatric fracture shaft of femur fractures particularly in the age of group of 5-15 years of age as it acts an internal splint without disturbing periosteum, promotes faster bridging and callus formation and finally early mobilization.

Keywords: TENS nail, Flynn criteria, paediatric shaft of femur

Introduction

Shaft of femur fracture are one of the most common diaphyseal fractures in children with an incidence of about 19/1 lakh population. These fractures generally peak in toddlers where RTA is one of the commonest causes of injury^[1, 2]. Blood supply of shaft femur is such that it makes outcome of fracture fixation favourable for healing.

Treatment is variable and depends mainly on age. The aim of treatment is mainly anatomical reduction and realignment with proper functioning of hip and knee joints. A variety of alternatives exist such as conservative with hip spica, plating, ex fix, rigid nailing^[3] and a relatively newer method known as TENS (Titanium Elastic Nailing System)

In the age group of 5-15 years, intramedullary nailing cannot be done due to skeletal immaturity. Conservative management has been known to lead to loss of anatomical alignment, limb length discrepancy, deformities, malunion and complications related to application of plaster.

TENS is now the preferred treatment of choice because it involves the insertion of two or three titanium nails. The fixation, though not rigid, allows rapid fracture healing and maintains alignment [4]. It is a simple procedure and acts as a load sharing internal splint with an added advantage of prevention of physeal injury. It also allows for early mobilization and is more economical too. Since it is a closed procedure periosteum is preserved, hematoma is not disturbed and chances of infection decrease significantly [5].

Aim of study

The aim of this study was to assess functional and radiological outcome of paediatric shaft of femur fractures treated with TENS nail.

Materials and Methods

The study has been conducted in Department of Orthopaedic, K.R. Hospital December 2017 and December 2018. This is a prospective study conducted in children between 5-15 years of age.

Inclusion criteria

- Age between 5-15 years
- Closed fracture
- Diahyseal fractures

Exclusion criteria

- Open fracture
- Pathological fracture
- Metaphyseal and intrarticular fractures
- Age less than 5 and more than 15 years of age

Children with femoral shaft fractures after admission: vitals

were stabilized and fracture was temporarily stabilized by skin traction or Thomas splint. Plain radiographs were taken in both AP and Lateral views with one joint above and one joint below. Informed consent was taken. Those who fulfilled our inclusion criteria for study were included and patients were prepared for surgery. All the required investigations were done and anaesthesia clearance was taken. Diameter of the nail was taken to be one third of diameter of the medullary canal at isthmus.

Patients underwent operative treatment on table with manual traction. After proper reduction of fracture, small skin incision was given on either side of distal thigh around 2 cm proximal to distal epiphyseal plate. Titanium elastic nail of the correct size with curve ends were introduced from both medial and lateral side simultaneously till fracture site after it one nail was passed across the already reduced fracture site followed by another one. After satisfactory reduction and positioning of nails there ends were bent in to protect protrusion into the distal epiphyseal plate and also there ends were made blunt so that it should not irritate the skin. Finally introduction site were closed using staple.

Postoperatively patients were encouraged quadriceps strengthening and knee bending exercises as soon as patients could tolerate (usually within 24 hours of surgery) and for few days patients was kept non-weight bearing than partial weight bearing allowed depending on the stability of fracture and callus formation but full weight bearing was allowed only after radiological evidence of firm union. Patients was followed at 2, 6, 12 and 24 week. The final outcome based on the above observations was done as per Flynn's criteria [6].

Table 1: Flynn's Criteria # TENS Outcome score

Results variables at 24 Weeks	Excellent	Satisfactory	Poor
Limb length inequality	<1.0 cm	<2 cm	>2 cm
Mal-alignment	5 degree	10 degree	>10 degree
Unresolved pain	Absent	Absent	Present
Other complications	None	Minor and resolved	Major and lasting



Fig 1: Pre op and Post of xrays till Union



Fig 2: Clinical photos at final follow up

Results

Total 22 patients with shaft femur fracture were operated between December 2017 and 2018 with TENS nail in the Department of Orthopaedics K.R Hospital. There were 15 boys and 7 girls aged between 5-15 years who were taken. Most of the cases were due to RTA (54%) and self-fall accounted for 46%. Out of the fractures, proximal accounted for 9%, mid-shaft fractures 68% and remaining were distal. The most common

side affected in our case series was right which was in 17 kids (77%). Out of all types of fractures, transverse accounted for 31%, spiral 22% and the remaining were oblique. Closed reduction and internal fixation was done with negligible blood loss. Our patients underwent an average stay of 5 days in the hospital with minimum of 2 days and maximum of 8 days. Union in our study was achieved at an average of 9.2 weeks and cases were followed up at 2, 6, 12, 16 weeks.

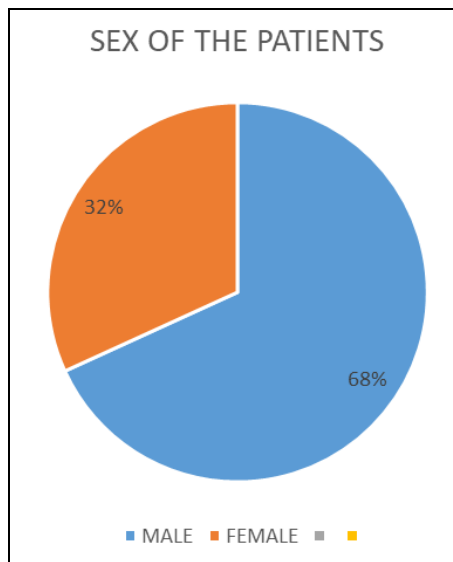


Fig 3: Sex predilection

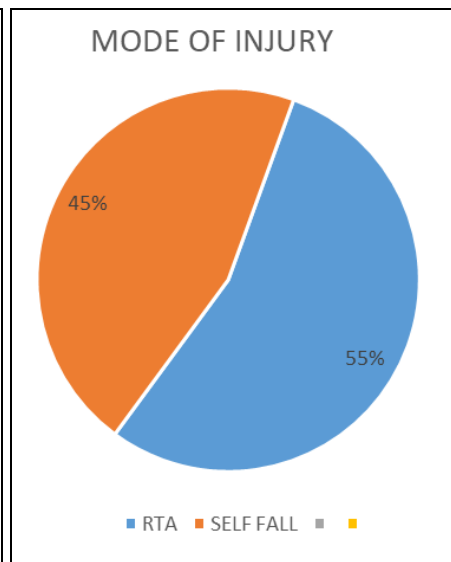


Fig 4: Mode of Injury

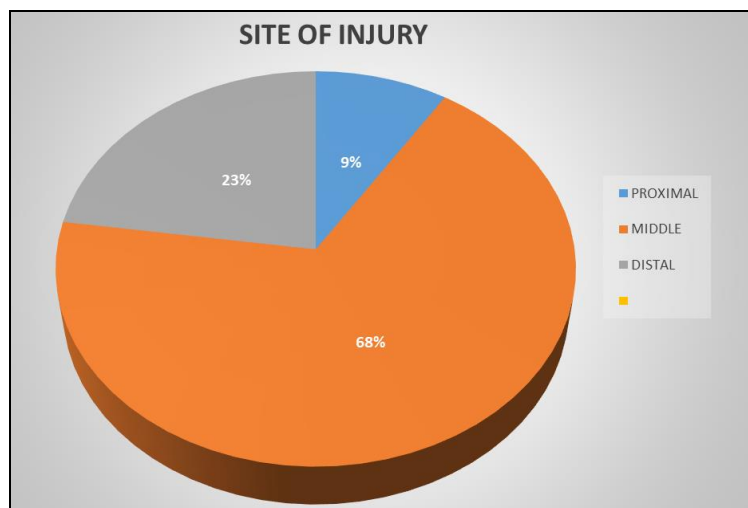
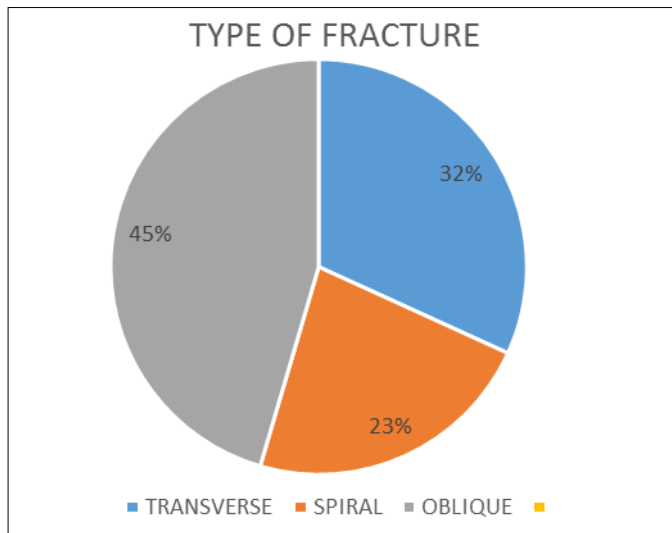


Fig 5: Site of Injury

Table 2: Predisposition to side

Side	Right	Left
Number	17	5
Percent	77%	23%

**Fig 6:** Type of Fracture**Table 3:** Follow up

Follow Up	6 Weeks	10 Weeks	12 Weeks	14 Weeks
Union	1	15	4	2

Complications

In our study, we came across a total of 6 cases with complications. 9% had superficial infections. Angular deformity was seen in 6.5% of the cases. Loss of knee flexion was in 15% of the cases. LLD was seen in 6.5% cases.

Table 4: Complications

complications	Number	Percentage
Sup Infection	2	9%
Angular deformity	1	6.5%
Loss of Knee flexion	2	9%
Limb length deformity	1	6.5

Functional Outcome

Table 5: Flynn Criteria

Results variables at 14 Weeks	Excellent	Satisfactory	Poor
Limb length inequality	<1.0 cm	<2 cm	<2 cm
Mal-alignment	5 degree	10 degree	>10 degree
Unresolved pain	Absent	Absent	Present
Other complications	None	Minor and resolved	Major and lasting

Functional Outcome

Table 6: Functional outcome

Study	Excellent	Satisfactory	Poor
Ours	14	6	2
Basant kumar Bhuyan <i>et al.</i>	33	7	0
K C Saika,SK Bhuyan <i>et al.</i>	13	6	3
Manoj Kumar, Rajak <i>et al.</i>	14	5	1
Heybeli <i>et al.</i>	25	9	1
Lohiya <i>et al.</i>	59	10	4

Discussion

Paediatric shaft of femur fractures though less in incidence are a challenge to an orthopaedic surgeon as the method of fixation is not fixed for fractures and the debate still rages on. Conservative management has many disadvantages especially with prolonged immobilization and loosening of spica [7]. Hence TENS nail is considered a good implant for early fixation and faster mobilization.

The average age in our study is 10 years which is comparable to the study done by FLYNN *et al.* [6] in which he has shown it to be 10.2 years.

The incidence of boys is about 68% and girls is about 32% which is comparable to the study done by BHASKAR *et al.* [8]. The mode of injury in our study was mainly RTA (54%) and the rest by fall (46)%. The average duration of surgery was between 45-90 mins which was comparable to SAIKA *et al.* [9] where he showed time duration between 50-120 mins.

The average time to union in our study was 9 weeks again comparable to SAIKA *et al.* [9] who showed the average time of union as 8.7 weeks but earlier than BHASKAR *et al.* [8] which showed to be 12 weeks.

In our study total of 6 patients showed complications in which 2 patient had superficial infection which was later resolved with antibiotics, 1 had angular deformity and 1 patient with limb length discrepancy of 1 cm. which was comparable to FLYNN *et al.* [6] who showed 10 cases with minor complications. Review by khoriaty *et al.* [10] also shows limb length discrepancy is not common in TENS nailing. TENS can be advantageous as both antegrade and retrograde nails can be used to avoid zones of injury. The nursing care is easier.

IN our study the functional outcome measured by FLYNN criteria [6] showed excellent in 68%, satisfactory in 27% and poor in 5% patients which was comparable to the study done by SAIKA *et al.* [9]

Currently TENS seems advantageous over other methods specially in the current age group as it is a load bearing, it does not open Physis and acts as an internal splint and maintains alignment. Faster bridging and callus formation is also a major advantage. The advantages of TENS were found by FLYNN [6] over hip spica and is proving to be the fixation of choice.

Conclusion

TENS is a good method of choice for paediatric fracture shaft of femur fractures particularly in the age of group of 5-15 years of age as it acts an internal splint without disturbing periosteum, promotes faster bridging and callus formation and finally early mobilization.

Reference

- Hinton R, Lincoln A, Crockett M. Fractures of the femoral shaft in children. *J Bone Joint Surg Am.* 81(4):500-509. [PubMed]
- Ward WT, Levy J, Kaye A. Compression plating for child and adolescent femur fractures. *J Paediatr Orthop.* 1992; 12:626-32.
- Flynn JM, Skaggs DL, Sponseller PD, Ganley TJ, Kay RM, Kellie Leitch KK *et al.* The operative management of pediatric fractures of the lower extremity. *J Bone Joint Surg Am* 2002; 84:2288-300.
- Flynn JM, Luedtke LM, Theodore J, Ganley TJ, Dawson J, Davidson RS *et al.* Comparison of titanium elastic nails with traction and a spica cast to treat femoral fractures in children. *J Bone Joint Surg Am.* 2004; 86:770-7
- Flynn JM, Hresko T, Reynolds RA *et al.* Titanium elastic

- nails for pediatric femur fractures: a multicenter study of early results with analysis of complications. *J Pediatr Orthop.* 2001; 21:4-8.
6. Flynn JM, Skaggs DL, Sponseller PD, Ganley TJ, Kay RM, Kellie Leitch KK *et al.* The operative management of pediatric fractures of the lower extremity. *J Bone Joint Surg Am.* 2002; 84:2288-300.
 7. Buford D, Christensen K, Weather P. Intramedullary nailing of femoral fractures in adolescents. *Clin Orthop Relat Res* 1998; 350:85-9.
 8. Bhasker A. Mumbai treatment of long bone fractures in childrens by titanium elastic nailing. *Ind. J Orthop.* 2005; 39(3):166-8.
 9. Saikia KC, Bhuyan SK, Bhattacharya TD, Saikia SP. Titanium elastic nailing in femoral diaphyseal fractures of children in 6-16 years of age. *Indian J Orthop.* 2007; 41(4):381-5.
 10. Khoriaty A, Jones C, Gelfer Y. The management of paediatric diaphyseal femoral fractures: a modern approach. Trompeter A. *Strat Traum Limb Recon*, 2016.