

Study of Treatment of Fracture Shaft Femur by Ender and Elastic Nailing in Paediatric Age GroupVishwa Mohan Priyadarshi¹, Rajeev Anand², Manish Ranjan³¹Senior Resident, Department of Orthopaedics, PMCH, Patna²Associate Professor, Department of Orthopaedics, PMCH, Patna³Assistant Professor, Department of Orthopaedics, PMCH, Patna

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Abstract:

Background and Objective: Femoral shaft fractures account for 1.6% of all paediatric bony injuries. Angulation, malrotation and shortening are not always corrected effectively by conservative methods. Fixation of femur fractures in children & adolescents by flexible intramedullary nailing is becoming widely accepted because of the lower chance of iatrogenic infection and prohibitive cost of in hospital traction and Spica cast care. The objective of our prospective study was to study the various aspects of Managing diaphyseal fractures of femur in children aged between 5-15 years by using Titanium Elastic Nailing System & Ender nailing. Subjective and objective study of clinical parameters like pain, comfort to the patients, early mobilization, operative technique, radiological evaluation for union, stages of weight bearing till complete recovery and any associated complications by using the above mentioned methods.

Method: Children and adolescents between the age group of 5-15 years with femoral shaft fractures who were admitted in PMCH Patna. All patients underwent titanium elastic nailing & Enders nailing fixation for the femur fracture.

Result: The outcome is excellent in 21 (70%) cases, satisfactory in 9 (30%) cases and there were no cases of poor outcome.

Conclusion: Flexible intramedullary nail leads to rapid fracture union by preservation of fracture hematoma and limited soft tissue exposure. It also helps in preventing damage to the physis.

Keywords: hematoma, Intramedullary, Fixation.

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Introduction

Femoral shaft fractures account for 1.6% of all paediatric bony injuries. Treatment of long bones fractures in children continues to improve as newer techniques evolve. Previously most of the fractures were effectively managed conservatively & only unstable and displaced fractures were taken up for fixation [1]. Although a number of other intramedullary devices like rush nail or enders nail are available for treatment of paediatric long bone fractures, yet these have poor elasticity, rotational stability and require multiple nails to achieve fracture stability. There is little controversy over the treatment of adult femoral shaft fractures with intramedullary nail fixation. Similarly, there is little controversy over the treatment of infants and toddlers with femoral shaft fractures by using spica casting [2], but the treatment of paediatric and adolescent (age 5 to 15 years) femur fractures remains controversial. Hence there was an evolution in treatment options for this age group for optimum treatment of fractures. Treatment of paediatric frac-

tures dramatically changed in 1982 when Me-taizeau and the team from Nancy, France, developed the technique of elastic stable intramedullary nailing. In last two decades there was an increased interest in the operative treatment of paediatric fractures, although debate persisted over its indication. There is little disagreement concerning the management of long bone fractures in children less than 6 years i.e. pop casting, and adolescents over 16 years with intramedullary nailing. [3] Differences of opinion about treatment are greatest for patients who are too old for early spica casting and yet too young for adult type of treatment with a reamed IM nailing [4].

Current treatment options include early spica casting, traction, external fixation, ORIF with plating, flexible intramedullary nails and reamed intramedullary nails. The two major drawbacks with various types of traction and plaster cast immobilization are prolonged bed rest leading to separation of the child from routine activities and the expenditure

incurred on the treatment during the stay in the hospital and parental non acceptance [5]. The now favoured Elastic internal fixation in the form of flexible intra medullary nailing & enders nail provides a healthy environment for fracture healing with some motion leading to increased callus formation. This method avoids physeal damage, minimally invasive with relatively reduced hospital stay and high acceptance by parents after a short learning curve [6].

Objectives

To prevent hip Spica associated problems such as shortening, angulation of fracture, toileting, formation of sores.

Avoiding plate osteosynthesis which have more deleterious effect on paediatric age group like scar, immobilization, joint stiffness & plate removal.

Materials and methods

Using descriptive study, Patients having history of pain & deformity over thigh with x ray showing fracture shaft of femur, aged between 1-15 years who are admitted in Patna Medical College and Hospital Patna, Bihar. Study duration of Two Years.

Inclusion criteria

- The patient with fracture shaft femur unilaterally or bilaterally.
- Aged between 1- 15 years.

Exclusion criteria

- Patients aged above 15 years.
- Patients with open fractures.
- Patients with pathological fractures
- Admitted patients are evaluated by paediatrician for fitness, routine pre anaesthetic check-up will be done and informed written consent will be taken before surgery.
- Intra operatively -Position of the Patient, bony landmark and surgical incision for the nail Insertion, reduction modalities under image intensifier, time needed for surgery, blood loss and any other difficulties faced during the procedure is carefully noted, including sizing and suitability of titanium elastic nails as per A.O. guidance.

Post operatively after 24 hours - Wound Inspection, Check X-ray to assess reduction and active static exercises/passive exercises / active neighbouring joint movement at the earliest, Between 8 to 10 days - wound inspection and suture/staple removal, Patient is called for periodic follow up at 4 weeks, 8 weeks, 12 weeks and at 6 months clinical and radiological assessment will be done. Clinical evaluation for - pain, range of movements (hip and knee), limb length and time of weight bearing (partial/complete) is done.

Radiological evaluation for – position of the nail, coronal and sagittal alignment, loss of reduction / deformity and delayed/non-union is done.

Flynn's criteria

Results Variables at 24 weeks	Excellent	Satisfactory	Poor
Limb-length equality	< 1.0 cm	1.0-2.0 cm	>2.0 cm
Malalignment	5 degrees	10 degrees	>10 degrees
Unresolved pain	Absent	Absent	Present
Complications	None	Minor and resolved	Major and lasting morbidity

when there was anatomical or near anatomical alignment, no leg length discrepancy with no perioperative problems.

Nail Size and Nail Width

The diameter of the individual nail is selected as per

Flynn et al's formula.

Diameter of nail= width of the narrowest point of the medullary canal on AP and Lateral view X 0.4mm

1) Intra operative assessment

Diameter of the nail is chosen so that each nail occupies at least 1/3rd -40% of the medullary cavity.

Nail length: Lay one of the selected nails over the thigh, and determine that it is of the appropriate length by fluoroscopy. The nail should extend from the level of the distal femoral physis to a point approximately 2 cm distal to the capital femoral physis and 1 cm distal to the greater trochanteric physis.

Preoperative preparation of patients:

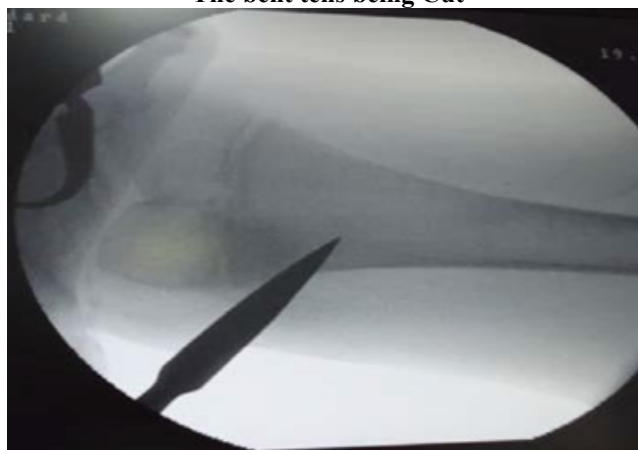
Patients were kept fasting overnight before surgery. Adequate amount of compatible blood was kept ready for any eventuality. The whole of the extremity below the umbilicus, including the genitalia was prepared. A systemic antibiotic, usually a 3rd generation cephalosporin was administered 30 minutes before surgery.



Both tents Introduced into the Femur



The bent tents being Cut



Entry using bone AEL

Results

Table 1 : Age Incidence

Age in years	No. of Cases	Percentage
5 – 8	19	64
9 -12	7	23
13 -15	4	13

Table 2: Sex Incidence

Sex	No. of cases	Percentage
Male	18	60
Female	12	40

Table 3: Mode of Injury

Mode of Injury	No. of cases	Percentage
RTA	15	50
Self fall	12	40
Fall from height	3	10

Table 4: Pattern of Fracture

Pattern of Fracture	No. of cases	Percentage
Transverse	8	27
Oblique	13	43
Spiral	5	17
Segmental	0	0
Communited	4	13

Table 5: Duration of Stay in Hospital

Duration (days)	No. of cases	Percentage
0-7	4	13
8-10	18	60
11-13	8	27

Table 10: Complications

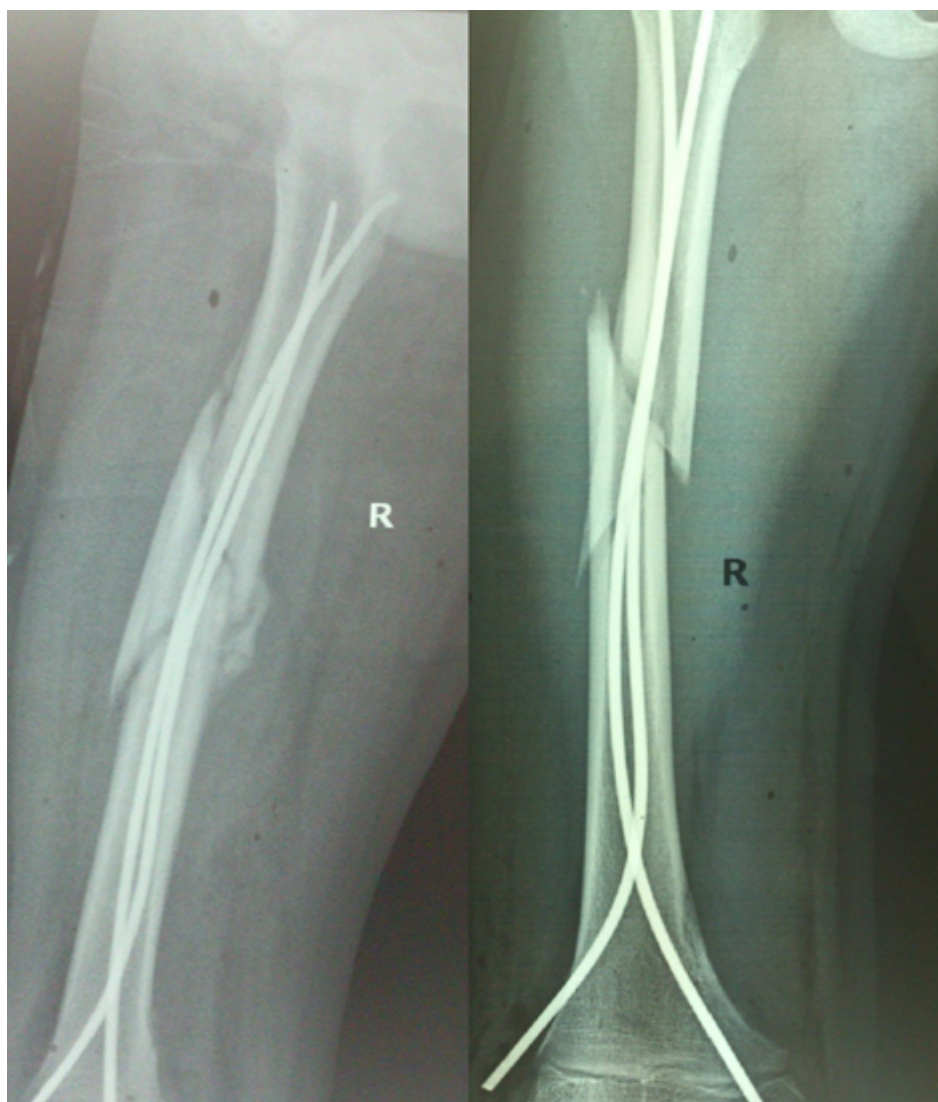
Complications	No. of cases	Percentage
Pain at the Site of Nail Insertion	6	20
Infection	2	7
Limb shortening <1cm	1	3.3
Limb lengthening <1cm	1	3.3

Table 11: Outcome

Outcome	No.of cases	Percentage
Excellent	21	70
Satisfactory	9	30
Poor	0	0



POST OP AT 4 WEEKS



POST OP AT 4 WEEKS

Discussion

Age incidence:

In the present study 19(64%) of the patients were 5-8 years, 7 (23%) were 9 to 12 years and 4(13%) were 13 to 15 years age group with the average age being 7.93 years. J. N. Ligier et al studied children ranged from 5-15 years with a mean of 10.2 years [7].

Studies	Age Incidence (Average) In Years
Present study	7.93
J.N .Ligier et al.	10.2

Sex incidence:

There were 18(60%) boys and 12 (40%) girls in the present study. The sexincidence is comparable to other studies in the literature.

In their study J. N. Ligier et al. out of 118 cases, had 80 (67.7%) boys and38(32.3%) girls. In their study, Gamal El-Adl et al. out of 66 patients, there were 48(72.7%) male and 18 (27.3%) females [8].

Studies	Male %	Female %
Present study	60	40
J.N. Ligier et al	67.7	32.3
Gamal El-Adletal	72.7	27.3

In the present study RTA was the most common mode of injury accounting for15 (50%) cases, self-fall account- ed for 12 (40%) cases and fall from height accounted for 3 (10%) of the cases.

J. M. Flynn et al, in their study assessing 234 cases, 136(58.1%) were following RTAs, 46(19.6%) were following self fall and remaining 43(28.8%) were as a result of fall from height [9].

Mechanism of injury (%)	RTA	Self-Fall	Fall From Height
Present Study	50	40	10
J.M.Flynn et al	58.1	19.6	28.8

Pattern of Fracture:

In our study, transverse fractures accounted for 8 (27%) cases, oblique fractures 13(43%), spiral fractures 5(17%), communitated fractures 4(13%) and there were no segmental fractures.

In their study J. N. Ligier et al out of 123 femoral fractures studied (38.2%) were transverse fractures, oblique fractures 7(23.3%), spiral fractures 19 (15.4%) and 4 (3.2%) were segmental fractures.

Studies	Transverse %	Oblique %	Spiral %	Segmental %	Communitated %
Present study	27	43	17	0	13
J. N. Ligier et al	38.2	23.3	15.4	3.2	25.4

Studies	Time of Union (In Weeks)
Present study	11.1
Oh C.W, et al	10.5
Aksoy C, et al	16

In our study, closed reduction of the fracture, leading to preservation of fracture hematoma, improved biomechanical stability and minimal soft tissue dissection led to rapid union of the fracture compared to compression plate fixation [11].

Complications: In the present study, 6(20%) patients had developed pain at site of nail insertion during initial follow up evaluation which resolved completely in all of them by the end of twenty four weeks. J.M.Flynn et al. reported 38 (16.2%) cases

of pain at site of nail insertion out of 234 fractures treated with titanium elastic nails [12]

Hossam M kandil, treated thirty-two children, age 4.9–13.2 years, with femoral shaft fractures, the outcome scoring to evaluate functional results showed excellent results in twenty-six patients (81.25%), satisfactory results in six patients (18.75%), and no poor results. In K.C. Saikia et al in their study of 22 children with femoral shaft fractures 13 (59%) excellent, in 6 (27.2%) satisfactory and 3(13.6%) poor results [13].

Studies	Outcome (%)		
	Excellent	Satisfactory	Poor
Present Study	70	30	-
J.M.Flynn et al ⁷	65	25	10
Hossam M Kandil ¹⁰	81.25	18.75	-
K.C.Saikia et al ¹⁴	59	27.2	13.6

Conclusion

Based on our experience and results, we conclude that Titanium Elastic Nailing System & Ender nailing is an ideal method for treatment of paediatric femoral fractures. It gives elastic mobility promoting rapid union at fracture site and stability which is ideal for early mobilization with lower complication rate, good outcome when compared with other methods of treatment. It is a simple, easy, rapid, reliable and effective method for management of paediatric femoral fractures between the age of 5 to 15 years, with shorter operative time, lesser blood loss, lesser radiation exposure, shorter hospital stay, and reasonable time to bone healing.

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