



## A CLINICAL STUDY TO EVALUATE OUTCOME OF PAEDIATRIC SHAFT FEMUR FRACTURE TREATED WITH FLEXIBLE INTRAMEDULLARY NAILING

<b>Dr. Rajdeepsinh H. Chauhan*</b>	Senior Resident, C.u. Shah Medical College, Surendranagar*Corresponding Author
<b>Dr. Rohan P. Doshi</b>	3 <sup>rd</sup> Year Resident, C.u.shah Medical College, Surendranagar
<b>Dr. Tapan R. Ankleshwaria</b>	2 <sup>nd</sup> Year Resident, C.u.shah Medical College, Surendranagar
<b>Dr. Divy J. Patel</b>	2 <sup>nd</sup> Year Resident, C.u.shah Medical College, Surendranagar
<b>Dr.kabir N. Desai</b>	Diploma In Orthopedics, C.u.shah Medical College, Surendranagar

### ABSTRACT

**Introduction:** femur fractures are the most common pediatric injury requiring hospitalization (1). The majority of these fractures occur as a result of major injury, since normal femoral shaft can be broken only by a tremendous force. The violence may be direct or indirect, such as that sustained in automobile accident or fall from height. Material and method: All patients included in this study sustained shaft femur fracture of age group 6 to 14 years. The prospective study was conducted at Department of orthopedics at tertiary health care center. We included 25 femoral shaft fractures treated with retrograde flexible intramedullary nailing with a minimum follow up of 6 month. Final limb length discrepancy and any angular or rotational deformities were determined.

**Result:** in this study average age of patients was 10.84 years, ranging from 6 to 14 years. The most common site of fracture of shaft femur according to present study is middle third (64%). The average duration to achieve union was 6.16 weeks according to present study (range 4 to 12 weeks). Evaluation of outcome as per Flynn criteria (2) was done on last follow up.

**Conclusion:** In conclusion, flexible intramedullary nail is a great choice for the treatment of pediatric patients (6–14 years old) with closed femoral shaft fractures.

**KEYWORDS :** pediatric shaft femur fracture, Flynn criteria, flexible intramedullary nail

### INTRODUCTION:

Femur fractures are the most common pediatric injury requiring hospitalization (1). The majority of these fractures occur as a result of major injury, since normal femoral shaft can be broken only by a tremendous force. The violence may be direct or indirect, such as that sustained in automobile accident or fall from height. The principle of treatment is simple alignment which is the chief requirement. The fracture should not be grossly angulated or rotated. In children healing is rapid and nonunion is almost nonexistent. The remodeling of bone that occurs in young children assists in realignment, and perfect anatomical reduction is less important than in an adult. Furthermore, the factor of stimulation of growth tends to correct shortening to some extent, if there is an overriding. In younger children, fall from height is more often mechanism of injury while in the adolescent age group, high-velocity motor vehicle accidents are more often the mechanisms of injury and account for up to 90% of all femoral shaft fractures.(3)

### MATERIAL AND METHOD:

All 25 patients in the present series were admitted at C.U.Shah Medical College & Hospital and were treated as indoor patients. After admission of the patients in trauma ward, they were examined for the vital data, head injury, level of consciousness, thoraco-abdominal injury and other associated injuries. Distal neurovascular status was checked. Proper splintage was given for immobilization of part. In all patients intravenous line was established for infusion and injectable. After application of splintage and establishing intravenous line, hemodynamically stable patients were sent for x-ray of affected limb, anteroposterior and lateral view including hip and knee joints and x-ray chest. After confirmation of fracture clinically as well as radiologically appropriate splintage or traction was given and limb was put on pillow or Bohler's splint respectively. Patients with fractures of diaphysis of femur were posted for intramedullary nailing. All the patients who were hemodynamically stable and who did not have medical contraindications were operated as early as possible.

### Inclusion criteria:

1. Shaft femur fracture without distal neurological and vascular deficit
2. Age 6 to 14 years

### Exclusion criteria:

1. Pathological fracture
2. Ipsilateral lower limb fracture
3. Fracture with distal neurovascular deficient

### Classification system:

Winquist Hansen classification (4) for amount of comminution

### method:

After giving spinal anesthesia patient was shifted to fracture table in supine position, traction was given to affected limb and normal limb placed in abduction for IITV placement. The leg is prepared and draped with the thigh (hip to knee) exposed. The image intensifier is used to localize the placement of skin incisions by viewing the distal femur in the AP and lateral planes. Incisions are made on the medial and lateral side distal to the insertion site in the bone. The proximal end of the 2- to 3-cm incision should be at or just distal to the level of the insertion site, which is about 2.5 to 3 cm proximal to the distal femoral physis. A 4.5-mm drill bit or awl is used to make a hole in the cortex of the bone. The distal femoral metaphysis is opened 2.5 cm proximal to the distal femoral physis using a drill or awl. The drill is then steeply angled in the frontal plane to facilitate passage of the nail through the dense pediatric metaphyseal bone. Upon insertion the rod glances off the cortex as it advances toward the fracture site. Both medial and lateral rods are inserted to the level of the fracture. At this point, the fracture reduction is optimized if necessary with a radiolucent fracture reduction tool which holds the unstable femoral fracture in the appropriate position to allow fixation. The surgeon judges which nail will be most difficult to get across the fracture site, and pass it first. If the easier nail is passed first, it may stabilize the two fragments such that the second, more difficult nail,

cannot be passed easily. The two nails then are driven into the proximal end of the femur, with one driven toward the femoral neck and the other toward the greater trochanter. On the lateral, one nail should have its tip pointing anteriorly. When passing the second nail across the fracture site and rotating it, care must be taken not to wind one rod around the other. After the nails are driven across the fracture and before they are seated, fluoroscopy is used to confirm satisfactory reduction of the fracture and to ensure that the nails did not comminute the fracture as they were driven into the proximal fragment. The nails are pulled back approximately 2 cm, the end of each nail is cut, then driven back securely into the femur. The end of the nail should lie adjacent to the bone of the distal femoral metaphysis, exposed just enough to allow easy removal once the fracture is healed.

Above knee slab, thigh brace or traction is given from immediate post-operative period where reduction is unstable of fracture is highly communitated for 3 week. Post-operative injectable antibiotics and analgesics given for 2 day then oral medication given. Weight bearing is avoided until there is radiological evidence of fracture healing. Quadriceps strengthening is begun on second / third day.

Knee bending is started on second / third day or later for selected cases where fracture is highly communitated or reduction is unstable.

**Complications.**

- Knee Pain and Stiffness
- Leg length discrepancies
- Nail penetration into knee joint and synovitis
- Malunion
- Infection

**RESULT:**

- In the present study the average age of patients was 10.84 years, ranging from 6 to 14 years.(table 1)
- In our series the male to female ratio is 1.5: 1, 15 among 25 patients were males and 10 patients were females.(table 2)
- In our study left side affected more than right side.(table 3)
- The most common mode of injury in present study was "fall" (64%).(table 4)
- The most common site of fracture of shaft femur according to present study is middle third (64%).(table 5)
- The most common fracture morphology was transverse in our study (40%) and second most common oblique (32%).(table 6)
- 96% of the fractures were closed according to present study and 4% were Gustillo Anderson compound grade 1. (table 7)
- The average duration to achieve union was 6.16 weeks according to present study (range 4 to 12 weeks). (table 8)
- Valgus angulation deformity occurred in three patients (12%) in present study and all 3 patient had < 50 valgus deformity. Three patients (12 %) had varus deformity.2 patient had 50 varus deformity and one patient had < 50 varus deformity. .(table 9)
- On evaluating outcome according to Flynn criteria 80% achieved excellent, 12% satisfactory and 8% poor results due to secondary procedure done before union of fracture. .(table 10)

**DISCUSSION:**

In present series average age of patient was 10.84 years (range 6 to 14 years),in study by Shekhar & Mayangar (5) it was 9.67 years (range 6 to 14 years), in study by Sharma, Singh (6) it was 11.26 years (range 6 to 14 years).

According to present study fracture shaft femur was more common in boys (60%) as compared with girls (40%).It is consistent with the findings of Sharma & Singh where fracture was more common in boys(75%) as compared with girls(25%).This is likely as boys are more involved in outdoor activities than girls.

In present study left side (80%) affected more than right side (20%). The most common site of fracture of shaft femur according to present study is middle third (64%).It was consistent with the

findings of Shekhar & Mayangar and Sharma & Singh where middle third was most common site of fracture (75% and 80% respectively).This is obvious due to anatomical considerations like changing of curvature and bowing of the femur is maximum at middle third and again because of the susceptibility of middle third to direct violence.

The average duration to achieve union was 6.16 weeks according to present study (range 4 to 12 weeks). This is consistent with the findings by Shekhar & Mayangar (average 6.6 weeks and range 5 to 12 weeks) and findings by Sharma & Singh (average 8.3 weeks and range 7 to 12 weeks).

On evaluating outcome according to Flynn criteria 80% achieved excellent, 12% satisfactory and 8% poor results. In study by Shekhar & Mayangar results were excellent in 83%, satisfactory in 17%.In study by Sharma & Singh results were excellent in 71%, satisfactory in 23% and poor in 6%.

**CONCLUSION:**

In conclusion, flexible intramedullary nail is a great choice for the treatment of pediatric patients (6–14 years old) with closed femoral shaft fractures. An ideal treatment for pediatric femoral shaft fractures is the one that controls the length and alignment, is comfortable for the patient and convenient for the family, and causes the least negative psychological impact. This technique can provide a rapid recovery, short rehabilitation and immobilization, few complications and a very high union rate. In addition to those benefits it has little psychological impact to the children and is cost-effective.

**ACKNOWLEDGEMENT: No**

**DECLARATIONS:**

- Funding: None
- Conflict of interest: None declared
- Ethical approval: Not required

**Tables:**

**1) AGE INCIDENCE:**

Sex	Present study	
	Cases	Percentage
Male	15	60%
Female	10	40%
Total	25	100%

**2) SEX INCIDENCE:**

Age	Present Study
Average (years)	10.84
Range (years)	6 TO 14

**3) SIDE OF AFFECTED LIMB:**

Side	Present Study	
	Cases	Percentage
Right	5	20%
Left	20	80%
Total	25	100%

**4) CAUSE OF INJURY:**

Cause of injury	Present Study	
	Cases	Percentage
Vehicular accident	9	36%
Fall	16	64%
Others	0	0%
Total	25	100%

**5) SITE OF FRACTURE:**

Level of	Present Study	
	No. of fractures	Percentage
Upper Third	7	28.00%
Middle Third	16	64.00%
Lower Third	2	8.00%
Total	25	100%

**6) TYPE OF FRACTURE:**

Type of Fracture	Present Study	
	No. of fractures	Percentage
Transverse	10	40%
Oblique	8	32%
Spiral	5	20%
Communited	2	8%
Total	25	100%

**7) NATURE OF FRACTURE:**

Nature of fracture	Present Study	
	Cases	Percentage
Closed fracture	24	96%
Open fracture	1	4%
Total	25	100%

**8) DURATION TO ACHIEVE UNION:**

	Present study
Average Duration to achieve union (weeks)	6.16 weeks
Range (weeks)	4 to 12 weeks

**9) ANGULAR DEFORMITIES:**

Angular deformity	Present study	
	Number	Percentage
Anterior	0	0%
Posterior	0	0%
Varus	3	12%
Valgus	3	12%

**10) OUTCOME:**

Outcome according to Flynn's Criteria	Present Study	
	Cases	Percentage
Excellent	20	80%
Satisfactory	3	12%
Poor	2	8%
Total	25	100%

**Figures:**



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