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Evaluation of fracture shaft femur fixation with ender's nailing in children

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Abstract
Background: Fixation of femoral shaft fractures by flexible intramedullary nailing has been accepted as boon procedure. In the resent past operative procedure had an upper hand over conventional spica cast fixation which was associated with psychosocial, educational and economical disadvantages. The present study is conducted with an aim to observe ender's nailing in children might be advantageous in healing and recovery of the patient.
Methodology: The study was conducted at Government General Hospital, Nizamabad during the period from January 2015 to July 2017. Children between the age group of 5-16 years with femoral shaft fractures were included and all patients underwent ender's nailing fixation for the sustained fracture.
Result: The study comprised 13 male patients and 3 female patients aged from 5 to 16 years with mean of 10.65 years. 10 (62.5%) were closed fractures and 6 (37.5%) were open fractures. Closed type of reduction is done in 75% of cases. The average time of union was 10.12 weeks. No delayed or nonunion and malalignment was seen.
Conclusion: Flexible intramedullary ender's nail is a boon to children and adolescence which helps in rapid fracture union with minimum complications and early recovery.

Keywords: Femoral shaft, intramedullary, Diaphyseal, ender's nail

Introduction
Usage of spica casting as the treatment for children with femoral shaft fractures is a controversy [1]. Current treatment options include early spica casting, traction, external fixation, ORIF with plating, flexible intramedullary nails and reamed intramedullary rods [2]. Time and experience of many clinicians have shown that children with diaphyseal femur fracture do not always recover with conservative treatment. Operative approach is the main stand for the management of femoral shaft fractures in children presently. The advantages of flexible intramedullary nails as a fixation device are closed insertion of the device, with preservation of the fracture hematoma and minimal risk of fracture site infection, no reaming is required, and as such the endosteal blood supply is essentially preserved [3]. Rapid recovery and re integration of patients seen with use of ender's nail fixation. Elastic internal fixation in the form of ender's nailing provides a healthy environment for fracture healing with some motion leading to increased callus formation [4]. Ender's nail fixation in the pediatric population is simple, effective and minimally invasive. It allows stable fixation, rapid healing and a prompt return of child to normal activity. Functional results are excellent and complications are minor [4].

Material and Methods
Type of study: Observational study.
Study Setting: Government General Hospital, Nizamabad.
Study period: January 2015 to July 2017.
Sample size: A total of study16 patients, aged 5 to 16 years during a study period.

Children with Femoral shaft fractures who were admitted during the study period were examined according to protocol. Relevant demographic, clinical data and associated injuries were noted.

Later radiological investigations were carried out and medical fitness for surgery to undergo ender's nailing fixation for the sustained fracture was taken.

Inclusion criteria

1. Children & adolescent patients between 5 to 16 years of age
2. Patients with Stable femoral shaft fractures
3. Both Type I and II compound fractures.

Exclusion criteria

1. Patients aged less than 5 years and more than 16 years of age.
2. Patients whose parents didn't give Consent for study.
3. Patients who are medically unfit for surgery.
4. Comminuted, segmental fractures and type III Compound fractures.
5. Very distal (or) very proximal fractures that precludes nail insertion.

Results

A total of 16 Patients were studied during the study period.

Table 1: Distribution of cases according to the Age

Age in years	No. of cases	Percentage
6-8	6	37.5
9-12	7	43.75
13-16	3	18.75

Majority of the patients i.e. 7 (43.75%) were in the age group of 9-12 years, followed by 6 (37.5%) patients in 6 to 8 years. The youngest patient was 6 years and oldest patient was 15 years. The mean age in our study was 10.65 years.

Table 2: Distribution of cases according to the gender

Sex	No. of cases	Percentage
Male	13	81.25
Female	3	18.75

Majority of the patients were males i.e. 13(81.75%)

Table 3: Distribution of cases according to the type of trauma

Type	No. of cases	Percentage
RTA	10	62.5
Fall while playing	1	6.25
Fall from height	5	31.25

The major cause of fracture in our study was RTA in 11 (62.5%) patients followed by fall from height in 5 patients (31.25%) patients.

Table 4: Description on fractures

	N	Percentage
Side		
Left femur	10	62.5%
Right femur	6	37.5%
Pattern of fracture		
Transverse	10	62%
Oblique	3	19%
Spiral	3	19%
Level of fracture		
Proximal	4	25%
Middle	12	75%

Table 5: Time interval between trauma and surgery

Duration in days	No. of cases	Percentage
<24 hours	1	6
2- 4 days	7	44
5 - 7 days	7	44
>7 days	1	6

Majority of patients were operated between 2 to 7 days.

Table 6: Type of Reduction

Reduction	No. of cases	Percentage
Closed	12	75
Open	4	25

Closed reduction was the commonest method adopted in most of the fractures correction.

Table 7: Size of Nail Used

Size of nail	No. of cases	Percentage
2 mm	1	6
2.5 mm	8	50
3 mm	6	38
3.5 mm	1	6

In most of the cases (50%) 2.5 mm diameter nails were used. 3 mm nails were used in 38% of the cases. Only in two cases 2 mm nail and 3.5mm nail each were used respectively.

Table 8: Duration of Stay in Hospital

Hospital stay in days	No. of cases	Percentage
6-9	1	5
10-12	16	80
>12	3	15

Majority of patients (80%) stayed in hospital for about 10-12 days.

Table 9: Time for union

Time for union	No. of cases	Percentage
8 weeks	4	25
10 weeks	7	43.75
12 weeks	5	31.25

In our study, time to union ranged from 8 to 12 weeks average being 10.12 weeks.

Table 10: Complications

Complications	No. of cases	Percentage
Limb shortening		
3 >5 mm	1	6.25
4 ≤ 5 mm	1	6.25
Infection	3	18.75
Delayed union and non-union	-	-
Nail impingement at entry point	3	18.75
Mal alignment		
Varus angulation	-	-
Varus angulation	-	-
Anterior angulation	-	-
Posterior angulation	-	-
Rotational angulation	-	-

Discussion

In our present study ender's nails were used in 16 cases. Ender's nails present an effective, more economical alternative in the treatment of femoral shaft fractures.

Stainless steel rods are stronger than titanium in bending stress, have greater intrinsic strength and therefore are not as dependent on the opposing bend technique. In a study conducted by Ravi Kant J, *et al* [5] transverse fractures accounted for 75% cases, Oblique fractures accounted for 15% cases and spiral fractures accounted for 20% cases where as our study has 62%, 19% and 19% cases respectively. In most of the cases (50%) 2.5 mm diameter nails were used. 3 mm nails were used in 38% of the cases. 3.5mm nail was used only in. In our study, no post-operative immobilization was done either in the form of pop cast or supplementary immobilization. InfanteAF, *et al* [6] treated 190 children with immediate hip spica casting. The average duration of immobilization in their study was 7 weeks. The average duration of hospital stay in the present study is 11.4 days. In the present study 80% of the cases stayed in hospital for 10 to 12 days .According to another study by Kalenderer O , *et al* [7] the mean hospital stay was 12 days .All patients had full range of hip motion in the present study. Bar- on E, *et al* [8] noted 20º loss of internal rotation at the hip in one patient treated with external fixation.Comparing to limb length discrepancy in conservative methods, limb length discrepancy in our study was within the acceptable limits. Venkat L, *et al* [9] noted Shortening in 17.9% of the population. Superficial infection was seen in 4 cases in our study which was controlled by antibiotics. In our study there was no varus/valgus malalignment. Heinrich SD, *et al* [10] reported 5ºof varus angulation in one child in their study and 11% of fractures had an average varus or valgus malalignment of 6º.Al-achraf K, *et al* [11] stated that familiarity of the surgeon with a treatment modality and the required equipment is relevant; studies on technically demanding operations (Elastic Nailing) report that up to 75% of all complications occur due to surgical inexperience.

Conclusion

Surgical management of fractures of femur in children and adolescents by flexible intramedullary nailing is simple, effective, provides early mobilization of the patients and rapid union. Functional results are excellent and complications are minimal. This procedure can be safely considered in the management of Diaphyseal fractures of femur in children and adolescents aged 5 to 16 years.

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