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Profile of Diaphyseal Fractures of Femur in Children and Adolescents at a Tertiary Care Hospital

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A B S T R A C T

The incidence of pediatric femur fractures is 19 in 100,000 patients and is more common in boys than girls. 1-4 Femur fractures account for 1.4% to 1.7 % of all pediatric fractures. This prospective study is based on consecutive 20 cases of fracture shaft of femur who were treated in Department of Orthopedic surgery, Basaveshwara Medical college, Chitradurga between 1st October 2012 to 31st September 2013. Maximum number of cases was observed in group I (6-9 years). Mean age is 9 years. Male outnumbered female. There are total 5 number of patient were having associated injuries. Most common mode of injury was RTA (40%).

Introduction

Children's bone changes from primarily weak woven bone to stronger lamellar bone through remodeling during childhood. Strength also is increased by a change in geometry. The increasing diameter and area of bone result in a markedly increased area moment of inertia, leading to marked increase in strength. This progressive increase in bone strength helps explain the bimodal distribution of femoral fractures. In early childhood, the femur is relatively weak and breaks under load conditions reached in normal play. In adolescence, high-velocity trauma is required to reach the stresses

necessary for fracture. Moreover, in children the bone elasticity is more than the adult, thick periosteum, less powerful muscles, better remodeling and healing which influences the treatment choice

Femoral shaft fractures, typically caused by blunt trauma, are the most common major pediatric injuries treated by the orthopedic surgeon. Seventy percent of femoral fractures involve the shaft (Flynn and Schwend, 2004). Femoral shaft fractures reportedly occur at a rate of approximately 20/ 100,000 children in the USA (Hinton *et*

al., 1999), representing 1.6% of all fractures in the pediatric population. Insofar as no operative technique had yielded consistently better results than casting, nonsurgical treatment continues to be the preferred and most cost-effective form of management for the preschool-age child with an isolated femoral fracture. The accepted methods are a Pavlik harness and/or splints for newborns or young infants and an immediate or early spica cast for older infants, toddlers, and young children (Blasier *et al.*, 1999).

The incidence of pediatric femur fractures is 19 in 100,000 patients and is more common in boys than girls (Hinton *et al.*, 1999; Rewers *et al.*, 2005; Sahlin, 1990; McCartney *et al.*, 1994). Femur fractures account for 1.4% to 1.7 % of all pediatric fractures (Hinton *et al.*, 1999). In the 1990s it was reported as the leading cause for hospital stay (days/yr) longer than 5 days for pediatric patients (Henderson *et al.*, 1993). Etiology of injury includes falls, motor vehicle related, sports injuries and abuse. Abuse has been reported as the leading cause of femur fractures in children less than 1 year old and of significant concern in those up to 5 years old (Hinton *et al.*, 1999; Rewers *et al.*, 2005; Femoral Shaft Fractures Guideline Team, 2006). Low socioeconomic status has been shown to be a risk factor for abuse related femur fractures, as well (Rewers *et al.*, 2005).

Materials and Methods

This prospective study is based on consecutive 20 cases of fracture shaft of femur who were treated in Department of Orthopedic surgery, Basaveshwara Medical college, Chitradurga between 1st October 2012 and 31st September 2013. All patients were in the age range of 6–16 yrs. Minimum follow up was 3 months.

Criteria of inclusion

1. Only those who give consent for operation and willingness for follow-up will be considered for the study
2. Age group 6–16yrs
3. Transverse, short oblique, spiral, long oblique, minimally comminuted diaphyseal fracture of femur.
4. Fresh (<21 days) fractures.
5. Closed and Type I open fracture

Criteria of exclusion

1. Patients who do not give consent or not willing to visit OPD for follow up.
2. Inability to take part in post operative rehabilitation
3. Definite major illness like malignancy, chronic liver or renal disease, heart failure etc.
4. Type II and III open fracture
5. Metaphyseal fractures
6. Pathological fracture
7. Multifragmentary fractures

Initial work-up

All patients admitted were evaluated and treated for life and limb threatening injuries, splinted in the interim with Thomas splint. Fractures with severe displacement were put on skin traction.

Adequate analgesic was given and splinted limb was kept elevated and distal neurovascular status was monitored clinically at frequent interval. Patient with multiple injuries including head injuries were managed in collaboration with specialized departments. Various demographic, clinical investigation and operative findings were recorded as per the Proforma and the results were evaluated according to Flynn scoring system of TENS

Results and Discussion

Maximum number of cases was observed in group I (6–9 years). Mean age is 9 years. Male outnumbered female. Right and Left are equally involved.

In our patient RTA was the commonest mode of injury, others include 1 child who is having injury due to child abuse

Maximum number, 9 cases were transverse type, 6 types were comminuted, 3 were oblique and 2 were spiral.

There are total 5 number of patient were having associated injuries, of which 4 were of head injury and 1 with facio-maxillary injury. No patient with Thoracic, cardiac or abdominal injury was encountered in our study.

Table.1 Age incidence

Group	Age	Cases no.	Percentage
I	6-9	12	60%
II	10-12	5	25%
III	13-16	3	15%
	Total	20	100%

Table.2 Mode of injury

Mode of Injury	Cases no.
RTA	8
Fall	7
Sports activities	4
Others	1
Total	20

Table.3 According to radiological type

Types	Cases no.	Percentage
Transverse	9	45%
Oblique	3	15%
Spiral	2	10%
Comminuted	6	30%
Total	20	100%

Table.4 Associated injuries

Injuries	No. of cases	Percentage
Head Injury (I)	4	20%
Facio- maxillary Injury (II)	1	5%
Total	5	25%

Table.5 Mode of injury

Study (year)	Total no of cases	Transverse	Oblique	Spiral	Commu nited	Segmen tal
Ligier <i>et al.</i> (1988)	123	63	22	18	--	4
Heinrich <i>et al.</i> (1994)	78	35	14	5	24	--
Heybeli <i>et al.</i> (2004)	35	15	11	6	3	--
Narayanan Unni <i>et al.</i> (2004)	79	44	25	10	--	1
Present study	20	09	3	2	6	--

Table.6 Radiological type of the fracture

Study (year)	Total no of cases	RTA	Sports injury	Fall	Others
Heinrich <i>et al.</i> (1994)	78	51	7	2	---
Narayanan Unni <i>et al.</i> (2004)	79	50	12	4	---
Heybeli <i>et al.</i> (2004)	35	28	6	---	---
Present Study	20	08	4	7	1

Because of rapid healing and remodeling potential conservative treatment is considered as treatment of choice before 6 years of age. Buckley (1997) stated that immediate spica cast was primary method of treatment before 6 years of age.

Flynn *et al.* (2002) recommended the application of spica cast in femoral shaft fracture below 6 years of age. Metaizeau *et al.* (2004) stated that stable elastic intramedullary nailing was not beneficial before 7 years of age. After skeletal maturation rigid intramedullary nailing fixation produces good clinical outcome though it should be avoided in children with open physis (Letts *et al.* 2002). In our series, all patients had open physis. The following chart shows a comparative study of incidence of side and the incidence of bilateral involvement observed by us with that of the other studies.

Incidence of right side involvement is equal to left side involvement in our study. We did not have any case with bilateral involvement. Moreover it is difficult to analyse and estimate the incidence of side with small number of cases within a short period.

Road traffic accident causes are more than the other injuries in our study as compared to other studies. Inadequate infrastructure, rise in the motor vehicle as well as improperly regulated traffic system contributes to a high number of accident victims. Outdoor contact sports activities are comparatively less in our region as compared to developed nations. So patients injured due to sports related activities are less in our study. 1 patient in others category is because of child abuse.

The numbers in our study is comparable to other studies. It appears that most of the fractures, stabilized with flexible

intramedullary nail were transverse. In contrast to rigid fixation, flexible nail does not provide sufficient stability in unstable fractures. Flynn *et al.* (2001) reported that most feasible fracture type was transverse in middle 60% of shaft.

Conclusion

Highest number of cases (12 patients 60 %) was seen in the age group of 6-9 years. An average age of the patients was 9 years. Male far outnumbered female with a male: female ratio of 1.85: 1. Right and left side was equally involved. Most common mode of injury was RTA (40%). All fractures were closed. Most common fracture type was transverse (9 cases, 45%).

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