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Is Urgent Treatment of Pediatric Neck Femur Always Needed?

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Abstract

Purpose: Pediatric hip fractures are very uncommon and the complications of these fractures are very serious. With this purpose in mind we evaluated retrospectively the treatment of pediatric femur neck fractures admitted during proceeding five years in our hospital. The Aim of study was to evaluate the outcome of our treatment and know preventable complications of pediatric neck fractures in comparison with literature.

Method: We evaluated 19 pediatric femur neck fractures with age from 3-12 years including 12 males 7 females. Treatment was by closed reduction and internal fixation at average of 4.5 days after hospital admission. Spica cast was applied for all patients up to age 10. Clinical and radiological evaluation was done by RATLIFF CRITERIA

Results: We enrolled 23 cases in study 4 lost to follow up and thus excluded from final study. We had 10 cases of Delbet type II, 7 cases type III and 2 cases of type IV. Patients were treated by closed reduction and internal fixation at average of 4.5 days after admission. Our results were 12 good, 3 fair and 4 poor. Complications encountered included avascular necrosis in 5 patients, 1 coxa vara, 2 cases of superficial infection and 1 septic sequel of sab acute septic arthritis.

Conclusion: Fluoroscopic aided reduction and internal fixation is a very good method of treatment for pediatric neck femur fractures. Emphasis should be on measures to reduce avascular necrosis and infection and give maximum smile to the children and their parents. In our under eloped and far-flung area complications are unavoidable but preventable once infrastructure and facilities of emergency and postoperative care are improved. Education regarding prevention of pediatric fractures in general and neck femur in particular and active participation of parents will help in minimizing complication of these fracture thus limiting diability and morbidity of these fractures.

Keywords: Pediatric neck femur fracture; Hip fracture in children; Pediatric femoral neck avascular necrosis

Introduction

Femur neck fractures are very rare in children as compared to adults, comprising only about 1% of all pediatric fractures [1-5]. Fracture neck femur in children usually results due to high energy trauma owing to thick and strong periosteum cover and the tough strong bone in children [6]. These fractures are associated with high rate of complications including avascular necrosis of head of femur, premature physeal closure, coxa vara/valga, nonunion and infections [7-9]. The anatomical and physiological factors usually counted responsible for these complications, it is the initial injury to hip and duration of fracture before fixation which seems significantly related to such grave complication. We present our experience of pediatric neck femur fractures in northern remote area of Indian with limited resources available for pediatric trauma and supportive critical care facilities [1,3,7-9]. Hospital for bone and joint surgeries is lone tertiary care orthopedic centre associated with Govt Medical College Srinagar, more than 6 km from the main medical college hospital. Due to lack of routine intensive care unit and pediatric consultant at our bone and joint hospital, all patients with polytrauma and associated medical/surgical emergencies at time of admission are managed by resuscitation and shifting these patients to main medical college hospital. We attribute this as the main cause of the delay in urgent and emergent treatment of pediatric neck femur fractures.

Materials and Methods

This was a retrospective study of 19 pediatric neck of femur fracture patients, treated in last 5 years (2010-2015) in our hospital with minimum follow up of one year duration (Table 1). All the pediatric neck femur fractures treated by surgical methods of reduction and or fixation after proper informed consent and explaining fully nature of injury and treatment modality to the parents/guardians were included in the study. All the patients were admitted, treated and under routine follow up in our hospital. Actually 23 patients were enrolled in study, four were lost or were unavailable at time of final follow up thus excluded from study. Records were checked for detailed admission notes and patient data including name, age, sex, side of involvement, mechanism of injury, type of fracture, operative note, type of injury, time of operation after injury (regarding date of admission and date of surgery) and complications thereafter. Fractures were classified as per Delbet classification system and evaluated as per RATLIFF criteria [10,11]. Good outcomes were rated as satisfactory, fair and poor were rated as unsatisfactory. Pre-operative radiographs were analyzed for

Good	Clinically, no or negligible pain, full or minimal restrictive hip movement, and normal activity or the avoidance of games. Normal or some deformity of The femoral neck in the radiograph.
Fair	Clinically, occasional pain, hip movement restriction less than 50%, and normal activity or the avoidance of games. Severe deformity of the femoral neck, mild avascular necrosis in the radiograph.
poor	Clinically, disabling pain, hip movement restriction more than 50%, and restricted activity. Severe avascular necrosis, degenerative arthritis, arthrodesis in the radiograph

Table 1: Ratliff system of clinical and radiographic assessment.

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fracture type and displacement whereas post-operative radiographs were analyzed for fracture healing and complications. AVN (avascular necrosis) of proximal femur was graded as per RATLIFF classification for AVN [1].

Each fracture was reduced in main operation theatres on routine working days. After reduction under general anesthesia fractures were internally fixed using at least 2 moors pins (12 cases) or 4 mm cannulated screws (6 cases) (Figure 1). There was no particular selection for implant as MOORS pin were supplied free from hospital and screws had to purchase by the parents outside the hospital. Internal fixation was done by lateral stab incisions for pinning or small incision for screws. One undisplaced type IV Delbert fracture was managed in hip spica only and showed no displacement subsequently.

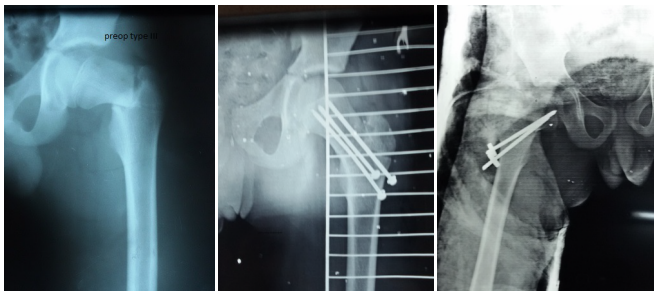

Figure 1: Preop type-iii fracture and post-operative x-ray.

S no.	Age	Sex	Type of fracture	Mechanism of trauma	Time of surgery after admission	Procedure performed	Complications
1	8	M	Type 2	FFH	3	CR and pinning	None
2	5	F	Type 3	RTA	5	CR and pinning	None
3	4	M	Type 2	FFH	1	CR and pinning	AVN
4	3	F	Type 2	RTA	6	CR and pinning	Pin site infection
5	8	F	Type3	FFH	2	CR and screws	Coxa vara
6	10	M	Type2	FFH	7	CR and pinning	Shortening 2 cm
7	6	M	Type2	FFH	1	CR and pinning	None
8	8	M	Type3	Building collapse	5	CR and screws	AVN
9	9	F	Type3	FFH	3	CR and pinning	lengthening 1.5 cm
10	11	M	Type2	RTA	2	CR and screws	AVN
11	12	M	Type3	FFH	4	CR and screws	Early physeal closure
12	3	M	Type4	FFH	5	CR and spica only	None
13	5	F	Type2	RTA	12	CR and pinning	None
14	10	F	Type2	FFH	6	CR and pinning	AVN
15	7	M	Type2	FFH	10	CR and pinning	None
16	6	M	Type2	FFH	7	CR and pinning	Pin site infection
17	8	M	Type3	FFH	5	CR and pinning	AVN
18	10	M	Type4	Gate falling	3	CR and screws	None
19	5	F	Type3	FFH	2	CR and screws	Sub-acute septic arthritis

Table 2: Fracture characteristics in patients.

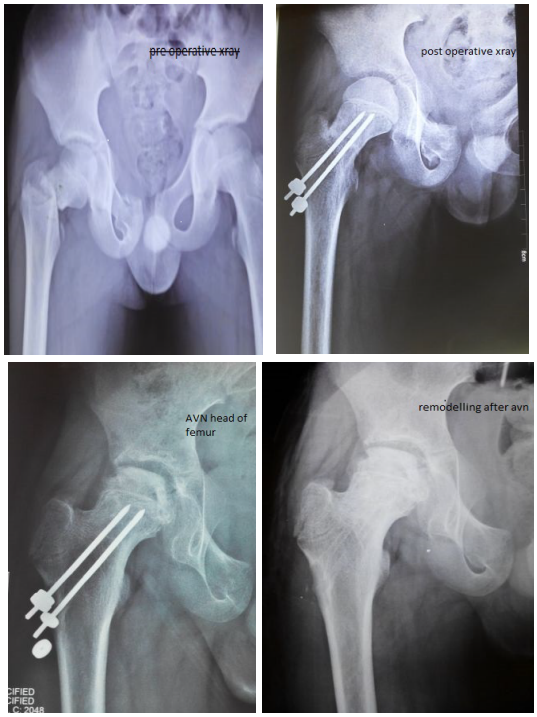

Figure 2: A Pre op x-ray, Post op x-ray, x-ray showing AVN and remodeling in post AVN state.

Children less than or equal to 10 years of age were initially protected by plaster of Paris hip spica for about 6 weeks, older children were put to bed rest for initial few weeks without application of hip spica. After 6 weeks spica cast was removed and mobilization started. Weight bearing was started after 12 weeks depending on radiographic satisfactory healing. Mean follow up was about 3.2 years and minimum follow up was one years.

Results

The mean age of patients was 7 years (3-12years) with left side (11 patients) involved more than right side (8 patients). thirteen patients had due to fall from height (fall from trees, windows and bridges), four patients were involved in road traffic accidents, one sustained trauma due to building collapse and another due to fall of heavy object (iron gate) on him. None of the fractures was treated in 1st 24 hours of trauma or admission to hospital and the interval of surgery ranged from 1 day to 12 days after admission to hospital. All patients were managed on usual routine theatre days with mean time of surgery 4.5 days after admission. There were 10 type II Delbet fractures, 7 type III Delbet fractures (Figure 1) and 2 type IV fractures.

Using RATLIF CRITERIA (Table 2) for final evaluation 12 patients had Good, 3 fair and 4 poor results. Total 5 (26%) patients had features of AVN (avascular necrosis) (Figure 2) out of which one improved later on during follow up and 4 remained symptomatic (Figure 3). Two cases of AVN had apparent shortening of more than 2.5 cm and patient developed over lengthening by 1.5 cm. In one female patient with AVN pain subsided after 2 years but owing to awkward gait, cosmetic concern in school, lengthening of ipsilateral leg was done

Figure 3: X-rays showing AVN with collapse of head.

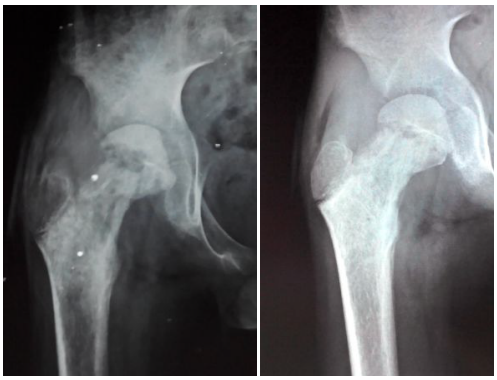

Figure 4: Septic AVN in NECK and head healed in spica.

to compensate for limb length discrepancy. One patient with AVN developed hinged abduction and apparent shortening of 3 cm, currently put on ischial weight bearing caliper to relieve pain and prevent further deformity. Two cases of superficial pin site infection were noted after removal of spica, which subsided with oral antibiotics. One case of pin fixation reported persistent pain and restricted hip movements, Moors pins were removed 6 months postoperatively, however pain continued and osteolysis appeared around femoral neck, which was attributed to subacute infection of hip. Fortunately the fracture had healed and we could remove pins. Culture sensitivity report after pin removal confirmed *staphylococcus aureus* intravenous antibiotics were given and patient was further protected by spica for about 3 months. Infection resolved and finally patient had fair result (Figure 4).

Discussion

Pediatric neck fractures are very rare, unlike adults and elderly result due to high energy trauma with impact on hips [12]. These fractures need special attention due to higher association of complications [1,13,14]. most of the cases were due to fall from height (13 cases, 68%) than road Traffic accidents (4 cases, 21%) as reported by other series [15]. we account this difference to the regional topography of our Kashmir valley where fruits tree attract young children who attempt their climbing skills in autumn and window peeping in snow covered winter resulting in substantial falls. 53% (10) fractures were Delbert type II while 37% (7) were type III fractures and 2 (10%) were type IV fracture. This data is in accordance with previous published series [13,14,16]. 5 cases (26%) of avascular necrosis featured in our study which is quite high compared to the newly reported data but is in accordance with the previously mentioned incidence of about 17%-47% cases [10,15-19]. we explain our higher rate of AVN to late overall intervention than the urgent and emergency treatment in current series in literature our mean time of surgery after admission was 4.5 days [20-22]. One reason for delay in surgical treatment is nature of injuries (high energy trauma and associated abdominal and head injuries) which necessitated optimization of patient to make fit for anesthesia and reluctance of anesthesia. Our hospital is lone tertiary care bone and joint surgery institute about 5 km from the main medical college hospital, lack of improved and routine ICU (intensive care unit) support at our orthopedic center and referral to other specialties (surgery and pediatrics) resulted in delay in surgical treatment. The risk of AVN depends on several factors which include age, degree of initial displacement, type of fracture, time to surgery, and method of fixation [13,23,24]. The most important factor is likely the severity of vascular compromise sustained at the time of trauma which may or may not change time of surgery after trauma [17]. It was not justifiable for early surgical intervention before proper optimization of patient for fear of AVN as the AVN in children behaves like perthes with ample scope for remodeling of head and reasonable functional outcome. Coxa vara developed in one patient in our serie. No patient presented with nonunion or delayed union, owing to internal fixation using moors pins or screws and added stability by hip spica for 6 weeks. One type IV fracture on x-ray and in fluoroscopy fracture was satisfactorily undisplaced primary hip spica had been given who showed no loss of resuction in subsequent follow up. Most cases of coxa vara, delayed union or nonunion in the series of Ratliff and Lam were treated without internal fixation [1,13]. Due to inherent nature of spica being open at top there is natural tendency of fracture to get displaced if treated without internal fixation, this can be also reason of high coxa vara and non-union in earlier series [17]. Superficial erythema and tenderness over skin overlying moors pin in 2 cases responded to oral antibiotics we presume it is related to hygiene in spica, usually poor in developing countries. This can be prevented by proper education and active participation by parents/guardians. One patient presented with painful range of motion of hip, pins were removal of pins sent for culture sensitivity confirming staphylococcal infection later serial x-rays showed osteolysis around neck of femur, intravenous antibiotics given for 6 weeks and protected by hip spica for 3 months was poor result on Ratliff criteria. In literature, the incidence of infection is 1% [15,16,25]. We presume due to infection the pins were painful, tender and irritating the child which necessitated early removal of pins, but till the time they were removed infection was already intra capsular. As fracture was initially stable and union had occurred infection resolved later after 6 weeks of intravenous antibiotic course. Proper education to parents regarding risk factors for fall, proper safety measures around roof tops, discouraging tree climbing in children, protection around windows will help in reducing pediatric fractures.

We conclude that proper reduction under fluoroscopic guidance and internal fixation is a good and reliable method of pediatric femur neck fixation. AVN the disastrous complication should be reduced to the minimum possible by urgent and emergent intervention. Overzealous emergent surgical reduction in an area with limited resources would endanger life of a child in race of AVN prevention. Post-operative complications can be reduced by appropriate surgical intervention in an optimized child and parent/guardian education regarding the nature and prognosis of fractures.

Children being source of smile to everyone's face should be given a smiling form of treatment to their hips which makes whole family smiling.

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