

## Outcome Of Paediatric Neck Of Femur Fractures Treated By Internal Fixation – A Retrospective Case Series

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### Abstract

**Background:** Neck of femur fracture in the paediatric population are rare injuries. Most commonly caused by high velocity injury or fall from height. There is high incidence of long term complications. The aim of this study was to evaluate radiological and functional outcome of paediatric neck of femur fractures treated by internal fixation.

**Materials & Methods:** This is a retrospective study done in Sree Balaji Medical College & Hospital, Chennai, India from May 2014 to May 2019. Total of 10 patients, 6 males and 4 females who sustained aged 2-12 years underwent internal fixation and completed a minimum of one year followup. Patients were divided according to Delbet classification. The final outcome was evaluated using Ratliff criteria.

**Results:** The mean age of the patients was 7.4 years(2-12). Average follow up was 2.1 years(1-4years). According to Delbet's classification there were 0 type I, 4 type II, 4 type III and 2 type IV fractures. Reduction was achieved by closed methods in 6 patients and open reduction was done in 4 patients. According to Ratliff's method 9 patients had satisfactory outcome (9 good) and 1 patient had poor outcome who developed AVN of femoral head.

**Conclusion:** Internal fixation of paediatric neck of femur fractures provides satisfactory and predictable outcomes following closed or open reduction irrespective of type implant used. Anatomic reduction and early intervention is the key to avoid long term complications.

**Keyword**— femur , fracture , internal fixation , paediatric.

### INTRODUCTION

Neck of femur fractures in the paediatric age group is relatively rare and has accounts of less than 1% of all fractures in children(1). The low incidence of these fractures are attributed to the thick periosteal cover in children according to Meyer(2). Most of these fractures are caused by high velocity injuries, but pathological fractures can also occur(3). Even though these fractures are rarely seen, the incidence of long term morbidity and risks of complications are very high due to presence of an open physis and precarious blood supply. Patients treated without internal fixation usually have high incidence of coxa vara, delayed union, and nonunion whereas osteonecrosis, premature physeal closure and limb length discrepancy can also occur and are more commonly seen with operative treatments. Any delay in fixing these fractures further increases the rates of complications. Hence the need for the proper primary management is absolutely necessary for a successful outcome(4-6). We share a series of 10 cases treated by internal fixation at our institute.

### METHODS

This was a retrospective study done from May 2014 to May 2019. Our study population included 10 displaced femoral neck fractures in 10 patients. 9 patients were taken up for surgery in <24 hours from the time of injury and 1 patient was brought to us after 3 days following injury.

The patient upon arrival to the hospital was evaluated from head to toe. Associated injuries were looked for and treated simultaneously and resuscitation done. Patients with severe head injury, polytrauma and hip dislocation were excluded in this study.

According to Delbet system popularized by Colonna, fractures were classified (7, 18).

After obtaining fitness for surgery, patients were taken up for surgery at the earliest. Closed reduction was attempted in all cases and failure of reduction was the indication for open reduction. The implants used for

fixation were based on the patient profile and the fracture pattern. Implants used were partially threaded cannulated cancellous screws and paediatric dynamic hip screw (DHS).

Ratliff System (16) of Clinical and Radiographic Assessment was used to assess the outcome at the end of the follow up.(Table 1)

**Table 1: Ratliff System of Clinical and Radiographic Assessment**

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.

## RESULTS

There were 6 male and 4 female patients (Table 2).The mean age of these patients was 7.4 years (2-12 years). Average follow-up was 2.1 years (1-4years). The mode of injury was road traffic accident in 7 patients and fall from height in 2 patients and sudden fall while playing in 1 patient. There was associated head injuries in 3 patients, clavicle fracture in 1 patient, distal radius fracture in 1 patient. All associated injuries were treated conservatively and did not affect the neck of femur fracture treatment.

According to Delbet classification system (FIG – 1), there 3 Type II, 4 Type III and 3 Type IV fractures in our study (Table 3). There was no transepiphyseal separation (Type I) case in our study. There were 6 cases of closed reduction and 4 cases of open reduction (Table 4).

According to Ratliff's method we had 9 satisfactory (good) outcomes and 1 unsatisfactory (poor) outcome. The patient who was brought for treatment after 3 days underwent open reduction and internal fixation with Paediatric DHS for type II fracture developed avascular necrosis of femoral head and subsequent shortening of limb. There were no cases of nonunion, coxa vara or failure of reduction.

**Table 2: Sex**

Gender	No. of patients	Percentage
Male	6	60.00%
Female	4	40.00%

**Table 3: Delbet Classification**

Types	No. of patients	Percentage
Type I	0	0
Type II	3	30.00%
Type III	4	40.00%
Type IV	3	30.00%

**Table 4: Management based on Delbet Classification**

Age of patient	Type of fracture	Type of reduction	Implant used	Complication
2	Type III	Closed	Cancellous screws	NIL
4	Type II	Closed	Cancellous screws	NIL
5	Type III	Open	Cancellous screws	NIL
11	Type III	Closed	Paediatric DHS	NIL
6	Type III	Open	Cancellous screws	NIL
12	Type IV	Closed	Paediatric DHS	NIL
5	Type IV	Closed	Cancellous screws	NIL
12	Type II	Open	Paediatric DHS	Osteonecrosis
11	Type IV	Open	Paediatric DHS	NIL
6	Type II	Closed	Cancellous screws	NIL

CASE1:



**Fig 1** Preop image showing type IV fracture



**Fig 2** Immediate Post op



**Fig 3** 1.5 years postop

healed fracture and no evidence of AVN

**CASE 2**



**Fig 4** PreOp showing Type III fracture



**Fig 5** Immediate Postop



**Fig 6 and 8** - 2 years and 7 months follow up showing healed fracture with no evidence of complications



**DISCUSSION**

High energy trauma is usually the cause of paediatric femoral neck fractures as the bone is hard and dense as compared to adults (8). Road traffic accident and fall from height are the leading cause of these fractures as reported in major series (6,16). Our study had 7 patients with RTA and 2 patients with fall from height matching the incidence as per literature (Fig 2-8).

Bali (6) reported 61% patients in their series to have associated injuries with head injury being the commonest (13 out of 36 patients). Even in our small series we found 50% patients had associated injuries with head injury being the commonest (3 out of 10 patients).

As per literature, most large series report Delbet type II being the commonest followed by type III & IV (3,9). Our study had 3 typ II, 4 type III and 3 type IV fractures. Type I fractures are very rarely reported and we did not encounter the same.

Conservative treatment in the form of hip spica cast or skin traction are the methods used to treat undisplaced fractures but subsequent loss of reduction or displacement is noted in most cases(6).

Early and aggressive treatment is recommended in literature to avoid complications associated with this fracture (10-13). Delayed treatment, especially noted in developing countries, has been suggested as a significant factor for setting in of osteonecrosis (14).

In our series, 9 patients presented early and were operated upon within 24 hours from the time of injury. One patient had been taken for native splinting immediately following injury and presented to the hospital after 3 days and underwent surgery.

Osteonecrosis of the femoral head, reported in 17% to 47 % cases, is the most common complication following neck of femur fracture and is caused by disruption of blood supply due to the injury(3,15,16).

Studies by Bali et al. (6) and Song et al. (17) reported decreased incidence of osteonecrosis following open reduction and internal fixation and postulated as the reason being the release of intracapsular pressure by capsulotomy. In our study we had 6 cases of closed reduction and 4 cases requiring open reduction. We had one (10%) case, who presented 3 days after injury and also required open reduction, developed osteonecrosis of femoral head and had poor outcome.

Coxa vara as reported by Lam et al. (15) and Bali et al. (6) leads to unsatisfactory results. Nonunion was caused mainly because of inadequate reduction and in displaced fractures(3). In our study we did not have patients who developed coxa vara or nonunion.

Limitation of this study is low number of cases in this series.

## CONCLUSION

Internal fixation of paediatric neck of femur fractures provides satisfactory and predictable outcomes following closed or open reduction irrespective of type implant used. Anatomic reduction and early intervention is the key to avoid long term complications. Although this case series has very limited number of patients, our study showed that early and aggressive operative treatment including the use of open reduction leads to satisfactory outcomes in the treatment of these fractures.

Conflict of interest – NIL

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