

Traumatic simultaneous bilateral femoral neck fracture in a child: A case report

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Abstract

Background: Traumatic bilateral fracture of femoral necks in healthy children is a rare occurrence. A delay in surgery can impair anatomic closed reduction of a femoral neck fracture.

Case presentation: The authors report a rare case of a traumatic bilateral fracture of the femoral neck in a 9-year-old schoolgirl. This case was an unusual association of a transcervical fracture and an intertrochanteric fracture. This is the first known case of these two fracture types described in the same patient. Primary skin traction and a late closed surgical management gave a good result, although if possible early surgery is advised.

Conclusion: The main mechanism of injury in this case is a two-step trauma. In this case, a delay to surgery by closed reduction and internal fixation by percutaneous screw fixation led to an acceptable outcome.

Key words: traumatic, child, femoral neck fracture, bilateral bone screws

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Introduction

A traumatic fracture of the femoral neck in children is a rare occurrence, comprising less than 1% of all paediatric fractures.¹ Bilateral fractures are even rarer, with only ten cases reported in the literature.²⁻¹⁰ Usually, a high energy trauma is involved, such as a fall from a height and motor vehicle accident.^{1,4,6,8,11}

We report the case of a 9-year-old schoolgirl who presented with traumatic bilateral fractures of the femoral neck after a fall from a height. Primary skin traction and secondary closed reduction with percutaneous cannulated screws

fixation (PCSF) was performed. The girl recovered completely in seven months. Anatomical characteristics, mechanism of injury and late surgical management are discussed.

Case presentation

A 9-year-old schoolgirl with no history of hip disease presented to our Emergency Unit with closed trauma of both her hips. When playing with schoolmates, she slipped and fell off a 17 foot-high bridge. First, her right limb struck an edge of the bridge and then she fell down on her left hip.

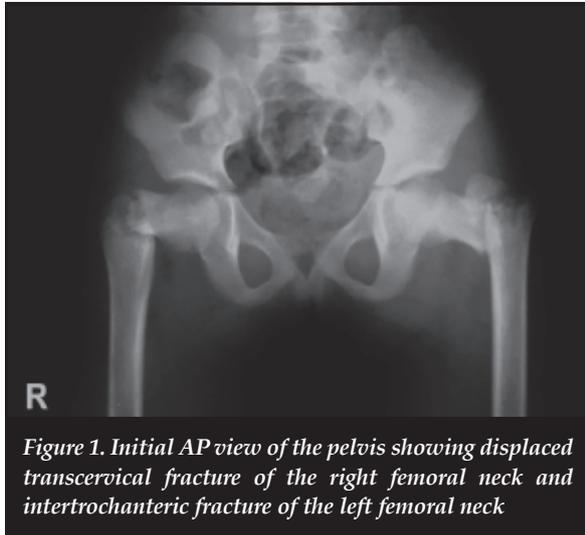


Figure 1. Initial AP view of the pelvis showing displaced transcervical fracture of the right femoral neck and intertrochanteric fracture of the left femoral neck

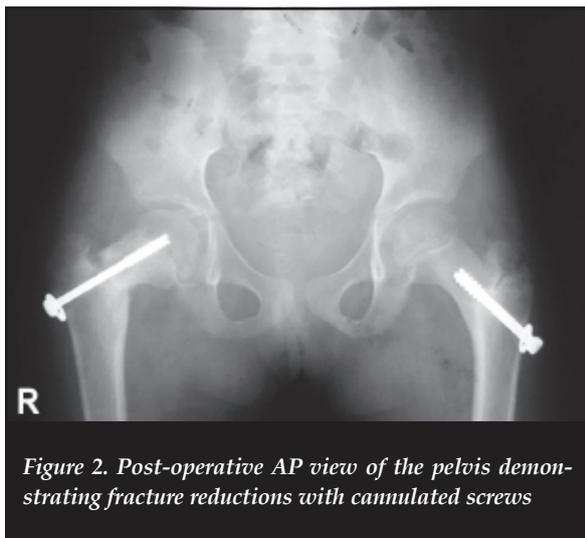


Figure 2. Post-operative AP view of the pelvis demonstrating fracture reductions with cannulated screws

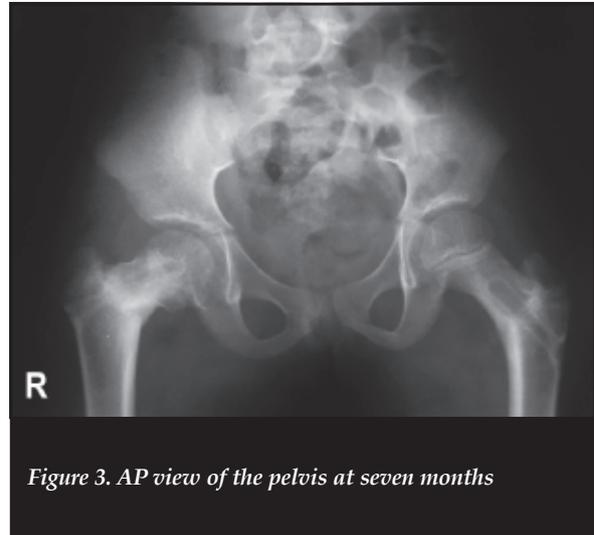


Figure 3. AP view of the pelvis at seven months

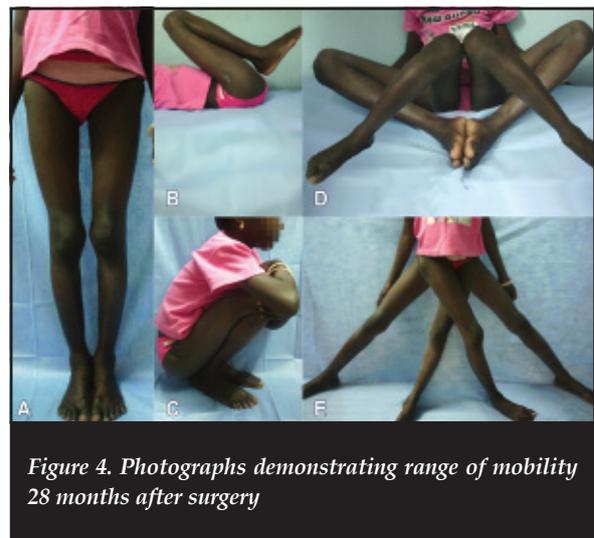


Figure 4. Photographs demonstrating range of mobility 28 months after surgery

On admission, the patient laid in supination with the two lower limbs externally rotated. She complained of severe pain in the groin area and could not move her hips. Distally, the neurovascular status was normal. The AP pelvic radiograph showed a displaced transcervical fracture of the right femoral neck and an intertrochanteric fracture of the left femoral neck, classified as Delbet type III and IV respectively (Figure 1).

Skin traction was first applied. On the seventeenth day, under general anaesthesia, closed reduction was performed by traction and internal rotation. Fluoroscopic-guided percutaneous partially threaded cannulated screws with washers were used as internal fixation. A double plaster spica was applied immediately after surgery. The reduction was perfect on the left side with a measured cervicodiaphyseal angle (CDA) of 130 degrees. On the right side, the reduction was acceptable with a CDA of 128 degrees (Figure 2). The delay was due to our hospital's lack of materials, and the screws were the best

we had available at the time of surgery. The post-operative period was uneventful. No post-operative rehabilitation was performed. The surgical wounds were healed in ten days, the spica was removed after a month and partial weight-bearing with crutches was allowed after seven weeks. Ten weeks after surgery, the hips were pain-free and she was able to walk without crutches. Follow-up pelvic radiographs showed signs of union at seven weeks, consolidation at seven months and signs of bone remodelling at 14 months. Screws were removed at seven months. There was no radiographic sign of femoral head necrosis or osteoarthritis but a shortened femoral neck and overgrowth of the greater trochanter was present on the left side (Figure 3). At 28 months, there was no lower limb shortening and the range of motion of both hip joints was: 120° for flexion, 15° for extension, 60° for abduction, 45° for adduction, 45° for external rotation and 30° for internal rotation (Figure 4). Finally the patient returned in school.

Table 1: Literature review of paediatric cases of bilateral fracture of femoral neck^{2-7,9-11}

	Upadhyay ⁶		Gilban <i>et al.</i> ⁷	Togrul <i>et al.</i> ⁸	Kumar ⁹	Saeed & Jalili ²	Mazurek <i>et al.</i> ¹⁰	Gopinathan ⁵	Dhar ³	Sane <i>et al.</i> ⁴	Current case
	Case 1	Case 2									
Age	11	8	5.5	6	8	4	5	10	9	9	9
Sex	M	F	F	M	F	M	M	M	F	F	F
Diagnosis delay	10w	.	4d	.	.	.	.	.	.	.	.
Trauma											
Aetiology	FFH (roof)	FFH	MVA	FFH	FFH (tree)	Cement block	MVA	FFH	MVA	FFH (tree)	FFH (bridge)
Mechanism of injury	Indirect (2 injuries)	Indirect (2 injuries)	?	?	Indirect (2 injuries)	Direct (1 injury)	Indirect (axial load)	?	?	Indirect (2 injuries)	Indirect (2 injuries)
Fractures (Delbet type)											
Right hip	?	II	III	III	III	II	III	III	II	III	III
Left hip	?	II	III	III	III	I	III	II	III	II	IV
Associated lesions											
Hypovolaemic shock	no	yes	no	no	no	no	no	nn	no	no	no
Brain concussion	yes	no	no	no	no	no	no	no	no	no	no
Intracerebral haemorrhage	no	no	no	no	no	no	no	no	yes	no	no
Fractures	no	Pelvic	Tibia	.	no	Pelvic	Distal radius	no	Tibia, Pelvic	no	no
Traction	1w	no	no	.	10d	no	.	.	.	2d	17d
Period of surgery	11w	1d	4d	.	10d	12h	3d	2d	hours	2d	17d
Treatment											
CRIF	screws	screws	screws + plates	dhs	no	pins	no	screws	screws	screws	screws
ORIF	no	no	no	no	screws	no	plate plates	no	no	no	no
Supplementary Immobilisation											
No	yes	yes	.	.	.	.	.	.	.	.	.
Spica	.	.	16w	.	.	8w	8w	6w	9w	6w	4w
Traction	.	.	.	.	3w	.	.	.	.	.	.
Time of weight-bearing	18w	12w	16w	.	.	.	.	12w (R side)	.	12w	10w
Consolidation	18w	12w	16w	.	14w	.	.	52w	20w	20w	28w
Follow-up											
Time	20m	30m	16m	9m	30m	24m	17y	18m	24m	5m	28m
Complications	no	no	AVN, Varus (L)	no	no	no	valgus (R<L), hypertrophic GT (R)	no	no	no	AVN
Outcome											
Good	yes	yes	no	yes	yes	yes	.	yes	yes	yes	yes
Shortened lower limb	.	.	.	.	.	.	yes	.	.	no	no
Poor	no	no	yes	no	no	no	no	no	no	no	no

M: Male, F: Female, hr: Hours, d: Days, w: Weeks, m: Months, y: Years, R: Right L: Left FFH: Fall from height, MVA: Motor vehicle accident CRIF: Closed reduction and internal fixation, ORIF: Open reduction and internal fixation, DHS: Dynamic hip screw GT: Greater trochanter

Discussion

A traumatic bilateral fracture of the femoral neck in children is an unusual injury. All previous cases described in the literature were due to high energy trauma as a result of a motor vehicle accident or fall from a height (Table I).²⁻¹⁰ In polytrauma cases, it is important to check the hips to avoid a delayed diagnosis.⁶ The average age at time of trauma was seven years (range 4–11) and the male to female ratio was 1:1.2.

Anatomical characteristics

Cervicotrochanteric and transcervical fractures are more frequently reported in the cases published in the literature^{2-7,9-11} (Table I). Saied *et al.*² reported one case of associated transepiphyseal fracture (Delbet type I). No such case of associated intertrochanteric fracture was previously reported with another contralateral proximal femur fracture.

Mechanism of injury

A traumatic fracture occurs as a result of a particular position of the limb, and a precise point of impact to produce the injury. In reported cases of traumatic bilateral fracture of femoral neck, three main kinds of mechanisms were hypothesised: a direct 'one-injury fracture',² an indirect 'two-injury fracture',^{4,6,9} and an indirect axial load fracture.¹⁰

- In the one-injury fractures, the mechanism is a lateral compression (LC) on a fixed pelvis. This mechanism seems similar to the LC type of the Young-Burgess System Classification.¹²
- In the two-injury fractures or 'abduction-adduction fractures', the first indirect impact occurs on the medial side of the thigh with the leg forced in abduction and external rotation, and the second direct impact occurs on the hip lateral side with the leg in adduction and internal rotation.
- In the axial load fractures, the force is transmitted from feet to flexed hips, through extended knees.

We are of the opinion that the mechanism in our case was that of a two-injury fracture type.

Injury management

The management of displaced femoral neck fractures is surgical by reduction and internal fixation.¹⁷ The closed reduction with PCSF followed by a spica plaster for seven weeks (4–16) gave best results in bilateral femoral neck fractures.^{3,4,6,7} According to Dhār,³ early surgery was necessary for a good outcome. Good results, however, were also observed with delayed surgery from two to 77 days with or without skin traction mainly by open reduction^{5,6,9,10} (Table I). Our 17-day delay explains the non-anatomic reduction at the right hip. We think that primary skin traction is important for pain management.

Many authors used a hip spica cast as complementary immobilisation.^{2,5,7,10} It secures the internal fixation for eight weeks on average (range 4–16) without any secondary hip stiffness. The weight bearing time is linked to radiographic signs of bone union. Full weight bearing is allowed at around 12 weeks.^{4,6} The mean time of bone consolidation was 24 weeks in the literature described (range 12–52) (Table I).

Reported complications of surgical management are avascular necrosis of the femoral head, osteoarthritis, premature closure of the proximal femoral epiphysis, varus or valgus deformity,^{7,10} shortening of the femoral neck and overgrowth of the greater trochanter.¹⁰ A non-perfect reduction of a transcervical fracture (Delbet type III) may lead to shortening of the femoral neck and overgrowth of the greater trochanter. The current case shows AVN and coxa vara on the right side with no complications on the left side. According to Togrul *et al.*,⁸ AVN is more frequent in bilateral hip fractures. The literature review found only one other case of AVN and varus deformity on a Delbet type III fracture⁷ (Table I). We think that a longer follow-up time and the use of MRI would be useful to evaluate the true rate of AVN. A non-perfect anatomic reduction of a Delbet type III fracture led to an earlier physeal closure with overgrowth of the greater trochanter and varus/valgus deformity.^{7,10}

Conclusion

The authors reported a first case of bilateral hip fracture in a child with a Delbet III and a Delbet type IV fracture. The mechanism of injury of the current case confirms the two-injury theory. A significant delay to surgery did not result in an adverse clinical result. However, a better outcome is observed with an earlier and perfectly closed reduction and a PCSF.

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Compliance with Ethics Guidelines

Informed consent: The patient and her parents were informed that data concerning the case would be submitted for publication. They agreed to this. They granted permission to use photographs. Patient confidentiality will be protected according to the US Health Insurance Portability and Accountability Act (HIPAA).

Competing interests: PWH Dakouré, M Diallo, AM Puente, S Ouédraogo and M Soulama declare that they have no competing interests.

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