

Case Report

The bilateral symmetrical neck of femur fracture in a child following trauma, successfully treated with surgical fixation

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Abstract

Neck of femur fracture in a child caused by trauma is rare and needs appropriate management to avoid complications. We present an 8-year-old child with a bilateral symmetrical Delbet type III neck of femur fracture following a fall from height.

Clinical assessment revealed an isolated bilateral neck of femur injury. Radiographs reveal bilateral symmetrical intracapsular neck of femur fracture which is Delbet type III. During initial medical management, adequate analgesics were given and traction was applied to the limbs. Surgical fixation of each hip was done in the next planned trauma list by the senior paediatric orthopaedic surgeon. A partially threatened cancellous cannulated screw and smooth K wires were used under the guidance of the image intensifier. The patient was followed in the clinic until the radiological evidence of healing and he regained the range of motion of the hip. He is still under follow-up for the late onset of complications.

A bilateral symmetrical intracapsular neck of femur fracture is rare. Awareness of this entity, early detection, and intervention in this condition may help preserve the native hip.

Keywords

The neck of femur fracture, paediatrics, Delbet classification, avascular necrosis of the femoral head.

Introduction

The neck of femur fracture is a rare injury in children, unlike adults. It comprises less than 1% of all fractures among children. A bilateral symmetrical-type neck femur fracture is even rarer (1). Many cadaveric models demonstrated that a neck of femur fracture in the paediatric population involves about 900 to 2000 pounds of weight-force transmission. In contrast, in

older adults, it is an osteoporotic fracture. (2). Unlike in adults, the neck of the femur blood supply is severely compromised by the neck of the femur fracture. The difficult complications to manage following neck femur fracture in paediatric populations are avascular necrosis of the femoral head and non-union. So early and appropriate intervention is needed to produce a successful outcome (3). We present our experience in managing a bilateral symmetrical Delbet type 3 fracture neck of the femur with cancellous screw fixation.

Case History

An 8-year-old boy was admitted to the surgical casualty ward following a fall from eight feet height and landed on his feet. He was complaining of bilateral hip pain and was unable to move the limbs on both sides in the accident and emergency department. The primary and secondary surveys were normal, and he had no neurovascular deficit in both lower limbs. Radiographs of the pelvis with proximal hip anterior-posterior view showed symmetrical bilateral Delbet type III cervicotrochanteric fractures in both hips. Both lower limbs were splinted, and adequate analgesics were given to alleviate the pain.



Figure 1: Anterior posterior view of pelvic radiograph including both hips shows bilateral symmetrical cervicotrochanteric (Delbet III) fracture.

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Figure 2 shows an anterior posterior view of Pelvis with both hips shows evidence of healing without complication.



Figure 3 shows an anterior posterior view of Pelvis with both hips after removal of K Wires



Figure 4 shows a range of motion of both hip

A closed reduction and percutaneous fixation of both neck of femur was planned on the next available list. Surgeries were performed by a senior consultant orthopaedic surgeon under general anaesthesia. Both fractures were reduced on the traction table with the fluoroscopic guidance and fixed with a cannulated cancellous screw and a smooth k wire.

Non-weight-bearing physiotherapy followed for the initial first six weeks of the postoperative period, and then protective weight-bearing gradually started. He was followed in the clinic regularly and fracture healing was assessed with radiographs. After one 1 year and 3 months, he was pain-free with a full range of movements achieved on both hips and his k wire was also removed.

Discussion.

The neck of femur fractures is an unusual injury among paediatric fractures, accounting for less than 1% of all paediatric fractures(1). The bilateral symmetrical neck of femur fracture in the paediatric population is reported rarely in the literature. Motor traffic accidents and falls from height are the main mechanisms of injury(3). Low-energy mechanisms are common in underlying bony pathology in children(3). The upper part of the femur consists of a strong medial calcar plate, which contains a complex mesh of traction and compression trabeculae. 85% of high-energy mechanism injuries are associated with other injuries e.g.: pelvic injury, and head injury.

The majority of the blood supply to the head of the femur in the paediatric population is derived from the posterior superior and posterior inferior branches of the medial circumflex artery, which travel along the retinacular fibres of the capsule (4). The lateral circumflex artery supplies the medial part of the physis, medial metaphysis, and greater trochanter(4). In addition to the medial circumflex and lateral circumflex artery, the head of the femur also acquires blood supply through the ligamentum teres which is a major blood supply in childhood(4). Blood supply from the Lateral circumflex artery and ligamentum teres begin to regress after the age of 4 until 10 years (3). The neck of femur fractures during this age are more vulnerable to avascular necrosis of the head of the femur due to this blood vessel arrangement(5).

The Delbet classification is widely used for paediatric neck of femur fractures, which was introduced in 1907 and modified in 1929 by Colonna(6).

Table 1 shows the Delbert classification for the paediatric neck of femur fractures, with the incidence and the risk of avascular necrosis.

Table 1: Delbert Classification

Type	Description	Incidence	Risk of AVN
I	Transphyseal fracture A: without dislocation, B: with dislocation	<10%	40% (7)
II	Transcervical fracture	40-50%	27% (7)
III	Cervicotrochanteric fracture	25-35%	20% (7)
IV	Intertrochanteric fracture	6-15%	5% (7)

Initial radiographic assessment should include an anterior-posterior view of the pelvis with the affected hip and a lateral view of the affected hip to study the fracture anatomy. The plain radiographic assessment of the femur full length needs to be performed to exclude concomitant femur shaft fractures. Plain radiographic assessment will be helpful in the study of the fracture pattern, determining the classification, degree of displacement, and status of the physis which are important points in the management of paediatric neck of femur fractures(3). When there is a high degree of clinical suspicion with negative X-ray findings, MRI is the gold standard investigation to rule out this entity. T1 weighted MRI study is 100% sensitive in diagnosing occult neck of femur fracture in coronal plan images(8)we retrospectively reviewed the MRI scans of the 35 patients who had no evidence of a fracture on their plain radiographs. In eight of these patients MR scanning excluded a fracture but the remaining 27 patients had an abnormal scan: one with a fracture of the pubic ramus, and in the other 26 a T(1.

Age and type of fracture according to the Delbet classification are considered during the decision-making. Anatomical reduction of the fracture segment and stable fixation will help in reducing the risk of the premature arrest of growth in the growth plate and avascular necrosis of the femoral head and allow the patient early weight-bearing(9). Cannulated screw fixation, K wire fixation, and dynamic hip screw are

the available surgical optionsfor the stabilization of the fracture(4). A smooth K wire can be used to stabilize the fracture segment in Delbet type II and III fractures in less than 2 years. A cannulated screw can be used to treat this entity Delbet type I, II, and III fractures among 4–6 years of age. A dynamic hip screw can be used in Delbet type III and IV patients to stabilize the fracture segments(4).

The fracture should be tried to reduce closely with the guidance of fluoroscopy using traction, internal rotation, and abduction manoeuvres. If close reduction fails, the open reduction can be achieved by using a standard anterior (Smith Peterson) or anterior lateral (Watson Jones) approach(4). Early stabilization of the fracture with decompression of the capsule will reduce the incidence of complications. Although capsular decompression is a controversial topic, many surgeons prefer to do decompression.

The most common and difficult complication to manage following a neck of femur fracture in the paediatric population is avascular necrosis of the femoral head (10). It can be predicted using the Delbet classification. Patients should be followed up in the clinic for anterior thigh pain and reduced range of movement. They should be investigated with an anterior-posterior view of the pelvis with a frog lateral view radiologically to exclude the AVN of the femoral head during the follow-up (10). Early-stage AVN shows radiolucent patches within sclerotic epiphyseal margins known as patchwork appearance. An MRI study of the affected hip is the gold standard for diagnosing the condition. Early anatomical reduction of fracture with capsular decompression is considered a modifiable risk factor and older age, initial fracture displacement, and Delbert type are considered non-modifiable risk factors for AVN of the femoral head (10). Core decompression, free vascular fibular graft, proximal femoral osteotomy, total hip arthroplasty, and hip arthrodesis are the available treatment options for the avascular neck of the femoral head (10).

Informed consent

Informed written consent was obtained from the parent of the patient for the publication of the data and clinical images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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