

# Traumatic Hip Dislocation with Proximal Femoral Epiphyseal Fracture in 12-Year-Old Boy: A Case-Based Review

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## Learning Point of the Article:

The ideal treatment is based on anatomical reduction, stable fixation, and surgery as early as possible to prevent complication such as avascular necrosis and post-traumatic arthritis.

## Abstract

**Introduction:** Pediatric hip fractures comprised <1% of all pediatric fractures. These fractures are usually associated with high-energy trauma, such as motor vehicle accidents or fall from height. The Delbet classification of pediatric hip fractures is frequently used to describe these injuries and to relate the fracture type to the development of avascular necrosis. Treatment should be given as an emergency basis and monitored according to the type of fracture and the patient's age. Historically, casting was used for such fractures; however, due to the high complication rate, the treatment modality has shifted to early anatomical fixation.

**Case Report:** We present the case report with detailed history, examination, and treatment of a 12-year-old boy with an uncommon site of fracture at right transepiphyseal hip fracture with dislocation. Emergency initial operation was done and followed up for 2-year duration on regular basis. The patient has currently normal gait with painful terminally restricted movements.

**Conclusion:** Early recognition and operative management of pediatric hip fractures has improved outcomes.

**Keywords:** Fracture neck of femur, femoral epiphysal fracture, pediatric hip fracture, Ganz safe dislocation of hip, Delbet classification, hip spica application

## Introduction

Pediatric hip fractures are very rare and are usually caused by high-energy trauma, often combined with multiple injuries [1-4]. These fractures are frequently associated with additional extremity, visceral, and head injuries in approximately 30% of cases.

Proximal femur fractures in children occur at a rate of 1.2–2 cases per year, accounting for approximately 0.3–0.5% of all fractures in children [1-4]. The peak incidence is between the ages of 10 and 13 years (with a range from 1 day to 18 years), and the male-to-female ratio is approximately 1.3–1.7:1 [5, 6]. In pediatric hip fractures, there is significant concern due to the high rate of

complications and the potential for lifetime morbidity. Dysfunction and pain are the most frequently reported complications, affecting 20–50% of patients. These complications may result from osteonecrosis, coxa vara, proximal femoral physeal growth arrest, non-union, and growth abnormalities leading to limb length discrepancy or angular deformity [7].

## Classification of proximal femur fracture in pediatrics

Pediatric hip fractures are generally classified by the method of Delbet (Fig. 1) [8].

Type 1-transepiphyseal fracture

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## Author's Photo Gallery



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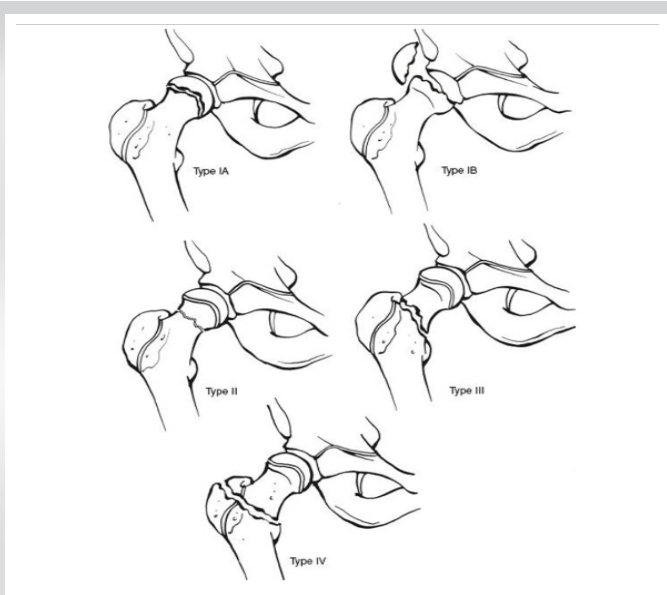
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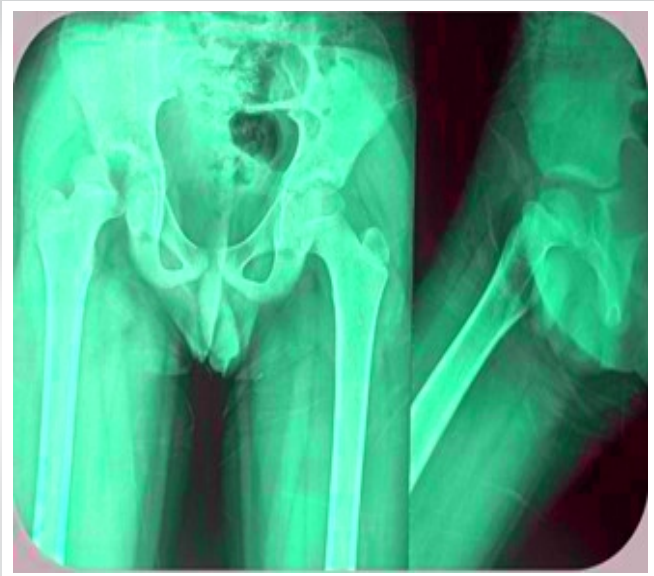
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**Figure 1:** Delbet classification of hip fractures in children.



**Figure 2:** AP and lateral radiograph showing X-ray right proximal femur fracture (Delbet type 1B).

1A-without dislocation

1B-with dislocation

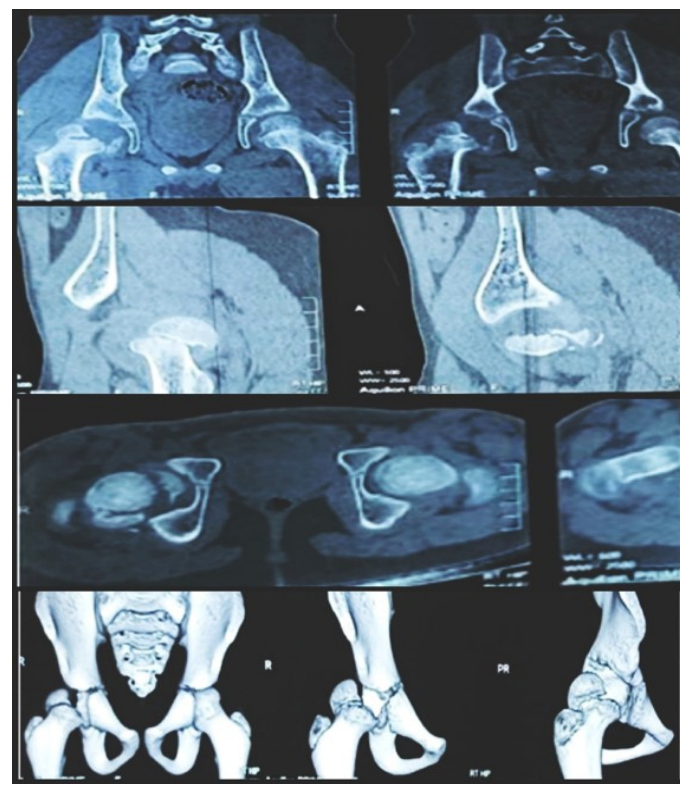
Type 2 – transcervical

Type 3 – cervicotrochanteric

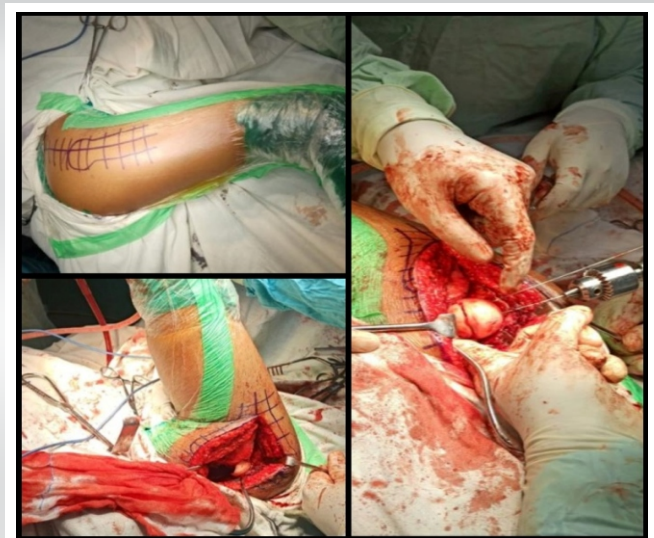
Type 4 – intertrochanteric

This fracture classification not only provides descriptive information but also has prognostic significance. Osteonecrosis occurs in 16–47% of cases. Type 1 and Type 2 fractures are more prone to osteonecrosis and growth arrest, whereas the latter two groups tend to have higher rates of varus malunion. The outcome for Type 1B fractures is inferior, with osteonecrosis and premature physal closure occurring in nearly 100% of patients.

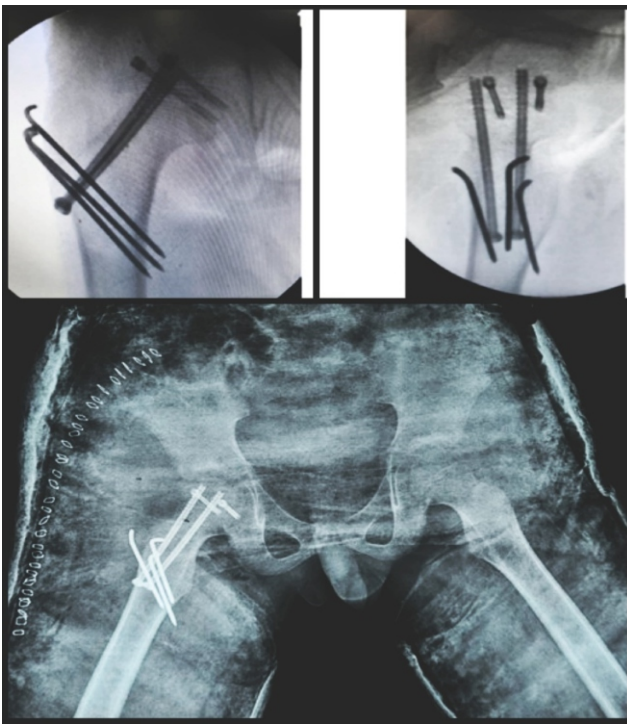
When a dislocation is not reduced within 6 hours, the risk of AVN increases dramatically due to compromised blood flow to



**Figure 3:** Computed tomography scan – right proximal femoral epiphyseal fracture with dislocation.



**Figure 4:** Positioning, exposure, and surgical hip dislocation of femur.



**Figure 5:** AP and lateral radiograph showing intraoperative C-arm and immediate post-operative with spica cast.

the affected area, especially in joints like the hip [9]. AVN can lead to the death of bone tissue, resulting in long-term issues such as stiffness, discomfort, and instability.

### Case Report

A 12-year-old male presented in emergency department after 3 days with a history of a motor vehicle accident, accompanied by pain in the right hip, inability to bear weight and wound over the right knee. The patient was initially taken to primary health care

center where multiple close reduction attempts were given. Later patient brought in our hospital for further management. There was no history of any previous chronic medical illness. Advanced Trauma Life Support (ATLS) protocols were followed.

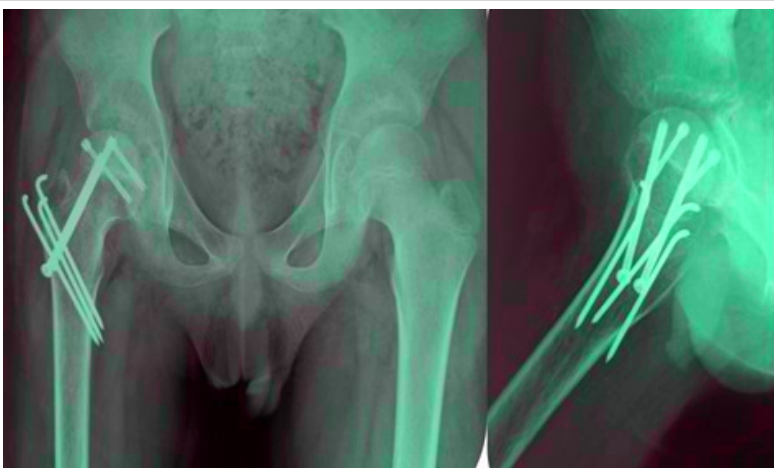
The patient was conscious, alert, and oriented to time, place, and person. A head-to-toe examination revealed a lacerated contaminated wound with measuring  $8 \times 3$  cm on the anterior aspect of the right knee. Local examination of the right hip showed swelling and tenderness over the joint line. The range of motion in the right hip was restricted and painful. Pelvic and bilateral hip X-rays confirmed a right proximal femur fracture with transepiphyseal dislocation (Delbet type 1B) (Fig. 2).

Emergency CT pelvis with bilateral hip was done (Fig. 3). After examining the X-rays and CT scan considering the fracture type and age, emergency surgical intervention was planned. Treatment options and complications were discussed with the family, written informed consent was taken.

The patient was taken to the operative room, under combined spinal epidural anesthesia with patient in left lateral position, under all aseptic precaution parts painted and draped.

A lateral incision was made, centered over the anterior and middle thirds of the greater trochanter. The fascia lata was incised along the skin incision, and the gluteus maximus was split. The vastus lateralis was retracted anteriorly, and the interval between the piriformis and gluteus medius was developed. The capsule was identified deep to the gluteus medius. A greater trochanteric osteotomy was performed and the trochanteric flip piece along with its muscular attachments was reflected anteriorly. The hip capsule was then opened with Z-shaped incision (Fig. 4).

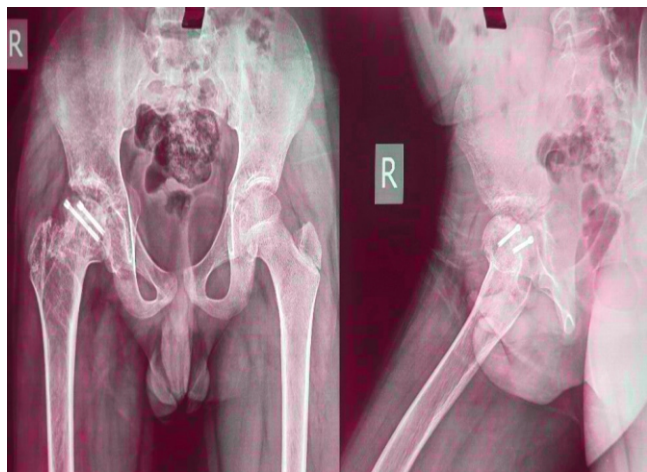
A safe surgical dislocation of the hip (Ganz dislocation) was achieved by flexing and externally rotating the hip followed by



**Figure 6:** AP and lateral radiograph showing post-operative 3 months follow-up.



**Figure 7:** Ap radiograph showing 1-year post-operative follow-up with hip arthritis.



**Figure 8:** Ap and lateral radiograph showing 2-year post-operative with hip arthritis.



**Figure 9:** Two-year post-operative with cross leg sitting and squatting.

cutting the ligamentum teres with curved scissors. The fracture epiphysis was temporarily fixed with a K-wire and then secured with two Herbert screws. The hip was reduced (Fig. 5).

Trochanteric osteotomy is fixed with 2 partially threaded cannulated cancellous screw and 3 k-wires, c-arm shoots were taken, sterile wash given, capsule repaired, and incision closed in layers. Sterile dressing was given and post-operative stabilization was given with hip spica casting.

### Post-operative management and follow-up

A post-operative X-ray was taken with the hip spica cast in place. The patient tolerated the procedure well and there were no complications such as deep vein thrombosis or wound dehiscence. The wound over the right knee was debrided and closed primarily. The patient's parents were instructed on the specifics of spica cast care and the patient was scheduled to be discharged after 5 days.

The patient was followed up at regular intervals to monitor for any early signs of avascular necrosis. He was closely monitored by the outpatient department and hip spica cast was removed at 2 months. K-wire and cc screw was removed at 3 months (Fig. 6). The patient showed positive initial improvement and followed a physical therapy plan that included mobilization using a wheelchair and gradual weight-bearing.

One year after the surgical fixation, the patient presented at the clinic with a normal gait, no active complaints and X-rays indicated complete healing with hip arthritis with signs of avascular necrosis (Fig. 7). After 2 year follow-up, the patient was doing cross leg sitting and squatting (Fig. 8 and 9).

### Discussion

Pediatric hip fractures are very rare and cause significant morbidity in adulthood if not fixed anatomically on acute basis.

Accidental fractures are a frequent occurrence in childhood and pose considerable risks to children's health. The likelihood of bone fractures increases as children grow older. However, the occurrence of multiple fractures in children is rare and usually associated with high-energy trauma.

As first described by Delbet, pediatric hip fractures can be classified into four types [7], which help determine whether operative or non-operative treatment is appropriate and predict the risk of avascular necrosis (AVN) of the femoral head. The present case involved Delbet's type 1b femur fracture. According to Delbet's classification, Types I and III are associated with a 15 times higher risk of AVN compared to other fracture types [7]. Even with the timely intervention of reduction and fixation of the femoral head, there is a high rate of associated osteonecrosis (0–92%).

Multiple injuries are consistently linked to high-energy trauma and this case included both a knee injury and a femur fracture. Due to the presence of incarcerated fracture fragments and soft-tissue interposition, closed reduction is difficult and potentially more damaging to the vascularity of the head. Non-surgical treatment with spica casting remains the initial method for all patients under the age of five [9]. However, children above this age threshold are increasingly undergoing surgical intervention. Surgical treatment has reduced the burden of care for families, shortened hospital stays, decreased early disability rates, and minimized disruption to families' lives [10,11]. Optimal outcomes are achieved through the urgent reduction of the femoral head, the use of safe surgical techniques to preserve vascularity, stable fracture fixation, and appropriate rehabilitation. Ideally, closed reduction should be attempted in an operation theater; however, if closed reduction failed open

reduction should be done. However, time between injury and reduction does not directly correlate with the risk of avascular necrosis. Urgent closed reduction following patient presentation is recommended for all patients.

### Conclusion

This report demonstrates that early surgical treatment with internal fixation followed by cast immobilization can significantly improve functional outcomes. However, the risk of avascular necrosis and post-traumatic arthritis are common

sequelae of these fractures and necessitate long-term follow-up to address these complications.

### Clinical Message

Outcomes of these fractures are best determined by urgent reduction of the femoral head, safe surgical techniques to preserve vascularity, stable fixation of fractures, and proper rehabilitation.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Conflict of interest:** Nil **Source of support:** None

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**Consent:** The authors confirm that informed consent was obtained from the patient for publication of this case report

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