

Imaging Features of Bilateral Slipped Upper Femoral Epiphysis in Sequential Presentation of Hip Pain: A Case Report

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ABSTRACT

Slipped Upper Femoral Epiphysis (SUFE) is the most common hip abnormality in adolescents, leading to significant morbidity if not properly treated. It is classified as a Salter-Harris type I injury, resulting from a fall that affects the physis of both hips and can cause unstable alignment between the epiphysis and metaphysis. They typically present with a decreased range of motion, hip discomfort and limping. Hereby, the author presents the case of 12-year-old adolescent female with a sequential history of hip pain one after the other after a fall one month back. On physical examination, full internal rotation was lacking and flexion and abduction ability were limited. X-ray and Magnetic Resonance Imaging (MRI) of both hip joints were taken, which revealed widened epiphysis of bilateral femurs with slippage of bilateral femoral epiphysis onto metaphysis, suggestive of bilateral SUFE. Later the patient underwent bilateral prophylactic in-situ fixation with screws to prevent further slippage and long-term complications.

CASE REPORT

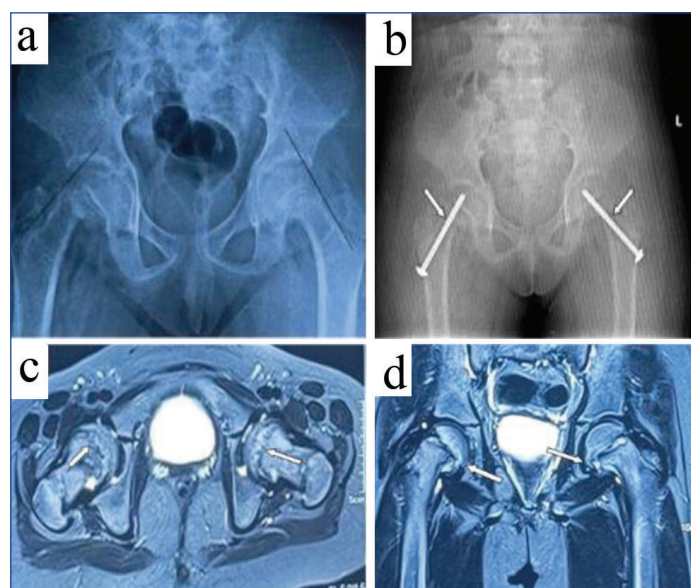
A 12-year-old female presented with a history of right hip pain after a fall, one month back, for this she visited a local hospital where she was prescribed pain medication and advised bed rest. After two weeks, she again fell, now she developed pain in her left hip. As the patient's symptoms were not relieved, she visited the hospital and consulted the Orthopaedic Department. Considering the age and clinical history they advised pelvic X-ray including both hip joints and MRI to detect the underlying cause. On X-ray, there is bilateral posteromedial slippage of the femoral epiphysis and on MRI there is bilateral physeal irregularity with the widening of the epiphysis and periphyseal oedema [Table/Fig-1a-d]. Imaging findings were suggestive of bilateral SUFE. The patient got admitted and underwent bilateral prophylactic in-situ fixation with screws [Table/Fig-1b] to prevent further slippage and long-term complications and advised follow-up. On follow-up visits, she was doing well with no complications.

DISCUSSION

The SUFE is the most common hip abnormality in adolescents, characterised by the anterior, lateral and superior displacement of metaphysis relative to epiphysis [1]. It is more common in adolescents during pubertal growth spurt. This condition may cause hip pain, limping and potentially long-term complications like avascular necrosis, early osteoarthritis and chondrolysis [1]. Appropriate clinical examination and imaging (pelvic X-ray with both hip joints in the AP and frog leg view and MRI) are the main approaches used to make SUFE diagnosis [2]. SUFE can be classified based on the degree of displacement of the epiphysis relative to the metaphysis [3]:

- Mild displacement:** The lateral edge of the epiphysis is situated within the lateral third of the metaphysis.
- Moderate displacement:** The lateral edge of the epiphysis lies between the lateral third and the midpoint of the metaphysis.
- Severe displacement:** The lateral edge of the epiphysis is located within the medial third, extending beyond the midpoint of the metaphysis.

Keywords: Avascular necrosis, Chondrolysis, Metaphysis, Valgus



[Table/Fig-1]: a) X-ray pelvic with both hips AP view showing widened epiphysis of both bilateral femurs with slippage of bilateral femoral epiphysis onto metaphysis as indicated by a line of Klein (black line); b) Postoperative X-ray of same patient, note prophylactic fixation screws in bilateral femoral head (arrows); c) Same patient preoperative axial proton density fat-suppressed MRI image (Proton Density Fat-saturated (PDFS)) showing widened and irregular bilateral femoral epiphysis with subtle periphyseal oedema. (arrows). d) Same patient coronal PDFS image showing slippage of bilateral femoral heads posteromedially onto to femoral neck (arrows).

The SUFE is a Salter-Harris type 1 fracture that occurs through the proximal femoral physis and represents the most common hip condition in adolescent. The exact aetiology of SUFE is unclear. However, some predisposing factors reported include obesity, male gender, renal insufficiency, history of radiation especially hypothyroidism (or growth hormone deficiency) [4].

In patients with suspected Slipped Capital Femoral Epiphysis (SCFE), evaluation begins with pelvic X-ray of both hips in Anteroposterior (AP) and frog leg views. SUFE can be identified on AP view using Klein's line, which is drawn along the superior border of the femoral neck. If this line doesn't intersect the lateral part of the superior

femoral epiphysis, known as the Trethowan sign, SCFE is more likely. Klein's line serves as a radiographic reference to assess SCFE, particularly in case of varus SCFE. Its diagnostic utility lies in providing an early indicator of femoral head displacement, guiding clinicians in diagnosing and managing this condition effectively [5].

The MRI can reliably identify contralateral pre-slips with high sensitivity and specificity; it would significantly improve the decision making process regarding treatment for unilateral slips. It would reduce unnecessary surgeries while ensuring timely interventions for hips at risk of developing potential severe complications [6].

The primary objectives of surgical treatment for SUFE are to stabilise the hip, prevent additional slippage and minimise the risk of long-term consequences like avascular necrosis and chondrolysis. The reported trend of decreasing complication rates highlights the significance of early intervention and ongoing improvements in surgical management strategies [7].

Almedaifer SF et al., reported in a study that valgus SCFE is extremely rare, characterised by a superolateral displacement of the epiphysis on the metaphysis. Bilateral disease is extremely uncommon and presents management hurdles to the treating orthopedic surgeons. There is no standard method for managing bilateral valgus SCFE and the posterolateral displacement of the femoral epiphysis in this condition makes in-situ pinning more challenging. The screw's entry point must be positioned more medially, which increases the risk of injuring the femoral neurovascular bundle. In valgus SCFE, Klein's line is typically normal, making it essential to obtain a lateral radiograph for any child with hip pain [8].

Femoral head osteonecrosis, femoroacetabular impingement, labral tears, infection, chronic pain and occurrence of SCFE are few

complications of SCFE including the contralateral hip. Early-onset osteoarthritis of the hip is the long-term complication [9].

CONCLUSION(S)

Radiologists should be well aware of this condition and should have sufficient knowledge to diagnose SUFE at the earliest in order to avoid unnecessary investigations and complications, thereby guiding the clinician to execute a proper management strategy.

REFERENCES

- [1] Hesper T, Zilkens C, Bittersohl B, Krauspe R. Imaging modalities in patients with slipped capital femoral epiphysis. *Journal of Children's Orthopaedics*. 2017;11(2):99-106.
- [2] Alhassan HS, Almushait YB, Almarshad AY, Alghamdi A, Alhussainan TS. Clinical diagnosis of slipped capital femoral epiphysis in a child with negative radiological findings: A case report. *Cureus*. 2023;15(1):e33396.
- [3] Aronsson DD, Loder RT, Breur GJ, Weinstein SL. Slipped capital femoral epiphysis: Current concepts. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons*. 2006;14(12):666-79.
- [4] Marquez D, Harb E, Vilchis H. Slipped capital femoral epiphysis and hypothyroidism in a young adult: A case report. *Journal of Medical Case Reports*. 2014;8:01-04.
- [5] Klein A, Joplin RJ, Reidy JA, Hanelin J. Slipped capital femoral epiphysis: Early diagnosis and treatment facilitated by "normal" roentgenograms. *JBJS*. 1952;34(1):233-39.
- [6] Balch Samora J, Adler B, Druhan S, Brown SA, Erickson J, Samora WP, et al. MRI in idiopathic, stable, slipped capital femoral epiphysis: Evaluation of contralateral pre-slip. *Journal of Children's Orthopaedics*. 2018;12(5):454-60.
- [7] Azzopardi T, Sharma S, Bennet GC. Slipped capital femoral epiphysis in children aged less than 10 years. *Journal of Pediatric Orthopaedics B*. 2010;(1):13-18.
- [8] Almedaifer SF, AIShehri AJ, Alhussainan TS. Bilateral valgus slipped capital femoral epiphysis in an 11-year-old girl. *Cureus*. 2018;10(11):e3598.
- [9] Roaten J, Spence DD. Complications related to the treatment of slipped capital femoral epiphysis. *Orthopedic Clinics*. 2016;47(2):405-13.

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