Valgus Slipped Capital Femoral Epiphysis

Case Report and Literature Review

RA Rajan FRCS (✉), T Ibrahim MRCS, R Asirvatham FRCS, A Aster FRCS

Department of Orthopaedic Surgery, Leicester Royal Infirmary, Infirmary Square,
Leicester, United Kingdom.

Correspondence:

R A Rajan

E-mail: rohanrajan20@hotmail.com

Abstract

Slipped capital femoral epiphysis (SCFE) usually occurs in children at around the growth spurt. There is a sheering force across the epiphysis at the hypertrophic zone allowing the slip. However, in the vast majority of cases, the slip usually occurs in the varus direction.

Valgus slipped capital femoral epiphysis is an uncommon entity. Although there are a few isolated reported cases in the literature, to date this entity has not been sufficiently reviewed and understood. Such a case is presented and a review of the published literature on this subject is carried out.
Introduction

SCFE is commonest in boys aged 12 to 14 years and 2 years younger in girls. However, they can occur as early as 3 years of age. Predisposing factors include endocrinopathies such as hypothyroidism, hypopituitarism, hypogonadism, renal rickets, obesity and rapid growth spurts.

The shape of the physis lends a certain amount of stability to resist sheer forces across it, including the interlocking effect of the zone of provisional ossification, the concave shape of the epiphysis and the perichondral fibrocartilaginous ring complex around the physis itself \[1\]. The orientation of the growth plate is usually such that the physeal slope angle (intersection of the physeal plane with the axis of the femoral shaft) is at an acute angle \[7\].

Due to the complex three–directional anatomy of the hip joint, it should be appreciated that it is the femoral neck that displaces from the capital femoral epiphysis which is held in place within the acetabulum by the ligamentum teres. The femoral neck rotates laterally and upwards, which means the capital femoral epiphysis appears to have slipped posteriorly and into varus.

Following on from this, a valgus capital femoral epiphyseal slip is therefore both difficult to explain and clearly unusual. Such a case is presented and the available literature on valgus SCFE is reviewed and a plausible hypothesis is put forward.

Case Report

A 10-year old girl presented with a six-month history of limping without a history of any trauma. Prior to the limp, she had walked normally and was an active child. Examination revealed a slightly overweight and prepubertal child. She had a right long leg gait with a 2cm leg length discrepancy. Internal rotation, abduction and flexion of the right hip was reduced.
Radiological findings revealed a laterally displaced capital epiphysis of the head of the femur with a “V” shaped teardrop (Fig 1).

![A-P radiograph at admission.](image)

**Fig. 1: A-P radiograph at admission.**

An arthrogram and examination under anaesthesia revealed a stable SCFE. Best coverage of the femoral head was obtained with 30° of abduction and 45° of external rotation. Following the arthrogram an adductor tenotomy, intertrochanteric varus osteotomy and fixation with Richards screw was preformed (Fig 2).
The patient was placed in a hip spica for 6 weeks. She continues to be followed regularly. At the last review (four years after surgery), she has pain free movement of her right hip with 40° abduction, 30° adduction, 20° internal rotation, 40° external rotation, full flexion and extension.

**Literature Review**

Muller [8] is credited with the first description of valgus SCFE. He described this condition in patients with pre-existing acetabular dysplasia. Finch and Roberts [3] reported two cases of valgus SCFE. He treated them both with traction and bed rest. Krishnan and Shelton [6] described another case of valgus SCFE, which was chronic in nature. This was treated with in
situ pinning using Knowles pins (x3). Skinner and Berkheimer [11] reported another case of valgus SCFE suggesting that pre-existing coxa valga could predispose to its occurrence. Wilson et al [12] described two cases of valgus SCFE in their series of 300 hips. Fahey and O’Brien [2] reported an acute case of valgus SCFE in his series of ten SCFE patients who was treated with gentle traction and pinning. Rothermel [9] describes a case of valgus SCFE and suggests that a horizontally disposed epiphyseal plate with a forced medial displacement of the upper femur such as a direct blow on the lateral side of the upper thigh, could be the cause of such an entity. Chung et al [1] performed cadaveric studies to determine shear strength and modes of failure of the capital femoral epiphysis. They concluded that the forces necessary to displace the capital femoral epiphysis were within the physiological range of the force generated in overweight children. Clearly the sheer forces across a horizontally positioned physis would not be as great as that in one which is inclined.

Griffith [5] challenged the existence of valgus SCFE in his Hunterian Lecture. He suggested that no true medial or lateral displacement of the capital femoral epiphysis took place, and that the displacement of the capital epiphysis was strictly posterior. He went on to suggest that the appearance of the varus or valgus slip on the anteroposterior radiographs was attributable to the effect of parallax. In our case report, the magnetic resonance image (Fig 3) clearly shows the valgus slip. Segal et al [10] described two cases of valgus SCFE and suggested that increased femoral anteversion may have a role in the mechanical aetiology of valgus SCFE. Gelberman et al [4] showed that there was a relative retroversion in those with epiphyseal slip (in the more usual varus SCFE). Gelberman et al and Chung et al would therefore suggest that the hip with a horizontal growth plate and one which is anteverted would be most stable, in reference to the more usual varus SCFE.
Conclusion

The literature appears to suggest several possible reasons for a valgus SCFE. These include acetabular dysplasia, coxa valga, excessive femoral anteversion, increased neck shaft angle and a horizontal epiphyseal plate. In our case report, the magnetic resonance image demonstrates a horizontal epiphyseal plate.

Supposing that the capital femoral epiphysis is held within the acetabulum by the ligamentum teres, then it is the femoral neck that has rotated medially. This causes the capital epiphysis to lie in the valgus position. In the case of a valgus SCFE, the horizontal physis although in theory would require a greater sheer force to displace the epiphysis than one which is inclined, the horizontal physis would allow for a valgus or lateral displacement of the capital femoral epiphysis. Also, an anteverted neck of the femur would predispose the epiphysis
slipping anteriorly and into valgus when compared to the traditional retroverted neck in the case of the varus slip.

The usual anatomy of the upper femur is one where there is an inclined physis with a physeal slope angle in the range of 30° and an anteverted femoral neck and a neck shaft angle between 120-135°. A retroverted femoral neck with a steep (acute) physeal angle would thus predispose to a varus SCFE. In contrast, an excessively anteverted femoral neck with a horizontal physis predisposes to a valgus SCFE. In both cases, an increase in the neck shaft angle predisposes to a slip. Clearly none of these theories have been proven and we can only speculate as to why it does not occur more regularly.

References


