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Severe slipped upper femoral epiphysis; fish osteotomy versus pinning-in-situ: An eleven year perspective



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ABSTRACT

Purpose: Slipped upper femoral epiphysis (SUFE) is not common with a reported incidence of 10 per 100 000. The management of SUFE is controversial and evolving, with advancing surgical skills and expertise. The infrequency of cases, the various classifications in use, the various surgical treatments, and lack of robust evidence for outcomes, has resulted in the lack of clear, evidence-based recommendations for treatment. Although mild slip can be treated with pinning-in-situ (PIS) with predictably good outcome, moderate and severe slips present a challenge for the treating surgeons. It is logical to reduce the slip to near anatomical position; however, this desire has always been tempered by concerns about the potentially devastating complications of osteonecrosis and Chondrolysis

Methods: This is a single centre, retrospective study comparing (PIS) and Fish femoral neck osteotomy. Seventy four children presented with SUFE (90 hips). The mild and the moderate groups were treated with a single pinning-in-situ (PIS). The severe group had either a surgical reduction by Fish femoral neck osteotomy or PIS. The study was approved by the regional and local ethic committee. Demographic data, clinical findings, radiographic features were collected.

Results: Avascular necrosis of the femoral head (osteonecrosis) was the primary outcome. There were 11 cases of osteonecrosis (12.2%): 3/41(6.9%) in the stable group compared to 7/22 (31.8%) in the unstable group, statistically significant [$P < 0.001$]. In the severe slip group, the osteonecrosis rate was 33.3% in the PIS group and 26.6% in the Fish osteotomy ($P = 0.539$). This is not statistically significant, but the trend favours surgical reduction.

Conclusions: Then reduction of the deformity is valuable. The majority of cases that do not suffer osteonecrosis will benefit by reduction of the deformity; those who are destined to develop osteonecrosis are still better off with the femoral head in a reduced position. The unstable slip is more likely to be severe and more likely therefore to receive surgical reduction than a stable and less severe hip. The implication here is that the osteotomy might not be the cause of the osteonecrosis; it is the vascular damage due to the instability of the slip that is responsible.

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Introduction

Although a relatively rare condition, slipped upper femoral epiphysis (SUFE) is nevertheless a troublesome paediatric and adolescent hip disorder, whose treatment is controversial. The capital femoral epiphysis separates from the metaphysis through the physis resulting in the head of the femur staying in the acetabulum and the neck slipping forward and outward.¹ The cause is poorly understood, although several anatomical variants and underlying medical conditions have been implicated in the pathogenesis.

Most investigators agree that once a SUFE has been diagnosed, surgical treatment is indicated. The most appropriate operative management has been a topic of debate for many years.^{2,3}

Slipped upper femoral epiphysis has been classified into the followings based on:

- A. Ambulation and weight bearing status⁴:
 1. Stable: patient is able to ambulate and bear their weight
 2. Unstable: patient is unable to ambulate with or without crutches
- B. Onset of symptoms^{5,6}:
 1. Pre-slip: patient has symptoms with no anatomical displacement of the femoral head. There may be useful radiological evidence such as widening of the physis or osteopenia of the pelvis.
 2. Acute: there is an abrupt displacement through the proximal physis with symptoms and signs developing over a short period of time (<3 weeks)
 3. Chronic: patients with a chronic slipped capital femoral epiphysis present with pain in the groin, thigh, and knee that varies in duration, often ranging from months to years.
 4. Acute on chronic: initially, patient has chronic symptoms, but develops acute symptoms as well following a sudden increase in the degree of slip.
- C. Direction of the slip⁷:

Majority of cases of SUFE, the epiphysis is displaced posteriorly and inferiorly (also called varus or posterior slip) relative to the femoral neck. In rare cases, the displacement is either superior or posterior (Also called valgus or anterior slip).

D. The severity of the slip:

This is based on the radiographic findings; the degree of displacement either by proportion of slip⁸ or by angle of slip (Southwick).⁹ The Southwick angle is drawn on the lateral radiograph. It is the angle between a line drawn from the posterior to the anterior edge of the physis, and the axis of the neck (Fig. 1). A mild slip has an angle difference of less than 30°, a moderate slip had an angle difference of between 30 and 50°, and a severe slip has a difference of over 50° (Fig. 2).

In practice, most clinicians tend to use a combination of the Loder's classification and one of the radiographic



Fig. 1 – Pelvis X-ray of a child with osteonecrosis.

classifications. There is some crossover between the classifications but severe slips are more likely to be unstable.³

There is a reasonable clinical consensus that the treatment of Grades I and II SUFE should be by pinning-in-situ (PIS): placing a single screw across the growth plate through a very small incision on the thigh to prevent further slip until growth plate closure. The goal of treatment is to prevent progression of the slip, whilst avoiding the complications of osteonecrosis and chondrolysis.¹⁰ Osteonecrosis is usually caused by the acute displacement of the femoral head which kink the posterior blood vessels, compromising the blood flow to the epiphysis. Chondrolysis is the rapid and progressive loss of articular cartilage seen in some SUFEs. The cause is unknown; however, few theories have postulated an autoimmune phenomenon or some interference with cartilage nutrition. Risk factors leading to chondrolysis include immobilisation in a cast, unrecognised pin penetration and severe SUFE.¹⁰

If the slip is Grade III (severe), pinning-in-situ can be technically difficult. In addition, when the saucer-shaped physeal surface of the head abuts the cylindrical posterior surface of the femoral neck, there is contact at only two points. Fixation in this position gives poor stability. If osteonecrosis occurs with the head in this posterior displaced position, disability is severe. Even if osteonecrosis does not occur

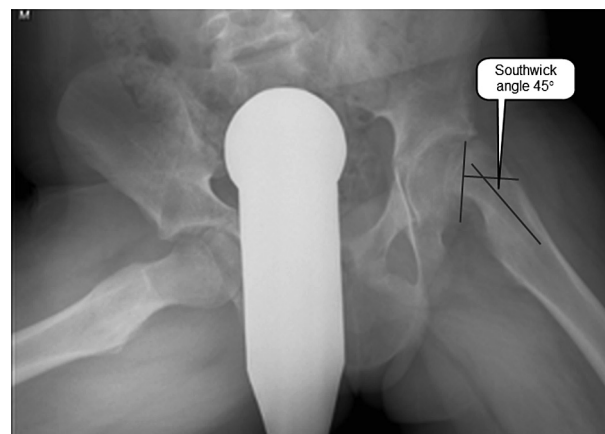


Fig. 2 – Southwick angle: the angle between a line drawn from the posterior to the anterior edge of the physis, and the axis of the neck.

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