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# Slipped capital femoral epiphysis

## A report of 4 cases occurring in one family

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**Summary.** *We describe slipped capital femoral epiphysis in 4 members of a black, obese family, who were all first-degree relatives. The aetiology of slipped capital femoral epiphysis is unknown, although it is thought to be multifactorial. Genetic predisposition and environmental factors have been associated with the condition. A familial incidence with at least two cases in the same family has been reported. In epidemiological studies, this incidence ranges from 3% to 35%. Our cases were investigated in an attempt to find a possible aetiological genetic factor. A genetic predisposition with an autosomal dominant pattern of transmission is suggested, although environmental variables must be considered as provocative factors.*

**Resumé.** *L' etiologie de l' épiphysiolyse fémorale supérieure (EFS) n'est pas connue, mais, en tous cas, elle parait multifactorielle. La prédisposition génétique et les conditions environmentales ont été associées avec l' EFS. L' incidence familiale avec au moins deux cas dans la même famille a êté rapporté dans la littérature de 3% à 35%. Un cas de EFS chez 4 sujets d'une famille de race noire, tous obèses, a été étudié de façon à montrer un éventuel facteur génétique etiologique. On suggère une prédisposition génétique avec un élément dominant autosomique sans oublier les differents facteurs environmentaux comme facteurs prédisposants.*

### Introduction

Familial incidence of slipped capital femoral epiphysis (SCFE), with at least two cases in the same family, has been reported by a number of authors with an incidence of from 3% to 35% [1, 2, 6, 8, 10–15, 19, 20, 23, 26, 27, 29, 31–35, 37–39, 42]. Oschner described a family with SCFE in 10 members [27]. Since many cases of SCGE do not have symptoms the figures may be underestimated, with the true familial incidence being higher [15, 28, 30, 31].

The familial clustering suggests either a predisposing hereditary trait [15, 27, 31] or a provocative environmental factor common to the family [15, 21, 31], or both. The incidence of SCFE has been found to be higher in blacks than whites [22, 24, 42] and among males than females [6, 16–18, 20, 22, 24, 28, 38, 42]. This increased incidence further suggests a genetic factor in SCFE, although interactive environmental factors might also be involved [9, 16, 21, 25]. A different male:female ratio in the familial group (1:2/1) against the nonfamilial group (4:1) is typical of a condition showing a genetic effect [31].

The form of inheritance in some families appears to be an autosomal dominant with variable penetrance [15, 27, 30, 31]. However, some authors consider that familial inheritance is of no aetiological significance, and that environmental factors play the major role [36, 38]. Some familial cases of SCFE could be due to environmental factors affecting the whole family [21], such as a rural life, where heavy work may lead to repeated or violent trauma of the epiphysis [15, 16, 31].

The occurrence of SCFE in several, or all, of the siblings of one parent is less often reported and strongly suggests a familial vulnerability. Cases of SCFE in a black family, as in the present report, has only been described once [37], although the increased incidence of slipped epiphysis in blacks has been recognised.

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## Case reports

### *Case 1*

A boy, 12 years of age, of black race (from the Cape Verde Islands) complained of pain in the right hip and limping for a month with no apparent cause. He had limited and painful internal rotation and abduction. The patient was admitted to hospital in May 1995. Radiographs showed bilateral SCFE (Fig. 1). He was obviously obese with some signs of puberty (genitalia slightly enlarged, lightly pigmented downy pubic hair).

### *Case 2*

A girl, 11 years of age, black and the sister of case 1, developed symptoms 8 months later. She was admitted in February 1996. Radiographs showed SCFE in the right hip (Fig. 2). She was obese with no signs of puberty (prepubertal breasts, infantile genitalia, no pigmented pubic hair).

### *Case 3*

A girl, 6 years of age, black and a half-sister to cases 1 and 2, with the same father but a different mother, had experienced chronic pain in both hips with limited internal rotation, but had never sought medical attention. She was extremely obese and sexually mature. Radiographs revealed bilateral old SCFE (Fig. 3).

### *Case 4*

A man, 40 years of age, and father of the cases 1, 2, and 3, had never had hip symptoms or functional limitation, but radio-

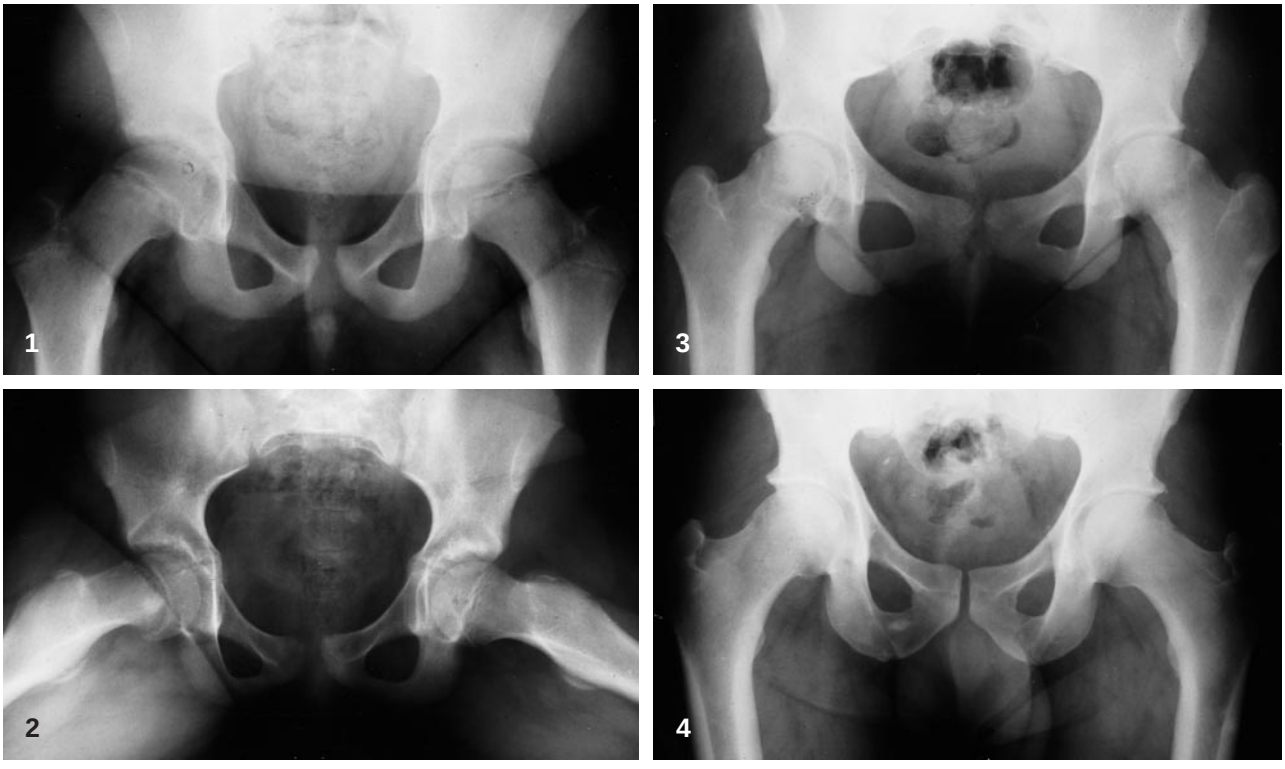


**Fig. 1.** Anteroposterior radiograph of the pelvis of case 1 showing bilateral grade I SCFE

**Fig. 2.** Lateral radiographs of the upper femora of case 2 showing grade I SCFE of the right hip

**Fig. 3.** Anteroposterior radiograph of the pelvis of case 3 showing bilateral old SCFE

**Fig. 4.** Anteroposterior radiograph of the pelvis of case 4 showing minimal old SCFE on the right side

**Table 1.** Hormonal imbalances found in the three siblings

| Identification: Hormone levels (serum) | Case 1 male, 12 y. | | Case 2 female,11 y. | | Case 3 female, 16 y. | | Case 4 (father) | | Mother of cases 1 and 2 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Results | Refer. values | Results | Refer. values | Results | Refer. values | Results | Refer. values | Results | Refer. values |
| SHBG (nmol/l) | 20.6 | P: 55–110 A:10–70 | 18.9 | P: 55–100 A:20–100 | 19.6 | P: 55–100 A:20–100 | 21.8 | P: 55–100 A:10–70 | 29.1 | P: 55–100 A:20–100 |
| Insulin (mU/ml) | 29.6 | 3–17 | 20.4 | 3–17 | 20.4 | 3–17 | 10.1 | 3–17 | 14.3 | 3–17 |

Reference values for sex, age and sexual development: P: pre-pubertal values; A: adult values; SHBG: sex hormone bind globulin

graphs revealed minimal old SCFE in the right hip (Fig. 4). He had no other siblings.

The mother of cases 1 and 2 was also studied. She was 40 years of age and had never had hip symptoms. Radiographs showed no signs of old SCFE. She had no other siblings. The mother, 35 years of age, of the other child had no present or past hip symptoms, and radiographs showed no signs of old SCFE. She has two other children from another father with no signs of SCFE. There is no consanguinity among the parents of the three siblings.

Laboratory data from the 4 cases showed that subtle hormonal imbalances were present in the sex hormone bind globulin (SHBG) and the insulin in 3 of the siblings (Table 1).

## Discussion

Several investigations and case reports have emphasised the occurrence of more than one case of SCFE in the same family. Genetic and environmental conditions have been implicated. Probably the susceptibility of a given individual to SCFE is influenced by genetically determined response to his environment. Different patterns of transmission of this susceptibility have been suggested including multifactorial, X-linked dominant, autosomal dominant with variable penetrance and autosomal recessive [15, 27, 31]. In the present black family, all 3 siblings have SCFE, are obese and showed subtle hormonal imbalances with low levels of SHBG and increased insulin levels, probably related to obesity [3–5, 7, 40, 41]. This underlies a possible interaction between endocrine imbalance and obesity in SCFE. It seems that in the present family, obesity or hormonal imbalance, whatever the cause, do not fully explain the increased incidence of SCFE. The father, with minimal old SCFE, having three affected children from two unaffected wives, suggests an autosomal dominant form of inheritance. In some families, this pattern of transmission seems more likely to occur than a multifactorial form of inheritance [15, 27, 31], and an important genetic predisposition may exist with a clear pattern of transmission; the role of environmental factors as triggering conditions is of varying importance, but remains unknown. As previous authors have pointed out, in families with more then one case of SCFE, it is important to be aware of the increased risk that subsequent children may be affected.

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