Hindawi Publishing Corporation
International Journal of Pediatric Endocrinology
Volume 2009, Article ID 609131, 3 pages
doi:10.1155/2009/609131

*Case Report*

# Chronic Bilateral Slipped Capital Femoral Epiphysis as an Unusual Presentation of Congenital Panhypopituitarism due to Pituitary Hypoplasia in a 17-Year-Old Female

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Received 17 July 2009; Accepted 13 October 2009

Recommended by Roberto Lanes

We report an interesting case of a 17-year-old normal-statured female who was diagnosed with congenital panhypopituitarism due to pituitary hypoplasia at the presentation of bilateral slipped capital femoral epiphysis. We emphasized the importance of endocrinologic evaluation in patients with atypical slipped capital femoral epiphysis to prevent potential complication of adrenal crisis during surgery. This case also demonstrates growth without growth hormone which resulted in a delay in diagnosis of congenital hypopituitarism in this patient.



## 1. Introduction

Slipped capital femoral epiphysis (SCFE) is a common hip disorder in adolescents, characterized by medial and posterior displacement of the proximal femoral epiphysis on the metaphysis. This results in the classic varus appearing hip on X ray. In contrast, some hips may slip in a posterolateral displacement, producing an apparent valgus deformity and a so-called valgus SCFE. This occurs when shearing forces applied to the femoral head exceed the strength of the capital femoral physis [1]. The exact etiology is unknown, but is believed to be secondary to multiple factors, including obesity which increases mechanical strain on the physis. The periosteal thinning and widening of the physis seen during rapid adolescent growth acceleration may also be a predisposing factor for the weakening of the physis [2]. Only small percentage of SCFE (5.2%–6.9%) is associated with endocrinopathies such as hypothyroidism or growth hormone deficiency [3, 4]. Short stature, early age at presentation, and the atypical appearance of a valgus SCFE have all been suggested as indicators for endocrinopathy screening [5, 6]

We report an interesting case of a 17-year-old normal-statured female who was diagnosed with congenital panhypopituitarism due to pituitary hypoplasia at the presentation of SCFE.

## 2. Patient Report

A 17-year-old Caucasian female presented with a 3-month history of hip pain, difficulty walking, and inability to bend down. She did not have any regular well child care until this illness. She was born full term with birth weight of 8 lbs and her early development was described as normal. She was home schooled because of some learning difficulties. Her mid-parental height was 167.6 cm which is at 75th percentile (+0.67 SD). On physical exam, the patient was 158.1 cm tall (25th%) (Figure 1), and weighed 65 kg (75th%). Her body mass index was 26 kg/m$^2$ (90th%). She had bilateral hip pain with hips held in obligatory external rotation. Hip flexion was limited to 60 degrees bilaterally. She had waddling gait and pain with walking. She had Tanner stage 1 for breast and pubic hair development.

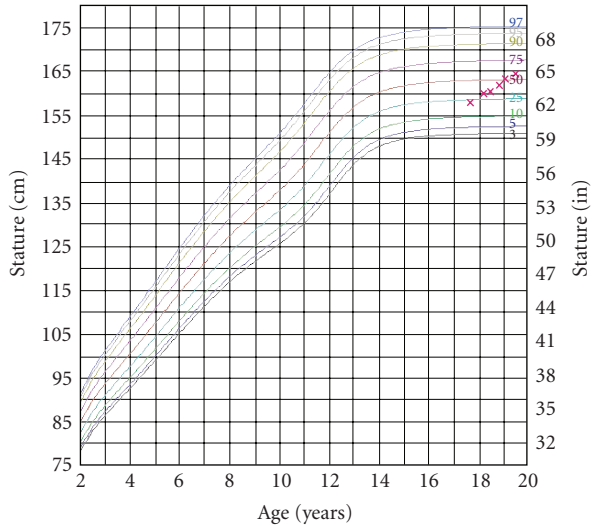


Figure 1: Growth chart depicts the patient's growth at diagnosis and over the course of follow up on growth hormone therapy.

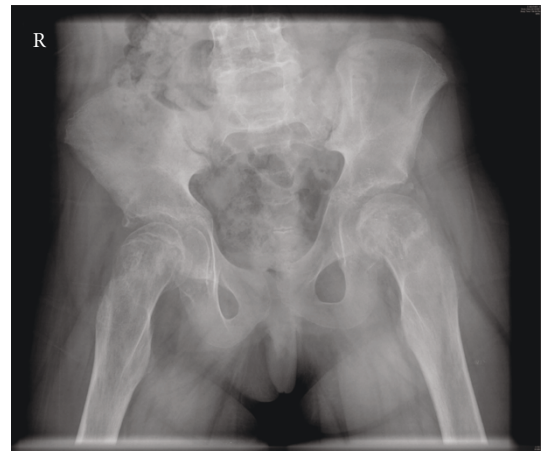


Figure 2: An anteroposterior radiograph of the pelvis revealing severe, bilateral, valgus slipped capital femoral epiphysis.

An anteroposterior pelvis radiograph (Figure 2) showed bilateral, chronic, severe, valgus SCFE, confirmed with CT scan. She was admitted to Orthopedic service for hip surgery. Endocrine service was consulted due to her delayed puberty and primary amenorrhea. Laboratory studies showed low free T4 (0.5 ng/dL; normal 0.7–2.0), slightly elevated TSH (7.97 $\mu$IU/mL; normal 0.5–5.0). FSH 1.3 mIU/mL, LH < 0.5 mIU/mL, estradiol < 0.1 ng/dL. Pelvic ultrasound revealed no visualized uterus or ovaries. The finding of hypogonadotropic hypogonadism prompted the work up for hypopituitarism. ACTH stimulation test using 1 microgram cosyntropin showed low peak cortisol (5.9 ug/dL). She was given stress dose of hydrocortisone prior to her hip surgery on hospital day 3. Subsequently, complete pituitary evaluation showed undetectable IGF-1 level (<25 ng/mL), low IGF-BP3 (1.7 mg/dL; normal 3.2–8.7), and low peak growth hormone (<0.1 ng/mL) on growth hormone stimulation test using arginine and clonidine. Fasting insulin was normal at 15 uU/mL. Her bone age (Greulich and Pyle) was delayed at 13 years. Brain MRI showed pituitary hypoplasia, with no identifiable pituitary stalk and ectopic posterior bright spot. Her pelvic MRI showed no identifiable uterus and tiny cystic structures bilaterally in the lower pelvis that may represent streak ovaries.

She was treated with levothyroxine, hydrocortisone, growth hormone, and subsequent estrogen replacement therapy. Her growth hormone dose was 0.18 mg/kg/week with IGF-1 level within the normal range. Repeat pelvis ultrasound after 9 months of estrogen therapy revealed a small uterus and ovaries. After 18 months of growth hormone therapy, her height increased to 164.5 cm (65th%) (Figure 1).

## 3. Discussion

Although only 5.2%–6.9% of patients with SCFE are associated with endocrinopathy [3, 4], there are some clinical characteristics that should alert clinicians to obtain an endocrinologic evaluation prior to surgical treatment including: young age at presentation, bilateral disease, and the presence of a valgus SCFE. This case report highlights such importance as the patient was found to have panhypopituitarism with adrenal insufficiency, the condition in which without proper perioperative corticosteroid stress dose coverage, the patient could suffer from adrenal crisis with potential mortality or serious complications.

In a review by Loder et al. of 85 patients with SCFE and known endocrinopathy, 40% were found to be hypothyroid, 25% were growth hormone deficient, and 35% had other endocrinopathies such as hypogonadism, hypopituitarism, hyperparathyroidism, growth hormone excess, and Turner's syndrome [4]. In a review by Shank and Klingele, 13 cases of valgus SCFE were identified among 257 SCFE cases presenting to a single hospital, a 5% prevalence [7]. Of the valgus SCFE patients, 5/13 (38%) had panhypopituitarism [7]. Age at presentation of SCFE can offer a clue to which patients should receive an endocrine screening. Typical age presentation of SCFE is between 10–16 years with the average 13-14 years for boys and 11-12 years for girls [6]. Patients with hypothyroidism or growth hormone deficiency associated with SCFE are usually younger than 10 years of age, whereas, those patients with other endocrinopathies either presented at a typical age or were older than 16 years of age [4].

The diagnosis of SCFE relative to the time of diagnosis of the endocrine disorders was different depending on the type of endocrinopathy. Most patients with hypothyroidism were diagnosed at presentation of SCFE, whereas all of the growth hormone-deficient patients had the endocrinologic diagnosis made before presentation of SCFE [4]. In a report from the National Cooperative Growth Study, Blethen and Rundle examined the association between SCFE and growth hormone deficiency in a large cohort of 16,514 children. They found that SCFE developed in 15 children before they received growth hormone and 26 children developed SCFE during treatment [8]. In our patient, we do not

anticipate a slip progression during the course of growth hormone therapy, as both hips were treated with a surgical hip dislocation and osteotomy to correct the severe amount of slippage, not by traditional pinning with one single screw where a slip progression can be seen. Once treated in this manner, the slip will not worsen or recur because the physis growth plate was removed during the procedure and the femoral head and neck heal together with a bone union.

Our patient presented at age-17 years which is an atypical age for presentation. Her bilateral hip involvement and valgus SCFE presentation also favor the possibility of having associated endocrinopathy. Her thyroid function test which showed low free T4 and slightly elevated TSH level may be misleading as a picture of primary hypothyroidism, which might not have prompted the extensive work up for panhypopituitarism. One should keep in mind that slightly elevated TSH level with low free T4 can be seen in central hypothyroidism as the primary hormone deficiency can be thyroid-releasing hormone, resulting in different TSH levels that can be normal, low-or slightly elevated.

Our patient's lack of puberty served as an important clue to the need of a thorough endocrinologic evaluation. Her low FSH and LH levels confirmed hypogonadotropic hypogonadism which led to a complete pituitary hormone evaluation. She was found to have complete growth hormone deficiency with undetectable IGF-1 and growth hormone levels. Moreover, she was also found to have secondary adrenal insufficiency, as part of her panhypopituitarism. This finding has significant implication in the management prior to surgery to prevent potential fatal complication from adrenal crisis.

Most patients with congenital hypopituitarism present at young age when short stature is noted during childhood. Our patient had no medical care until her presentation of SCFE which is a very unusual presenting sign for hypopituitarism. The interesting and puzzling point in this patient is that she has a normal stature despite having complete growth hormone deficiency as a result of pituitary hypoplasia which is a congenital condition. Her infantile uterus and ovaries (from lack of hormone stimulation) which were nonvisualized by imaging studies at the time of diagnosis of panhypopituitarism but later grew in size and were visualized after estrogen hormone replacement also suggest that her pituitary hormone deficiencies have been present since birth. This case illustrates growth without growth hormone syndrome which has been described in literature [9, 10]. It was postulated that other growth factors such as leptin, sex hormones, insulin may locally activate the IGF system in the epiphyseal growth plate [10]. Our patient had absent sex hormone with normal fasting insulin level. Other undiscovered hormones and growth factors may have effects on growth.

In summary, we report an interesting case of a 17-year-old normal-statured female who was diagnosed with congenital panhypopituitarism due to pituitary hypoplasia at the presentation of slipped capital femoral epiphysis. We emphasized the importance of endocrinologic evaluation in patients with slipped capital femoral epiphysis that have signs of endocrinopathy to prevent potential complication of adrenal crisis during surgery. This case also demonstrates growth without growth hormone which resulted in a delay in diagnosis of congenital hypopituitarism in this patient.

## List of Abbreviations

SCFE: Slipped capital femoral epiphysis
TSH: Thyroid stimulating hormone
FSH: Follicle stimulating hormone
LH: Luteinizing hormone
IGF-1: Insulin-like growth factor 1
IGF-BP3: Insulin-like growth factor binding protein 3.

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