The Delay in Diagnosis of Slipped Capital Femoral Epiphysis: A Review of 102 Patients

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Abstract *Objectives:* The aim of this study were (1) to evaluate the incidence of apparent missed diagnosis of slipped capital femoral epiphysis (SCFE) by the primary care system and (2) to identify possible factors leading to a delay in diagnosis of this disorder. *Setting and Design:* A retrospective review of emergency department records, outside medical charts, and preoperative and postoperative radiographs of children treated surgically for SCFE at the Children's Hospital of Los Angeles (CHLA) from 1989 to 1997 was done to assess the delay in diagnosis for SCFE. The primary care system included outside emergency department visits, urgent care clinic visits, and private office visits. *Results:* Of 102 patients (69 men, 33 women; mean age at surgery, 11.9 years), 68% were above the 95th percentile mean weight for age. Pain in the hip and/or groin was documented in 60%. The mean duration of symptoms experienced before being seen at CHLA was 140 days (hours to 1.5 years) and the mean delay after the first primary care visit till being seen at CHLA was 76 days (hours to 1 year). Fifty-two percent of primary care visits for hip, groin, knee, or thigh pain in obese children did not lead to either a diagnosis of SCFE or a referral for orthopedic evaluation. *Conclusions:* This study documents a 2 1/2-month delay and a 52% incidence of apparent missed diagnosis for SCFE by the primary care system. There seems to be a need for increased orthopedic education for primary care providers.

Key words slipped capital femoral epiphysis · delayed diagnosis · primary care system

Introduction

Slipped capital femoral epiphysis (SCFE) is the most common hip disorder occurring in adolescence [1]. It is characterized by a growth disturbance of the proximal

femoral growth plate, resulting in weakening of this structure and a subsequent displacement of the femoral head on the femoral neck. Growth and mechanical factors seem to play an important role in the etiology of this condition. Many have noted a large number of obese patients, and Kelsey et al indicated that half the patients in their series were above the 95th percentile for weight [2]. The annual incidence of this disorder was estimated to be 2 per 100,000 in the general population. There are, however, geographical variations with incidences as low as 0.2 per 100,000 reported in the eastern half of Japan to incidences as high as 10.08 per 100,000 in certain regions of the United States [1].

The most frequent presenting complaints in patients with SCFE is pain in the affected hip, groin, thigh, or knee, alteration in hip range of motion, and often a gait abnormality. Symptoms may be very mild, even allowing patients to be active and play sports, or so severe that it prevents ambulation. Stable or mild cases of SCFE can be treated effectively with cannulated screw placement with a success rate of nearly 90%. However, the treatment of unstable or severe slips with screw fixation is far less successful, with a poor result usually secondary to avascular necrosis of the femoral head in up to 47% of cases [3].

Once the diagnosis of SCFE is made operative, stabilization is recommended without delay to prevent further epiphyseal slip and its adverse sequelae.

The aims of this study were to evaluate the incidence of apparent missed diagnosis of SCFE and to identify possible factors leading to a delay in diagnosis of children with this disorder.

Materials and methods

We reviewed retrospectively the inpatient medical records, emergency department records, and radiographs of children who had been surgically treated for SCFE at the Children's Hospital of Los Angeles. Review of outside medical charts and patient interviews were also conducted. The period of review was 1989 to 1997. There was a total of 102 patients with 138 hips: 66 (65%) had unilateral involvement and 36 (35%) had bilateral involvement.

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The sex, race, age, weight, coexistent medical conditions, and location of pain were noted. The number of outside clinic visits, the number of days of symptoms before diagnosis, tests performed outside CHLA to diagnose the disorder, the initial diagnosis by the primary physician, and the length of follow-up with any postoperative complications were also noted. The primary care system as defined in this study did not distinguish between outside emergency department and urgent care clinics, private offices of pediatricians, family practitioners, physician assistants, and registered nurse practitioners. Three patients were noted to have been seen by a chiropractor before presenting at the CHLA.

Results

Of the total 102 patients, 69 (68%) were male and 33 (32%) were female. The male to female ratio was 2:1. The mean age for male patients was 12.7 years (range, 7.3–15.1 years). The mean age for female patients was 11.1 years (range, 6.7–17 years). The combined average age at surgery was 11.9 years (range, 6.7–17 years). Fifty patients (49%) were Hispanic, 27 (26%) were African American, 15 (15%) were Caucasian, 5 (5%) were Asian, and 5 (5%) were of Oriental origin.

Coexisting medical/orthopedic conditions included the following: 9 patients had asthma, 2 had hypothyroidism (1 female, age, 12 years 10 months; 1 male, age, 13 years), 2 had Osgood-Schlatter's disease, and there was 1 patient each of panhypopituitarism (female, age, 17 years), myotonic dystrophy, Down's syndrome, Legg-Calvé-Perthes disease, cerebral palsy, autism, Blount's disease, tarsal coalition, and Sever's disease (Table 1).

The weight of 5 children was not recorded. Of 102 patients, 69 (68%) were above the 95th percentile for mean weight for age as determined by the National Center for Health Statistics [4]. The mean weight for both sexes was 68.4 kg (range, 43–115 kg). The mean weight in males was 71 kg (range, 46–115 kg). In female patients, the mean weight was 63 kg (range, 43–95 kg).

The number of days the patients experienced symptoms was noted. The mean days of symptoms experienced

Fig. 1. Number of primary care visits before CHLA

before being seen at CHLA for both sexes was 140 days with a range of hours to more than 112 years. Data were not available in 3 patients.

In documenting the number of primary care providers seen before the CHLA, the records of 14 patients were unclear: they were placed in the “no-outside-visit” group. Of 102 patients, 76 (74.5%) were evaluated by 100 outside primary care clinics. Of 72 patients, 53 (69%) had 1 visit, 22 (30%) had 2 visits, and 1 (1%) had 3 visits to primary care providers before they were referred to the orthopedic service at CHLA. Of 102 patients, 26 (25.5%) presented directly to the CHLA orthopedic clinic or emergency department (Fig. 1).

The delay from the patients' first visit to a primary care provider to the time they were admitted to CHLA was noted. The records of 9 patients were incomplete in this regard. In both sexes, the mean delay was 76 days, with a range of hours to 365 days. Thirty-five patients had delays of 30 days or more after their first primary care visit, whereas 21 patients had delays of 90 days or more after their first primary care visit for groin, thigh, or knee pain.

One hundred primary care visits for the evaluation of hip, groin, thigh, or knee pain led to 48 (48%) referrals to an orthopedist. Of these 48 referrals, 29 (60%) suspected SCFE. However, 52 (52%) primary care visits for hip, thigh, or groin pain did not lead to a diagnosis of SCFE or for a referral for an orthopedic evaluation.

On physical examination, 55 (83%) of the unilateral slips had a documented decrease in range of motion, with a mean loss of 25° of internal rotation between the SCFE hip

Table 1. Coexisting medical/orthopedic conditions

Coexisting medical/orthopedic conditions	No. of patients
Asthma	9
Hypothyroidism	2
Osgood-Schlatter's disease	2
Panhypopituitarism	1
Myotonic dystrophy	1
Down's syndrome	1
Legg-Calvé-Perthes disease	1
Cerebral palsy	1
Autism	1
Blount's disease	1
Tarsal coalition	1
Sever's disease	1

Fig. 2. Location of pain

and the non-SCFE hip. The location of pain at presentation was recorded (Fig. 2). Pain in the hip and/or groin was documented in 60%, pain in the knee in 22%, and pain in the thigh in 18% of patients.

Various tests were ordered outside the orthopedic service at CHLA to evaluate these patients. These included hip or pelvis radiographs that were read “negative”, knee radiographs, bone scans, computed tomography (CT) scans, magnetic resonance imaging (MRI), abdominal ultrasound, and various blood tests (Table 2).

In evaluating the radiographs in our series, slip severity based on the percentage of epiphyseal displacement was used. A slip was defined as being mild if the epiphysis was displaced less than one third of the neck width, moderate if the epiphysis was displaced from one third to one half the neck width, and severe if the epiphysis was displaced greater than one half the neck width. Ninety-seven preoperative radiographs were available for review. Seventy-two (74%) of 97 patients had radiological evidence of a mild slip, 14 (15%) had moderate slip, and 11 (11%) had severe slips. Of the 72 (74%) patients with mild slips, 41 (57%) had slips of less than 10%.

Review of outside visit records documented a total of 18 incorrect diagnoses. They included knee pathology in 8 (2 of these were diagnosed as Osgood-Schlatter’s disease), muscle pull or strain in 4, arthritis work up in 2, growing pains in 1, and Sever’s disease in 1; one patient each was worked up for suspected appendicitis and for a suspected bone tumor.

The mean length of follow-up was 18 months (range, 1 month to 6 years). Sixty-two (61%) of 102 patients had a follow-up of 1 year or more. Avascular necrosis of the femoral head was the most common complication, occurring in 10 (16%) of these 62 patients.

Discussion

Early detection and diagnosis of SCFE can be difficult and often remains delayed. Usually the initial symptoms are only mild weakness, easy fatigability, or limp, with groin pain occurring only with severe synovitis [5]. The onset of symptoms may be abrupt or may occur for many months. Abrupt onset of pain is typically associated with a sudden large amount of epiphyseal displacement and the child is usually in severe pain and is unable to walk. If the pain is

not severe and long standing, it is common for families to delay seeking medical attention. The physical examination typically reveals an obese child who walks with a mild antalgic gait with the affected leg in external rotation. Attempts to measure internal rotation of the hip will often cause an increase in pain. The affected leg has diminished or absent internal rotation and typically the thigh will externally rotate with flexion. Hip abduction may also be diminished. The contralateral hip must also be examined for evidence of symptoms.

Anteroposterior (AP) and frog lateral radiographs are the most important studies for diagnosis and treatment. On the AP view, the earliest change is widening and irregularity of the growth plate. Minimal displacement of the capital physis cannot usually be seen on the AP projection, but a frog leg lateral is likely to demonstrate the displacement.

The etiology of SCFE remains unknown. Growth and mechanical factors, genetics, trauma, radiation therapy, and endocrine dysfunction have been implicated as possible causes. The most common endocrine dysfunction associated with SCFE is hypothyroidism occurring in up to 40% of patients; the age at presentation was less than 10 years [6]. Our study had 2 patients with previously diagnosed hypothyroidism. SCFE has also been reported in patients with hypogonadism, hypopituitarism, parathyroid adenoma, growth hormone abnormality, and renal osteodystrophy [6]. Evaluation for endocrine abnormalities is only indicated for children with SCFE who are less than 10 years of age.

The goals of treatment for SCFE include timely surgical stabilization and prevention of further epiphyseal slipping. The potentially devastating complications of avascular necrosis and chondrolysis of severe cases of SCFE are well recognized [7].

In 1965, Wilson et al described 300 hips in children with SCFE where pain was referred to an area at some distance from the affected hip in 50% of cases [9]. In their series, the average duration of symptoms before correct diagnosis was 13 weeks in cases of mild slipping to 28 weeks in cases of severe slipping, suggesting that the degree of slipping was related in part to the delay in diagnosis. Diagnostic errors, resulting in delayed orthopedic referral and treatment, occurred in 26% of their patients. In their series, the principle erroneous diagnoses were muscle strain (7%), Osgood-Schlatter’s disease (3%), flat feet (5%), and growing pains (2%). Jacobs described 321 cases of SCFE, of which 31% had a delay in diagnosis related to misleading symptoms of little pain or pain referred to the knee [8].

Seigel et al reported a mean duration of 3 months of symptoms (range, 3 weeks to 15 months) in 45 patients with SCFE before diagnosis and treatment [10]. Loder et al reported mean duration of symptoms in 82 patients with SCFE at two centers; the mean duration of symptoms was 5 months in Detroit and up to 8 months in Ann Arbor [11]. Our study also documented a long period of symptoms before diagnosis and treatment, the mean duration in our sample being 412 months.

Table 2. Various outside tests ordered

Various outside tests ordered
Hip radiographs
Pelvis radiographs
Knee radiographs
Bone scans
CT scans
MRI
Abdominal ultrasound
Various blood tests

Our study also documented a significant delay in treatment for patients seen by the primary care system, the mean delay being nearly 11 weeks. In our series, 35% of patients had delays of 4 weeks or more after a primary care visit and 21% of patients had delays of 12 weeks or more before definitive treatment. The incidence of an apparent missed diagnosis for SCFE during the primary care visit was 52%, although nearly 70% of our patients were over the 95th percentile mean weight for age. The principle erroneous diagnoses documented in our study were knee pathology (8%) and muscle strain/pain (4%).

We conclude that there seems to be a need for increased orthopedic education for primary care providers. The primary care providers must have a high index of suspicion of SCFE in an obese adolescent with hip, thigh, or knee pain. We recommend that both anteroposterior and frog lateral views of the pelvis should be done when evaluating obese children and adolescents with hip, thigh, or knee pain.

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