Slipped capital femoral epiphysis (SCFE)

Objectives
1. Describe the pathologic anatomy (direction of slip, growth plate) of SCFE
2. Describe the presenting features, including age, symptoms, and physical findings associated with all types of SCFE
3. Define stable and unstable slip
4. Describe strategies of treatment for stable and unstable SCFE
5. Discuss the natural history of SCFE
6. Discuss salvage procedures for SCFE, their indications, results, and complications
7. Discuss endocrinopathies and systemic illnesses which predispose to development of SCFE

Discussion points
1. What type of fixation is best for stable SCFE?
2. Should fixation routinely be removed following surgery for SCFE?
3. Is there a valid indication for fixation of a radiographically normal, asymptomatic opposite hip of a patient with SCFE?

Discussion

Slipped capital femoral epiphysis is the most common hip problem of adolescence. Age of onset is usually between 10-16; predominately in boys. Obesity, black race, and delayed bone age have all been related to increased susceptibility to SCFE. The exact etiology of the slip is not known. Symptoms are generally pain (hip, thigh, or knee) and limp. Physeal widening, which occurs predominately in the hypertrophic zone is the first manifestation of SCFE. Cartilage maturation appears to be disrupted. There has been some speculation the perichondrial ring is also involved in some way with the weakening of the physis. The femoral head initially displaces posteriorly in the vast majority of cases, then inferiorly, although true valgus slips have been reported. Following physeal widening, the femoral head may slip slowly and insidiously or suddenly. These situations are presently described as stable or unstable, formerly acute and chronic, with a definition of less than 3 weeks of symptoms being acute. The unstable slip is essentially a physeal fracture of the femoral neck and accounts for about 10% of presentations. A stable slip may be complicated by a sudden acute episode, rendering the situation unstable. Recent studies have documented the value of ultrasound and scintigraphy for assessment of hip effusion (ultrasound) and epiphyseal viability (scintigraphy) prior to surgery. Patients with stable slips can walk, those with unstable slips an no more walk than anyone else with a hip fracture. On exam, patients with stable slips will demonstrate increased external rotation of the involved hip, and decreased internal rotation. The
sign of increased external rotation of the hip in flexion compared with extension is pathognomonic of SCFE.

Children with growth hormone deficiency, hypothyroidism, previous radiation therapy, or renal osteodystrophy are especially prone to developing SCFE. Those children undergoing treatment with growth hormone or thyroid replacement treatment are more susceptible during treatment. It is very rare for SCFE to be the initial presenting symptom of these problems. Discounting vascular complications accompanying unstable slips, long-term outlook appears related to the severity of slip.

Treatment is most straightforward for the mild, stable slip, fixation in situ to reduce further slippage; presently a single cannulated screw is preferred where adequate intraoperative imaging is available. Multiple Steinman pins are also satisfactory. Treatment is more complex for the unstable slip. Most authors feel a "gentle" attempt at reduction is warranted, essentially to the amount of displacement present before the acute episode, which is usually achieved simply by positioning on a fracture table. Complications of avascular necrosis and chondrolysis are more common after sustaining an unstable slip; it is presently unknown how much gentle operative reduction raises the incidence of avascular necrosis. Technically, if a single screw is placed, it should traverse the physis perpendicular to the epiphyseal side, be centrally placed in the epiphysis, and not violate the joint. The most serious error is placing a fixation device into the vascularly vulnerable anterolateral quadrant of the head. As the slip increases in severity, the entry point for the screw will progress anteriorly on the neck. Bone graft epiphyseodesis and cast immobilization as a primary treatment for SCFE have declined in favor due to increased morbidity of the procedure or reported higher rates of chondrolysis. The incidence of chondrolysis, which formerly appeared to be about 20% may be decreasing with single screw fixation and early motion. Chondrolysis is a mysterious entity; it does appear to have a higher incidence in patients treated in casts, but the etiology is unknown. The short-term outlook for patients with chondrolysis is not too bad, with a substantial number of patients demonstrating increase in motion and radiographic joint space over a 3-year period. The overall long-term outlook, however, seems less favorable.

Salvage procedures for patients with unacceptable restriction of motion following treatment for SCFE consist of various osteotomies about the proximal femur. Cuneiform osteotomies through the neck can completely correct the deformity at the site of deformity; but are complicated in all series by some avascular necrosis. The surgeon contemplating this procedure should review that data and decide with the patient if the risk is acceptable. Osteotomies at the base of the neck are intermediate in risk and quality of correction; the subtrochanteric osteotomy devised by Southwick creates a compensatory deformity to improve motion, and is safest in terms of risk of avascular necrosis. All corrective osteotomies, including subtrochanteric, can be complicated by chondrolysis, presumably due to increased joint pressure from correction of the inferior position of the femoral head.

Younger patients with SCFE have a higher risk of subsequently developing a slip on the contralateral side. In conditions such as endocrinopathies, prophylactic fixation appears justified, but for most patients, this issue is still debatable with the preponderance of opinion at present favoring periodic monitoring of the status of the contralateral hip. Removal of surgical hardware for SCFE has not been benign, many surgeons presently are not routinely removing the fixation device.
References


