

Slipped capital femoral epiphysis (SCFE) detected in a chiropractic office: a case report

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Objective: *To report on a case of slipped capital femoral epiphysis (SCFE), which is a somewhat rare condition but one that can present in a chiropractic clinic, particularly one with a musculoskeletal scope of practice.*

Case: *This is a single case report of a 16-year-old adolescent male patient who presented with an 18-month history of hip pain. Radiographs originally ordered by the patient's family physician were read by the medical radiologist as "unremarkable." The family physician diagnosed the patient with tendonitis.*

Treatment: *After reviewing the radiographs and examining the patient, the chiropractor suspected a SCFE that was confirmed with a repeat radiographic examination. The patient was referred back to his family physician with a diagnosis of SCFE and recommendation for orthopedic surgical consultation. The patient was subsequently treated successfully with surgical reduction by in situ pinning.*

Conclusion: *The prognosis for the SCFE patient when diagnosed early and managed appropriately is good. The consequences of a delay in the diagnosis of SCFE are an increased risk of further slippage and deformity, increased complications such as avascular necrosis and chondrolysis and increased likelihood of degenerative osteoarthritis of the involved hip later in life. The diagnosis and appropriate management of SCFE is where the chiropractor has an important role to play in the management of this condition.*

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Objectif : *Faire état d'un cas d'épiphysiolyse fémorale supérieure (EES), un état de santé relativement rare, mais qui peut se présenter dans une clinique de chiropratique, en particulier celles qui se spécialisent dans les traitements musculosquelettiques.*

Cas : *Il s'agit en l'espèce d'un rapport sur un dossier d'un adolescent de 16 ans qui présente un historique de douleurs aux hanches, une coxalgie, qui perdure depuis 18 mois. Les radiographies commandées au départ par le médecin de famille ont été interprétées par le radiologiste comme « n'ayant rien de particulier ». Le médecin de famille a posé un diagnostic de tendinite sur le jeune patient.*

Traitement : *Après un examen des radiographies et du patient, le chiropraticien a soupçonné une ESS, qui a été confirmée par de nouvelles radiographies. Le patient a été envoyé chez son médecin de famille avec un diagnostic d'ESS et une recommandation de consultation en chirurgie orthopédique. Le patient a été traité avec succès grâce à une réduction chirurgicale qui a consisté en un brochage in situ.*

Conclusion : *Le pronostic d'un patient souffrant d'une EES est juste quand le diagnostic est posé rapidement et géré de manière convenable. Les conséquences d'un retard de diagnostic amènent un risque accru de glissement et de malformation, des complications accrues, notamment une nécrose avasculaire, une chondrolyse et, plus tard dans la vie, une probabilité renforcée d'ostéoartrite dégénérative de la hanche affectée. Le diagnostic et la gestion compétente de l'ESS*

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illustrent le rôle important que joue le chiropraticien dans la gestion de cette affection.
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MOTS CLÉS : épiphysiolyse fémorale supérieure, ESS, hanches, adolescent.

Introduction

Slipped capital femoral epiphysis (SCFE) is defined as a posterior and inferior slippage of the proximal femoral epiphysis (femoral head) on the metaphysis (femoral neck), occurring through the epiphyseal growth plate during the early adolescent growth spurt.¹ In the United States, the incidence of SCFE for children between the ages of 9–16 years has been reported as 10.80 cases per 100,000 children.² The incidence rate has also been reported as being significantly higher in boys (13.35 cases per 100,000 children) versus girls (8.07 cases per 100,000 children). SCFE is known to be strongly associated with obesity in children and adolescents.^{1,3} In a retrospective review, investigators found that 81.1% of children with SCFE studied had a Body Mass Index (BMI) above the 95th percentile (i.e. clinically obese) compared to only 41.3% of controls ($P < 0.0001$).³ The significance of obesity is that it can increase the sheer stress across the growth plate leading to slippage of the femoral head inferiorly and posteriorly on the femoral neck in the direction of the weight-bearing force.

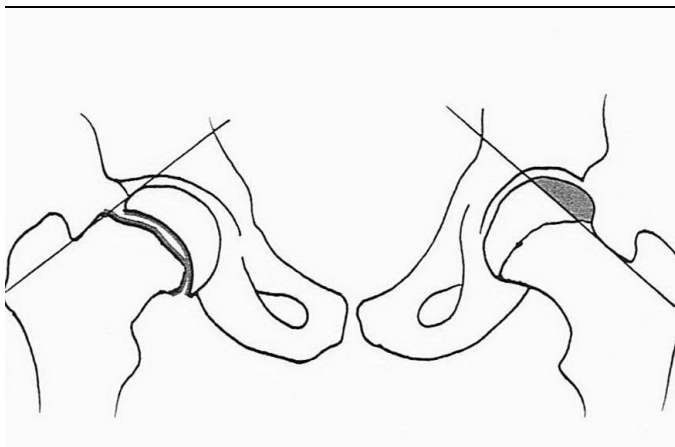
The SCFE patient can present to a chiropractic clinic with a variety of clinical presentations including lower back or hip pain, a painful limp, knee pain or little to no symptoms. The classic symptoms of SCFE include hip, groin or proximal thigh pain but a minority of patients may present with distal thigh or knee pain.^{1,4} In a retrospective study,⁵ it was found that 15% of patients presented clinically with knee pain and 85% presented with hip pain. When the patient presents with knee pain and does not present with hip pain, the clinician may overlook SCFE as a cause, instead focusing the examination to the knee joint. This in turn may lead to a delay in diagnosing a potential SCFE. A delay in diagnosis can lead to further slip of the femoral epiphysis on the femoral neck and progression of deformity.⁶

Degenerative osteoarthritis (OA) of the hip in patients

with SCFE typically develops gradually over several decades. The risk of OA increases and occurs at an earlier age of onset according to the severity of the SCFE, thereby reiterating why an early diagnosis is so important.^{1,7} The most severe complication that can result from a delayed diagnosis is damage of the arterial supply to the femoral epiphysis leading to avascular necrosis (AVN).^{6,8} Patients with AVN exhibit a more rapid osteoarthritic hip joint deterioration and require reconstructive procedures such as total hip replacement earlier in adulthood. Chondrolysis or acute cartilage necrosis occurs in approximately 5 to 7% of SCFE cases.⁸ The incidence of chondrolysis increases with increasing slip severity, thereby again reinforcing the importance of an early and accurate diagnosis. In approximately 50% of these cases, the hip joint regenerates. In other cases, the chondrolysis may progress leading to degenerative OA and/or debilitating pain requiring surgery. Therefore, SCFE should always be considered in the differential diagnosis when a child or adolescent patient presents clinically with a history of an intermittent limp and/or hip, thigh or knee pain. The prognosis is good in early diagnosis of SCFE.^{1, 6–8}

When the clinician suspects or is investigating for a potential SCFE, the examination should include a focused assessment of the hip joint. Physical examination including range of motion (ROM) and orthopedic testing typically will reveal limited and painful hip ROM with internal rotation, flexion and abduction.¹ Radiographically, SCFE is characterized by the presence of widening and blurring of the margins of the epiphyseal plate, loss of height of the femoral epiphysis and non-intersection of Klein's line, a line drawn tangentially along the lateral femoral neck, with the lateral aspect of the femoral epiphysis (Figure 1).⁹ The standard radiographic views to be taken include AP (anterior to posterior) with the patient weight bearing and Frog-leg (patient's femur externally

Figure 1 Diagram showing Klein's line. A normal Klein's line is drawn on the right of the diagram showing intersection with the lateral aspect of the femoral epiphysis. An abnormal Klein's line is on the left depicting a slipped capital femoral epiphysis (SCFE). (Source: Reprinted with permission from T.R. Yochum and L.J. Rowe, *Essentials of Skeletal Radiology*, 2nd ed., p. 719, J.P. Butler, © 1996 Williams & Wilkins.)



rotated) radiographs. Traditional medical management of SCFE is in situ surgical pinning of the femoral epiphysis to the femoral metaphysis.^{4,10} Surgical pinning is designed to stop further slip progression and deformity thereby reducing the risk and degree of osteoarthritis later in life.

Presented here is a case of an undiagnosed SCFE that with proper examination and radiographic investigation was subsequently detected in a chiropractic office.

Case Report

History

A 16-year-old Caucasian adolescent male presented with a chief complaint of right-sided hip/lower back pain of 18 months' duration. The onset of pain was insidious. Dejerine's Triad (i.e. pain with coughing, sneezing or bearing down during a bowel movement) was negative. The patient denied any neurological symptoms. Standing up from a seated position, walking, bending forward at the waist and lying on his right side were all provocative. The patient denied any palliative factors. The severity of

pain was graded as an 8 on a visual analog pain scale of 10, with 10 being the worst possible pain. The patient denied any radiation or referral of the pain. The frequency of pain was intermittent and tended to be worst first thing in the morning. The patient denied any ominous findings such as unexplained weight loss/night pain, fever/night sweats, blood loss or bowel/bladder dysfunction.

A radiologist's report of AP and Frog-leg radiographs taken at a medical imaging facility seven months earlier noted "minimal widening of the right femoral epiphyseal plate." In conclusion however, the films were subsequently read as "unremarkable" (Figure 2). The radiologist recommended a follow-up x-ray if the symptoms persisted. The patient's family physician diagnosed the patient with tendonitis. On close inspection of the radiographs, a mild slip of the femoral epiphysis on the metaphysis can be seen when measured with Klein's line. There is also widening of the epiphyseal plate and the right epiphysis appears smaller than the left.

The patient's past musculoskeletal history included a fall onto the tailbone from a six-foot wall four years prior. The patient received physiotherapy for this injury and had not received any other treatment for his current chief complaint. The patient's mother had a history of bilateral SCFE with surgical reduction (via in situ pinning) as an adolescent. She was also a patient at the chiropractic clinic for other musculoskeletal ailments and subsequently brought her son in for evaluation and a second opinion.

Examination Findings

Physical examination revealed a well-developed, well-nourished endomorphic male with a slight antalgic lean to the left. Bilateral subtalar overpronation was also noted on postural examination. Motion and static palpatory examination revealed joint restriction/malposition of the sacroiliac joints, bilaterally. Specifically, the posterior superior iliac spine (PSIS) was in an anterior-superior malposition (flexion restriction) on the right and posterior-inferior on the left (extension restriction). Prone leg length check revealed a functional short leg on the left. The lumbar range of motion (ROM) was restricted in active flexion and extension with pain on extension. The right hip joint ROM was restricted and very painful in passive flexion and internal rotation.

Orthopedic testing was positive for right hip joint pain with Hibb's (i.e. patient prone and knee is passively

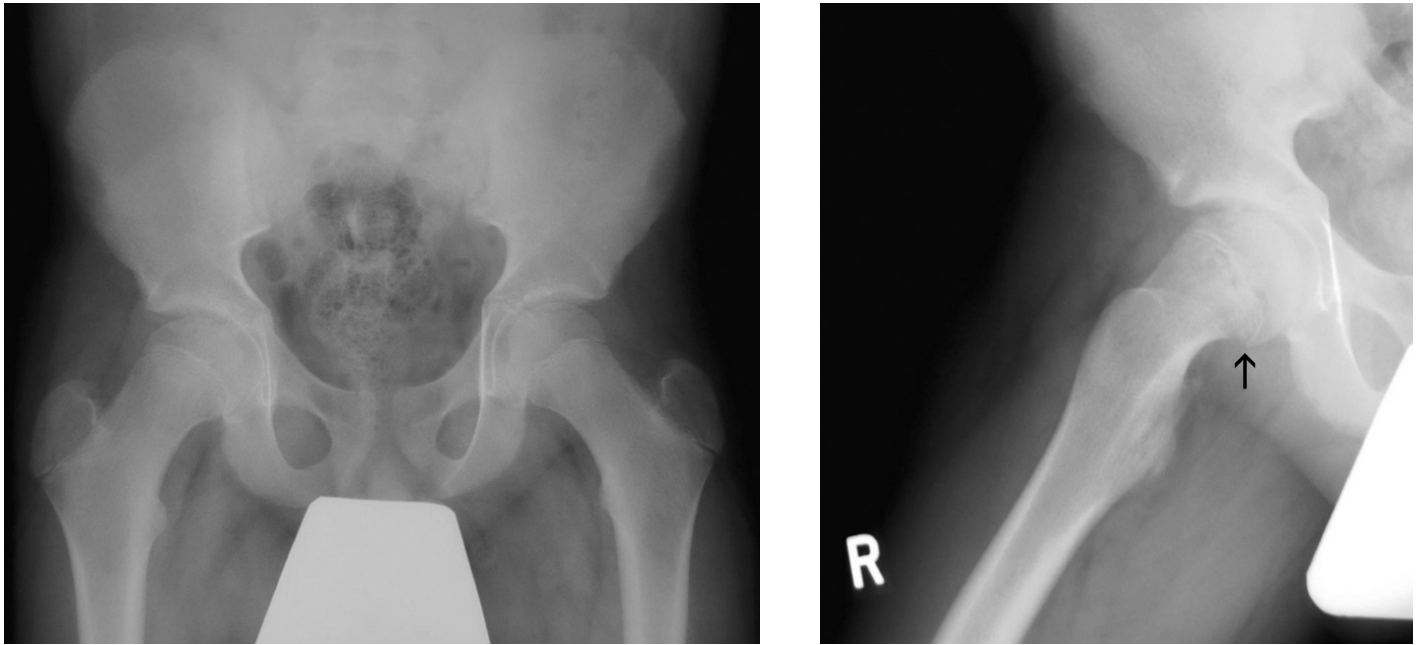


Figure 2 AP pelvis and Frog-leg right hip radiographs taken at a medical imaging facility seven months prior to presentation to the chiropractic clinic. The radiographs were read as “unremarkable” by the medical radiologist. On close inspection, the radiographs reveal mild SCFE of the right hip. (Note the small arrow drawn and pointing to the inferior aspect of the femoral epiphysis on the Frog-leg view.)

flexed approximating calcaneus with gluteal region), Yeoman’s (i.e. patient is prone and hip joint is passively extended while practitioner also applies pressure to the ipsilateral sacroiliac joint) and Fabere-Patrick’s (i.e. patient is supine and hip joint is passively abducted while the femur is in an externally rotated position). Supine leg length testing using Allis’ sign revealed no gross anatomical leg length discrepancy. Orthopedic testing including Kemp’s, Nachlas’ and Ely’s were all negative for hip and sacroiliac joint pain.

AP and Frog-leg radiographs were then taken at the chiropractic clinic (Figure 3). Measurement using Klein’s line (depicted on films) revealed posteromedial displacement of the capital femoral epiphysis on the metaphysis of the right femur. This displacement was more pronounced on the Frog-leg view of the patient’s right hip. Other radiographic findings included a smaller right capital femoral epiphysis when compared to the left side and mild thickening of the capital epiphyseal growth plate of

the right femur. The patient was diagnosed with a slipped capital femoral epiphysis (SCFE) of the right femur.

Plan of Management & Results

The patient was referred back to his family physician with a recommendation for orthopedic surgical consultation. Following a second radiographic examination at the request of the orthopedic surgeon, the medical radiologist subsequently confirmed the SCFE (Figure 4). The patient was then successfully treated with surgical reduction via in situ pinning of the right femoral epiphysis.

Discussion

The typical management for SCFE once it is diagnosed is surgical reduction by pinning the slipped femoral epiphysis to the metaphysis in situ.^{1,4,10} Because surgery is the treatment of choice for SCFE, there is very little scientific literature on conservative treatment approaches including chiropractic management. In general it is taught in

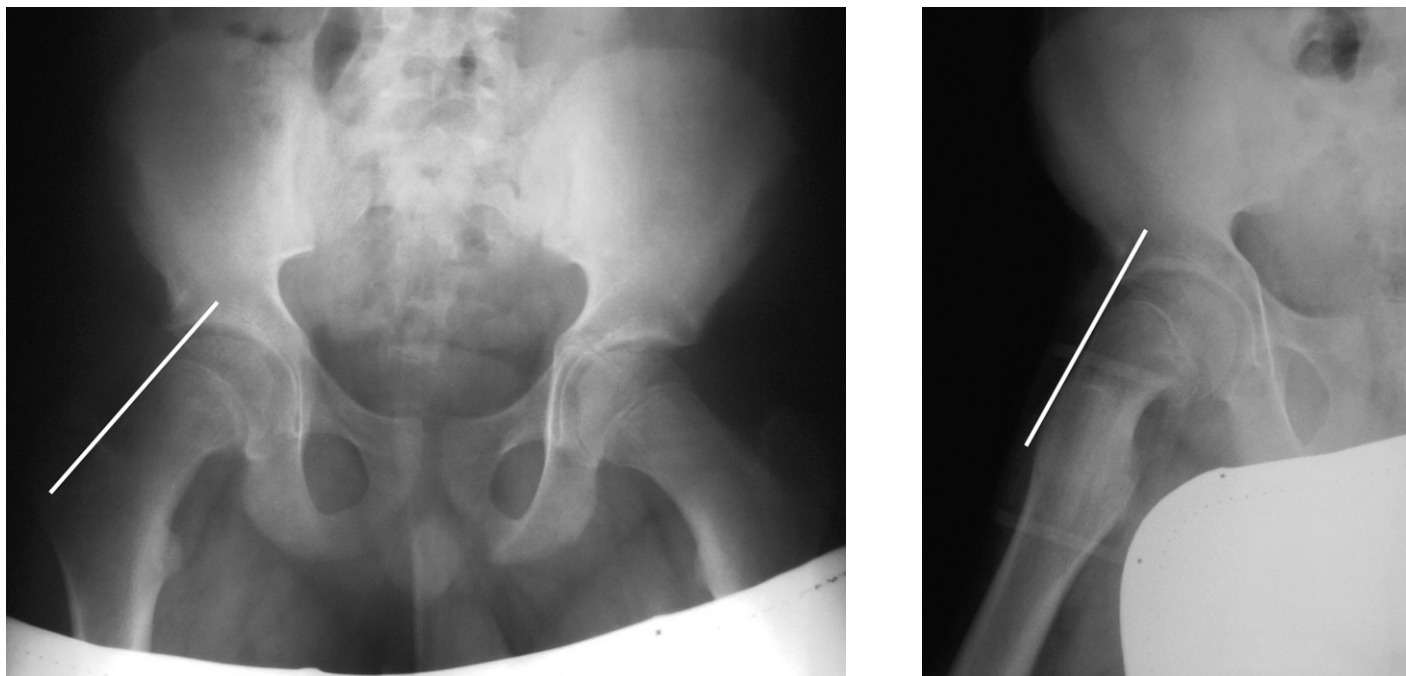


Figure 3 *AP pelvis and Frog-leg right hip radiographs taken at the chiropractic clinic revealing a SCFE of the right hip. (Klein's line is depicted on both films.)*

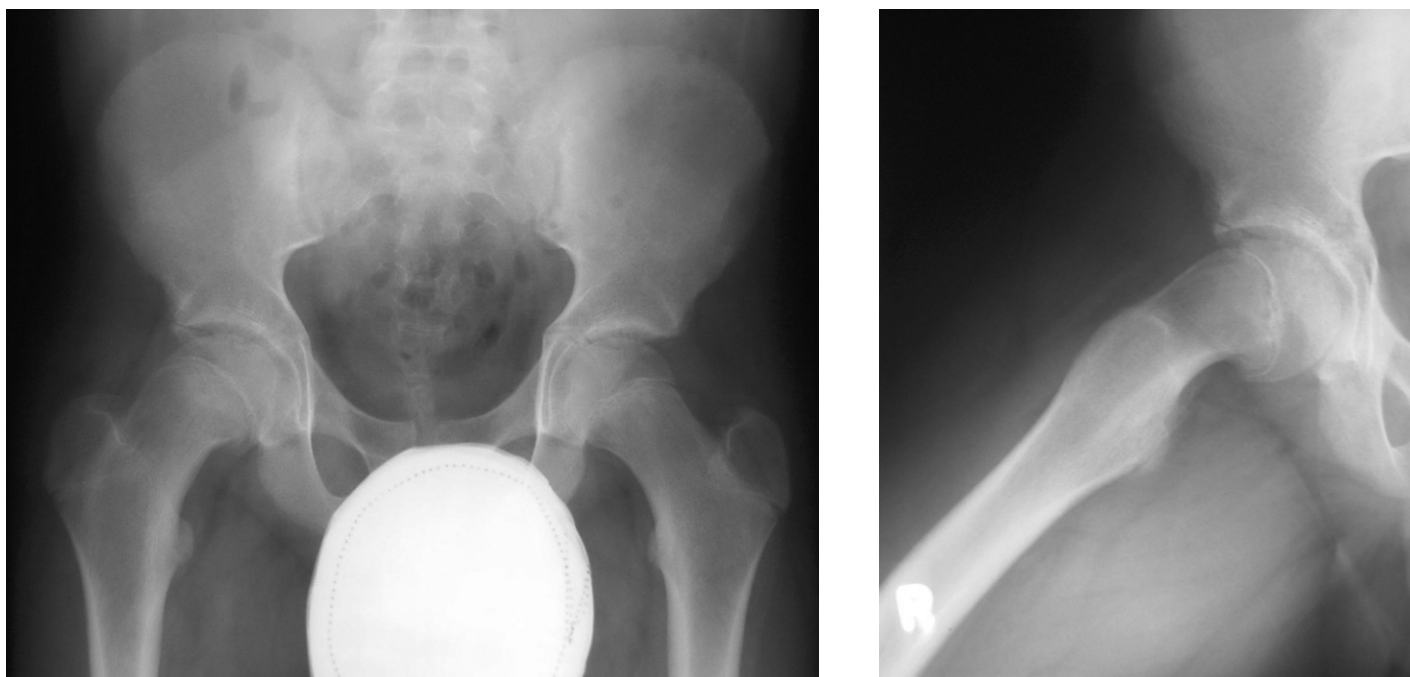


Figure 4 *Repeat AP pelvis and Frog-leg right hip radiographs requested by the orthopedic surgeon and taken at a medical imaging facility to confirm the SCFE.*

chiropractic that SCFE is a contraindication to high-velocity, low-amplitude (HVLA) manipulation (i.e. long axis distraction manipulation) of the hip joint. The contraindication is due to the potential increased risk of damaging the arterial supply to the femoral epiphysis leading to avascular necrosis (AVN).

In the medical literature, the use of manipulation in combination with surgical procedures for SCFE is controversial, particularly in cases of acute slips.¹¹ Studies have shown complications with AVN and chondrolysis in 20 to 31% of patients who underwent preoperative manipulation.^{7,12,13} In contrast, only 6% of patients who did not undergo manipulation prior to surgical fixation developed AVN.⁷ Conversely, research has also shown that preoperative manipulation can be safe^{14,15} and when an acute slip is reduced early (<24 hours), the AVN risk may actually decrease.¹⁴ This is because during an acute slip, the metaphysis displaces superolaterally and the femur rotates externally, causing twisting or kinking of the major arteries (i.e. the posterosuperior retinacular and lateral epiphyseal vessels) supplying the epiphysis.¹⁴ In an angiographic study, Maeda and colleagues¹⁶ showed that the superior retinacular artery circulation was regained after reduction. They concluded that the vascular damage may occur during the initial injury, before reduction, and that manipulative reduction does not necessarily lead to AVN. In addition, other research studies have shown that traction to reduce the SCFE prior to surgical fixation is safe and effective.^{17,18} However, given the risks of manipulation-associated AVN and chondrolysis, HVLA manipulation of the hip joint in a chiropractic office should continue to be taught as contraindicated for the SCFE patient. The most appropriate course of action for the chiropractor is surgical referral.

Post-operative treatment of patients with SCFE typically includes non-weight bearing of the involved hip as the patient remains in crutches for four to six weeks.^{1,4} Surgeons often prescribe gentle toe touching exercises for the patient as well while in crutches followed by a gradual return to normal daily activities after the minimum four to six week period. Once the epiphyseal growth plate has closed, weight bearing and contact sports can be resumed. It is unclear what role the chiropractor can play in the immediate and/or long-term post-operative treatment of patients with SCFE as no research has been done in this area. The chiropractic clinician's

best clinical judgement should be used when treating patients with a history of surgically reduced SCFE.

Besides the risk of complications with AVN and chondrolysis, the prognosis of children and adolescent patients with SCFE who are diagnosed early and surgically treated is good.^{1,4} The major long-term consequence of SCFE, particularly with a delay in diagnosing the condition, is the likelihood of degenerative osteoarthritis of the involved hip. The degree of degenerative arthritis typically depends upon the severity of the SCFE, hence the importance of an early diagnosis. Kocher et al.¹⁹ found that in their study of 196 SCFE patients, the median delay in diagnosis was 8.0 weeks. A longer delay in diagnosis was associated with greater slip severity and identified in patients with primarily knee/distal-thigh pain (compared with those with primarily hip/proximal-thigh pain). Other studies have also suggested that knee or distal thigh pain is a risk factor for delay in diagnosis.^{5,20,21} Mild slips being missed on radiographs by inexperienced surgeons or by radiologists can also delay the diagnosis.²⁰ Treating osteoarthritic symptoms is possibly one way in which the chiropractor could play a role in the long-term management of patients with a history of SCFE. At this point in patient management, HVLA long axis distraction of the arthritic hip joint could be more safely considered. Again however, the clinician's best clinical judgement should be used.

Conclusion

SCFE is a somewhat rare condition but can present in a chiropractic office, particularly one with a musculoskeletal scope of practice. When present, SCFE is typically seen in adolescents during their early growth spurt. The classic symptoms are hip or groin pain but a minority of SCFE patients may present with only knee pain. The clinical presentation may or may not include a history of trauma and/or a painful limp. Physical examination findings typically include painful hip joint ROM in internal rotation, flexion and abduction. The characteristic plain film radiographic findings utilizing the standard AP and Frog-leg radiographic views include widening and blurring of the margins of the epiphyseal plate, loss of height of the femoral epiphysis and non-intersection of Klein's line with the lateral aspect of the femoral epiphysis. The most appropriate plan of management for a patient with SCFE is referral to an orthopedic surgeon for in situ sur-

gical pinning. Early diagnosis of SCFE is important as this reduces the risk of further slippage of the femoral epiphysis, risk of complications such as AVN and chondrolysis and degree of degenerative osteoarthritis in the involved hip later in life.

Presented in this case report was an undiagnosed case of SCFE. It was detected in a chiropractic clinic through proper clinical examination and radiographic evaluation. The patient was referred back to his family physician with the diagnosis and a recommendation for orthopedic surgical referral. The patient was subsequently treated successfully with surgical reduction of the SCFE by in situ pinning. The diagnosis and appropriate management of the SCFE patient is where the chiropractor has an important role to play in the management of this condition. More research is necessary to determine the role, if any, that a chiropractor can play in the immediate and/or long-term management of the SCFE patient, particularly post-operatively.

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