Sonographic Evaluation of Snapping Hip Syndrome

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Snapping hip syndrome is characterized by a painful, palpable, and sometimes audible snap caused during certain movements of the hip.1 Painless occasional snapping phenomena can occur in asymptomatic people.2–4 These episodes are considered physiologic occurrences and should not be a cause for concern, nor should they be investigated.

The pathophysiologic mechanisms of snapping hips are diverse, and the exact cause of the painful anatomic conflict or snap may be difficult to identify with diagnostic tests. Although imaging techniques such as radiography, computed tomography, and magnetic resonance imaging (MRI) may yield useful and complementary information in these patients, sonography, with its high resolution and dynamic capabilities, is the imaging modality of choice in the investigation of snapping hip syndrome.5–8

Popularized at the turn of the 20th century, the term snapping hip referred to the snapping of the iliotibial band on the greater trochanter until Nunziata and Blumenfeld9 published a series of 3 patients with internal snapping hip involving the iliopsoas tendon in 1951. In 1995, Allen and Cope10 proposed a classification for snapping hip syndrome that distinguished intra- and extra-articular causes. According to this classification, various lesions, such as synovial chondromatosis, loose bodies, labral tears, synovial plicae, and chondral defects, may present with snapping or catching symptoms, caused by movement of the hip joint. These symptoms are usually of low intensity and differ considerably from the more powerful snapping typical of the extra-articular type. Consequently, it is probably more appropriate to reserve the term snapping hip syndrome for the extra-articular causes.11

The extra-articular type of snapping hip syndrome comprises 3 categories (Table 1): internal, which involves the musculotendinous iliopsoas unit; external, which involves the iliotibial band and the gluteus maximus muscle10; and posterior, which is less common and involves the ischiofemoral region.12–15 Sonographic evaluation of this last entity has not been reported to date.

The Sound Judgment Series consists of invited articles highlighting the clinical value of using ultrasound first in specific clinical diagnoses where ultrasound has shown comparative or superior value. The series is meant to serve as an educational tool for medical and sonography students and clinical practitioners and may help integrate ultrasound into clinical practice.
Internal Snapping Hip Syndrome

Internal snapping hip syndrome affects predominantly young adults, especially women, athletes, and, more specifically, ballet dancers. Activities requiring repeated hip abduction movements, such as ballet dancing, martial arts, and gymnastics, increase the risk. In a study involving 87 dancers from the National Ballet of Canada, 91% of the dancers presented with snapping hip phenomena. In 80% of the dancers, both hips were affected, and in 58% of cases, painful symptoms were associated with the snapping hip.16

The musculotendinous unit of the iliopsoas is most often involved in causing internal snapping hip syndrome. The anatomy of the iliopsoas is complex and important to know to understand the physiologic characteristics and, secondarily, the pathophysiologic mechanisms of internal snapping hip syndrome.17 This anatomy has been recently redefined by cadaver studies18 and detailed using MRI.19,20 Furthermore, using static and dynamic sonography, Guillin et al2 documented the sonographic anatomy of the iliopsoas at the inguinal level and its physiologic motion during flexion-abduction-external rotation followed by extension of the hip in 21 asymptomatic volunteers (Figure 1 and Video 1). Interestingly, the authors found a snapping hip phenomenon in 40% of this asymptomatic sample.

The initially proposed pathophysiologic mechanism of internal snapping hip was impingement of the iliopsoas tendon on the iliopsoalectemial eminence or the lesser trochanter.1,3 However, this presumed mechanism has never been shown by direct visualization of the anatomic structures on imaging, and it remains hypothetical. Sonography has helped identify various pathophysiologic mechanisms underlying internal snapping hip.7,8,16,21 The most frequently reported mechanism is snapping of the psoas major tendon on the superior pubic ramus after release of the medial fibers of the iliacus muscle. During flexion-abduction-external rotation of the hip, the medial fibers of the iliacus muscle become confined between the psoas major tendon and the superior pubic ramus. On extension and adduction of the hip, the medial fibers of the iliacus muscle suddenly free themselves from this position, which causes the psoas major tendon to return abruptly against the superior pubic ramus, generating a painful snap (Video 2). Other mechanisms that have been reported to cause painful snapping hip include the conflict between the two components of a bifid psoas major tendon,7,22 snapping of the psoas major tendon at the level of the anteroinferior iliac spine while in the flexion-abduction-external rotation (frog leg) position, and impingement of the psoas major tendon on a paralabral cyst.7

The terms iliopsoas tendon and psoas major tendon have been used interchangeably in the medical literature. At the level of the superior pubic ramus, the tendon involved in the snapping mechanism is the psoas major. The accessory tendon of the iliacus muscle and the psoas major tendon merge distally to the superior pubic ramus to form the iliopsoas tendon.18

A painful snapping iliopsoas tendon can occur in patients with total hip arthroplasty. This infrequent complication of total hip arthroplasty tends to become apparent during the postoperative period. The most common cause is overlap of the prosthetic cup at the anterior acetabular margin, over which the iliopsoas tendon extends as it leaves the pelvis.23,24 Other causes include lengthening and consequent tension on the iliopsoas tendon caused by a prosthetic femoral neck that is too long, the presence of cement debris in front of the acetabular cup, and acetabular cup screws or bone grafts protruding from the acetabulum.25,26

The sonographic examination of the internal hip compartment begins with a static evaluation in the longitudinal and transverse planes, using a multifrequency 5–12 MHz linear array transducer with the patient lying supine (Figure 1). In some patients with larger body habitus, the use

Table 1. Causes of Snapping Hip Syndrome

<table>
<thead>
<tr>
<th>Internal</th>
<th>External</th>
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<tr>
<td>Psoas major tendon snapping on the superior pubic ramus after release of the medial fibers of the iliacus muscle from a transient position between the psoas major tendon and the superior pubic ramus</td>
<td>Friction of the iliobibial ligament on the femoral head (to date, this presumed mechanism has not been shown by direct visualization on imaging)</td>
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<tr>
<td>Psoas major tendon impingement on an anterior paralabral cyst</td>
<td>Venous hemangioma of the gluteus maximus muscle</td>
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<td>Conflict between the two components of a bifid psoas major tendon</td>
<td>Posterior subluxation of the tendon of the long head of the biceps femoris muscle (to date, this mechanism has not been shown by direct visualization on imaging)</td>
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<tr>
<td>Iliopsoas tendon impingement on the iliopsoalectemial eminence</td>
<td>Ischiofemoral impingement with abnormalities of the quadratus femoris muscle (to date, this mechanism has not been shown by direct visualization on imaging)</td>
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<tr>
<td>Iliopsoas tendon impingement on a protruding acetabular component of total hip arthroplasty</td>
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of a 3–5-MHz curvilinear transducer may be indicated. Although infrequent in the presence of internal snapping hip syndrome, anomalies such as iliopsoas tendinopathy, bursitis, coxofemoral synovitis, and a paralabral cyst are systematically sought.4,7,8 During the dynamic evaluation, the transducer is applied firmly and maintained in an oblique transverse plane between the anteroinferior iliac spine and the superior pubic ramus. The movement of the psoas major tendon and iliacus muscle is observed on real-time sonography while the patient executes a motion of flexion-abduction-external rotation, followed by extension and adduction of the hip. In most cases, this motion will elicit the snapping, but patients may also be asked to perform any other movements that they know will reproduce the snapping symptoms. Given that the movements of structures are usually rapid and complex, it is often useful to make a video recording of the dynamic study to be able to review the images more closely.

The investigation of the painful hip should begin with radiographs of the pelvis and hip to exclude congenital, traumatic, or neoplastic osseous lesions as well as inflammatory, degenerative, or dysplastic joint disease. A sonographic examination should be performed if a snapping phenomenon is present. Because sonography is not degraded by metallic artifacts, it is especially useful in patients with total hip arthroplasty to evaluate the iliopsoas tendon.28 Computed tomography can also be useful in investigating patients with total hip arthroplasty to show the relationship between the prosthesis, the bone structures, and the iliopsoas tendon.29 Other causes of painful hip, including synovial chondromatosis, loose bodies, labral tears, synovial plicae, chondral defects, transient

Figure 1. Dynamic sonographic examination of internal snapping hip syndrome. A, The patient is supine. The probe is placed in a transverse oblique plane between the anteroinferior iliac spine and the superior pubic ramus to examine the iliopsoas musculotendinous complex in real time while the patient executes a motion of flexion-abduction-external rotation of the hip, followed by extension and adduction. B, Transverse oblique sonogram at the level of the superior pubic ramus (SPR) with the hip in extension-adduction (neutral position) showing the psoas major tendon (PT) and muscle (asterisk), the medial fibers of the iliacus muscle (MFI), the lateral fibers of the iliacus muscle (LFI), and the accessory tendon (arrow), which originates from the medial fibers of the iliacus muscle. C, Transverse oblique sonogram, slightly more lateral than B, centered on the anteroinferior iliac spine (AIIS) while the hip is in flexion-abduction-external rotation. D, Transverse oblique sonogram at the level of the superior pubic ramus showing the components of the iliopsoas musculotendinous complex coming back toward their resting position while the hip is brought back in the extension-adduction position.
subluxation of the femoral head, and femoroacetabular impingement, will be more appropriately evaluated with conventional MRI or MR arthrography.30,31

Initially, treatment of internal snapping hip syndrome is conservative and may include rest from sporting activities, stretching exercises, and nonsteroidal anti-inflammatory drugs. Sonographically guided corticosteroid injections in the iliopsoas bursa may be beneficial.32,33 In cases refractory to conservative treatment, arthroscopic iliopsoas tendon release has been shown to be effective.34,35

External Snapping Hip Syndrome

External snapping hip syndrome is caused by an abnormal “jerky” movement or transient subluxation of the junction between the iliotibial band and the anterior margin of the gluteus maximus muscle over the greater trochanter.6 This condition usually occurs with no apparent extrinsic cause, although external snapping hip has been reported in the presence of a femoral osteochondroma36 and a venous malformation of the gluteus maximus muscle.37

This entity, described by Mayer38 in 1919, is usually diagnosed clinically. Young adults, especially athletes, are at increased risk.10 Dynamic sonography can show the abrupt abnormal movement of the structures causing the painful snapping in these patients. The sonographic evaluation of the external compartment of the hip is performed with the patient in the lateral decubitus position, lying on the asymptomatic side (Figure 2). The static evaluation of the muscular and tendinous structures and peritrochanteric bursas is conducted with a multifrequency 5–12-MHz linear array probe in the longitudinal and transverse planes. In the presence of painful snapping, a thickened and hypoechoic iliotibial band6 and a thickened and inflamed greater trochanteric bursa,39 can be detected. During hip flexion and extension, the iliotibial band and anterior margin of the gluteus maximus muscle glide gently, anteriorly (during flexion) and posteriorly (during extension), over the lateral facet of the greater trochanter. In the presence of external snapping, during the early phase of flexion, the iliotibial band and gluteus maximus are restrained transiently against the posterolateral aspect of the greater trochanter. As the degree of flexion increases, the iliotibial

Figure 2. Dynamic sonographic examination of external snapping hip syndrome. A, The patient is in the lateral decubitus position. The probe is placed in a transverse position on the greater trochanter to examine the movement of the anterior margin of the gluteus maximus muscle and the iliotibial band over the lateral facet of the greater trochanter in real time while the patient executes motions of flexion and extension of the hip. B, Transverse sonogram at the level of the greater trochanter during hip flexion showing the anterior margin (long arrow) of the gluteus maximus muscle (GM) and the iliotibial band (short arrow) moving anteriorly over the gluteus medius tendon (single asterisk), which inserts on the lateral facet (LF) of the greater trochanter. The gluteus minimus tendon (double asterisks) inserts on the anterior facet (AF) of the greater trochanter. C, Transverse sonogram at the level of the greater trochanter during hip extension. The gluteus maximus muscle (long arrow) and the iliotibial band (short arrow) move posteriorly relative to the lateral facet of the greater trochanter.
band and gluteus maximus are suddenly released, moving forward abruptly over the anterior edge of the lateral facet of the greater trochanter while generating the snapping (Video 3). These patients may sometimes need to be examined while standing and leaning on the symptomatic side to provoke the snapping. In this position, the symptomatic hip is in adduction, and the iliotibial band is pressed firmly against the posterolateral aspect of the greater trochanter. As the hip flexes, the iliotibial band tightens and then abruptly completes an anterior translation, causing the snapping. Snapping may also occur during hip extension while the iliotibial band and the anterior margin of the gluteus maximus muscle are moving posteriorly over the greater trochanter.

Conservative management, including rest, stretching exercises, and nonsteroidal anti-inflammatory drugs, is considered the mainstay for the treatment of lateral snapping hip syndrome. Sonographically guided corticosteroid injections in the greater trochanteric bursa may be beneficial. Surgery is considered for patients refractory to this regimen. Various surgical techniques for iliotibial band plasty and fibrous band release of the gluteus maximus are used and generally provide good clinical results.39,40

Conclusions

Snapping hip symptoms must be investigated when they cause discomfort or pain. Combined with radiography of the pelvis and hip, dynamic sonography is the imaging modality of choice in this clinical setting, allowing correlation of the snapping phenomenon with the abnormal movement of an underlying structure and the patient’s symptoms. The differential diagnosis of snapping hip syndrome includes intra-articular lesions, which are more appropriately investigated with MRI or computed tomography.

References


