Ultrasound-Guided Intervention Around the Hip Joint

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OBJECTIVE. The purpose of this article is to review some of the most common reasons for ultrasound intervention around the hip joint, and describe the techniques involved.

CONCLUSION. Ultrasound alleviates the need for exposure to radiation and is already the modality of choice for aspiration of the hip joint, an intervention that may be helpful in guiding antimicrobial therapy and help avoid the need for surgical intervention. Ultrasound can also be used to access the hip for diagnostic or therapeutic injection.

Ultrasound of the adult hip is a commonly performed investigation that may be used to assess for both intra- and extraarticular pathology. Common findings include joint fluid, bursitis, hematoma, and paralabral cyst formation. Increasingly, ultrasound is being used to guide intervention around the hip joint for both diagnostic and therapeutic purposes. Ultrasound alleviates the need for exposure to radiation and is already the modality of choice for aspiration of the hip joint [1], an intervention that may be helpful in guiding antimicrobial therapy and help avoid the need for surgical intervention. Ultrasound can also be used to access the hip for diagnostic or therapeutic injection [2]. Guided injection of the greater trochanteric bursa or the iliopsoas tendon bursa may have enormous therapeutic benefits to the patient without the need for surgery or exposure to ionizing radiation. We review some of the most common reasons for ultrasound intervention around the hip joint: intraarticular injection, aspiration of joint fluid for both therapeutic and diagnostic purposes, injection of trochanteric or iliopsoas bursitis, and treatment of the symptomatic snapping hip. We describe the techniques used at our institution for these ultrasound-guided interventions, along with tips to aid a successful procedure.

Intervention Technique

In many cases, diagnostic ultrasound will be performed at the same appointment as any appropriate intervention. With modern equipment, a high-frequency linear probe can be used to image the hip joint, typically with frequencies around 9–15 MHz depending on patient body habitus. Occasionally, a lower-frequency probe may be required if the patient is obese.

Providing an aseptic environment is of paramount importance in minimizing the introduction of infection, particularly when injecting into the joint itself. This essentially involves using sterile gloves and probe covers; cleaning of the skin with an antiseptic skin preparation, such as chlorhexidine solution; and ensuring the needle tip passes through the cleaned area of skin, avoiding any areas of broken skin or overlying infected areas. With the probe positioned over the hip joint in the sagittal plane, the femoral head is visualized and just superior to it, the acetabular roof and acetabular labrum. The labrum is a hyperechoic triangular structure attached to the brightly hyperechoic bone of the acetabulum (Fig. 1).

There are several important factors to consider that will aid a successful ultrasound guided procedure. Namely, always know where the needle is, have a good knowledge of the surrounding anatomy, and only inject when the tip of the needle is visible. The crucial factor in keeping the needle visible on the screen is to keep the probe and the needle in the same place throughout the procedure. However, it is important to realize that the needle is best visualized when the needle and probe face are parallel. With increasing angle of insonation, the visualization of the needle becomes less clear and may even become invisible due to the reflection of sound.
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One of the most common indications for ultrasound of the adult hip is the detection and aspiration of a joint effusion. Pain in the groin or medial thigh, pain aggravated by lying on the side, decreased extension or internal rotation or abduction or flexion, painful external rotation, and pain on palpation in the groin showed a significant relation (adjusted for age and radiologic osteoarthritis of the hip) with ultrasonic hip joint effusion [4]. The most common reason for aspiration in the hip is for the diagnosis of infection. However, reliance on the ultrasound appearance of the effusion is not sufficient to distinguish between infection and a simple effusion. Pus can appear anechoic, and a complex appearance to the effusion does not reliably indicate sepsis (Fig. 5). The presence of a joint effusion is confirmed by an increased volume of fluid in the anterior recess. This is usually measured in the oblique sagittal plane along the line of the femoral neck and should be compared with a measurement from the contralateral side (Fig. 6). The normal distance from femoral neck to the capsule has been described as between 4 and 10 mm. It can sometimes be difficult to differentiate thickened synovium from joint effusion because both have similar appearances on ultrasound. If this is the case, asking the patient to move the hip is helpful because this will disperse an effusion around the joint, whereas synovial thickening would remain constant in appearance. Aspiration of joint effusion is not always necessary and should be confined to patients in whom there is a high clinical suspicion of sepsis.

Ultrasound-Guided Aspiration of the Hip

Injection of the hip joint is undertaken for a variety of reasons. Inflammatory arthritides may be treated with direct injection of cortisone into the hip. Similarly, symptomatic relief of osteoarthritis may also be achieved. Frequently, it is unclear whether a patient’s symptoms are due to hip pathology, for instance if the patient has both hip osteoarthritis and degenerative change in the spine. In this situation, a diagnostic injection of long-acting...
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anesthetic into the hip can help make the distinction. We also make use of ultrasound guidance for the injection of contrast material for MRI arthrography. In this instance, the technique is essentially the same as for therapeutic injection, with contrast medium instilled into the joint as opposed to local anesthetic and steroids. The introduction of contrast material for arthrography can be combined with diagnostic anesthetic injection if required.

Aspiration and Injection Technique

For both injection into the hip joint and aspiration of the hip joint the patient should be positioned supine and the transducer placed in the longitudinal oblique plane along the axis of the femoral neck to examine the anterior recess and confirm the presence of effusion (Fig. 6). Intervention can be performed either in the axial or sagittal plane. In our institution, the axial plane is preferred because it allows the needle to be introduced almost parallel to the probe face. This technique also means the skin puncture is made laterally, well away from the medially located neurovascular bundle. This enables the operator to place the needle and then confirm position with the sterile probe. For aspiration, the needle should be placed into the deepest pool of fluid within the joint and aspirated into a sterile syringe. Samples should be sent for culture and sensitivity. Aspiration should be as complete as possible to maximize relief of symptoms.

As with aspiration of the hip, we prefer an axial approach to the hip joint for injection. The femoral head is identified and the probe is then positioned to obtain an axial view through the head. Sweeping the probe distally identifies the junction of the femoral neck and head in the axial plane, which is the point targeted for the injection. The needle is introduced from the lateral side along the long axis of the probe and as parallel to the probe face as is feasible. When the needle is seen (and felt) to contact the bone, it will lie within the joint on the anterolateral aspect of the head–neck junction (Fig. 7). A sterile technique is again of paramount importance, and marking the skin at the appropriate needle entry point before preparing the sterile equipment is helpful. A combination of local anesthetic and steroids should be prepared in the same syringe. The injectate should be placed into the anterior recess at the femoral head–neck junction (Fig. 8). Unless the examination is being undertaken for arthrography,
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It is helpful to inject a little air at the start of the injection. This is easily seen on ultrasound and confirms the intraarticular location of the injection. If the patient is to undergo MRI arthrography, the presence of air is to be avoided because it may be confused for pathology, such as intraarticular loose bodies.

The patient should be warned that there might be an aching sensation in the hip in the 24 hours after injection and, when corticosteroids are injected, that the maximal therapeutic benefit may not be experienced for several days after the procedure.

Ultrasound-Guided Injection of the Greater Trochanteric Bursa

Trochanteric bursitis is a relatively common condition affecting physically active patients and usually presenting with pain to the lateral aspect of the hip, particularly on walking. This condition either occurs secondary to an injury—usually overuse injury—or more rarely as a manifestation of rheumatoid arthritis. Traumatic injury includes bursal irritation as a result of the iliotibial band moving over the bursa repetitively and is usually seen in athletes. The trochanteric bursa is best thought of as a bursal complex with bursae present between the gluteal tendons. The trochanteric bursa itself is often described as being situated between the iliotibial tract and the gluteal tendons (Fig. 9). In addition there is a subgluteus medius bursa beneath the gluteus medius tendon, and similarly, a subgluteus minimus bursa. Inflammation of any of these bursae will present with lateral hip pain. The gluteus medius and gluteus minimus muscles have been described in the literature as the “rotator cuff of the hip,” and tendinopathy or tears of these two muscles have also been shown to be present in most patients presenting with trochanteric bursitis [5].

Greater Trochanteric Bursa Technique

The trochanteric bursae are best approached with the patient lying on the side in the lateral decubitus position with the symptomatic side uppermost (Fig. 9A). The bursae are relatively superficial structures and therefore readily accessible. The superficial position also makes keeping the probe face and needle track parallel relatively easy. Both axial and sagittal imaging will show fluid within the bursa, provided not too much pressure is applied with the transducer, which may compress the inflamed bursa. As in assessment of joint effusion, comparison with the contralateral side is useful when findings are equivocal. Again, sterile conditions are essential. A combination of local anesthetic and steroids (typically 40 mg triamcinolone) should be prepared and injected into the fluid collection (Fig. 10).

Ultrasound-Guided Treatment of Iliopsoas Pathology

When the patient moves the hip through certain positions, snapping of the iliopsoas tendon over the iliopubic eminence may cause an audible snap or click that can be painful and felt anteriorly. This condition may occur secondary to previous trauma or injury, particularly overuse injury [6]. The iliopsoas muscle functions as a hip flexor and arises from the...
anterior inferior iliococcygeus muscle and biceps femoris muscle, and inserts into the iliopsoas bursa. A similar sensation is produced by the iliobibial band snapping over the greater trochanter but is felt in a lateral position and usually felt as the hip moves from extension to flexion. Iliopsoas tendinopathy is a recognized complication in patients who have had hip replacement surgery [7]. It may be possible to show impingement of the iliopsoas tendon on a prominent aspect of the hip arthroplasty. It is important to exclude other pathology that may present with similar symptoms, such as labral tears, cartilage defects, and intraarticular loose bodies. Ultrasound can be used to show the iliopsoas muscle flipping over the iliopsoas bursa as shown in video Figure S10A (available in supplemental data at www.ajronline.org). A shows needle (blue arrow) entering tissues proximal to greater trochanter (GT) and greater trochanteric bursa (white arrow), and B shows final position of needle in trochanteric bursa immediately before injection. Needle (blue arrow) is seen clearly with tip in bursa (white arrow).

Fig. 10—Needle position in greater trochanteric bursa in 68-year-old woman. A and B, Sonograms show start (A) and end (B) positions of needle as it is positioned into greater trochanteric bursa as shown in video Figure S10A [available in supplemental data at www.ajronline.org]. A shows needle (blue arrow) entering tissues proximal to greater trochanter (GT) and greater trochanteric bursa (white arrow), and B shows final position of needle in trochanteric bursa immediately before injection. Needle (blue arrow) is seen clearly with tip in bursa (white arrow).

Fig. 11—Snapping iliopsoas tendon in 27-year-old man. A and B, Sonograms show start (A) and end (B) of snapping iliopsoas tendon (IP) (blue arrow) as it flips across iliopsoas tendon on a prominent aspect of the hip arthroplasty. It is important to exclude other pathology that may present with similar symptoms, such as labral tears, cartilage defects, and intraarticular loose bodies.

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Complications after ultrasound-guided intervention at the hip are not common. However, as with every interventional procedure, complications do occasionally occur. The most common include infection both at the puncture site and of the hip joint itself, bleeding into the joint, and injury to the femoral nerve. Allergy to the local anesthetic may present with systemic symptoms of headache, dizziness, circumoral numbness and tachycardia, or local symptoms related to nerve damage, such as paraesthesia or prolonged anesthesia.

Introducing infection into the joint is rare, but if it occurs it may have long-term consequences in terms of damage to the joint. Patients should be informed of this potential complication when giving consent for the procedure to be performed. Aseptic conditions minimize this risk, but patients should be aware that ongoing or worsening symptoms accompanied by redness and swelling around the joint may be a sign of infection.

Bleeding into the joint is minimized by ensuring the international normalized ratio is below 1.5. Patients on anticoagulation therapy should be advised to stop the therapy before the procedure is performed.

Injury to the femoral nerve is rare but is documented in the literature [8]. This is usually temporary and results in diminished sensation over the anterior thigh and inability to flex the hip or put weight on the extremity. One of the major advantages of ultrasound guidance over fluoroscopy for intervention around the hip is that the femoral nerve and other neurovascular structures are well visualized and therefore injury is minimized.

Iliopsoas Technique

With the probe oriented along the femoral head and neck, the iliopsoas tendon can be seen to lie lateral to the neurovascular bundle. The patient is best positioned in the supine position. A combination of local anesthetic and steroids is again required. The approach is similar to that used to inject the hip in the axial plane. By positioning the probe over the bursa or tendon, the needle can be advanced in the lateral side of the thigh, parallel to the probe face, maintaining exquisite visualization. Injection typically comprises 40 mg of triamcinolone mixed with a small amount of lidocaine.

References
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