Sonoarthrography of the Hip Labrum: Ultrasound Evaluation of the Anterosuperior Acetabular Labrum Following Joint Distension with Magnetic Resonance Arthographic Correlation

Taylor J. Stone1*, Niamh Long2, Catherine N. Petchprapa2, Ronald S. Adler2

1Charlotte Radiology, Charlotte, NC, USA
2New York University Langone Medical Center & Hospital for Joint Diseases, New York, NY, USA

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*Corresponding author: Taylor J. Stone, Charlotte Radiology, 1701 East Blvd, Charlotte, NC 28203-5896, Tel: 704-334-7800; Fax: 704-334-7818; E-mail: Taylor.stone@charlotteradiology.com

Abstract

Objective: To determine if the anterosuperior labrum can be accurately evaluated by ultrasound after an intra-articular injection, comparing it to same-day magnetic resonance arthrography.

Methods: This retrospective study included patients referred for ultrasound-guided hip magnetic resonance arthrogram injections. Following injection, patients received ultrasound evaluation of the anterosuperior labrum. Images were retrospectively reviewed. The labrum was evaluated below the rectus femoris, between the rectus femoris and iliopectineus, and below the iliopectineus. In each location, presence or absence of abnormal morphology, labral clefts, or chondrolabral clefts was recorded. Arthroscopy reports were correlated when available.

Results: Twenty six patients received same day injection and magnetic resonance arthrogram. Six patients had arthroscopy. Ultrasound and magnetic resonance arthrogram correlated in 53% of points. When each labrum was divided into three zones, ultrasound demonstrated sensitivity of 0.686 and specificity of 0.160 for labral pathology. Ultrasound showed pathology in all patients below the rectus femoris, and between the rectus femoris and iliopectineus tendons. When limiting evaluation to below the iliopectineus tendon, ultrasound had sensitivity and specificity for labral pathology of 0.650 and 0.667. For labral clefts, ultrasound had sensitivity and specificity of 0.741 and 0.451. For chondrolabral junction clefts, ultrasound reported sensitivity and specificity of 0.578 and 0.303 respectively. For abnormal pathology, ultrasound had sensitivity and specificity of 0.810 and 0.491 respectively.

Conclusions: “Sonoarthrography” appears to be a sensitive examination for detecting labral substance tears and abnormal labral morphology. Post-injection ultrasound adds approximately three minutes to the examination and may supply additional useful diagnostic information.

Keywords: Ultrasound; Sonoarthrography; Magnetic Resonance Arthrography; Acetabular Labrum; Labral Tears

Introduction

Acetabular labral tears are thought to be a common cause of hip pain, with reported prevalence of labral tears in patients with hip or groin pain ranging from 22-55% [1-6]. The diagnosis of labral tear may be clinically challenging, and the differential diagnosis is broad, including contusion, strain, athletic pubalgia, osteitis pubis, inflammatory arthritis, osteoarthritis, septic arthritis, piriformis synovitis, snapping hip syndrome, bursitis, osteonecrosis, fracture, dislocation, tumor, hernia, or referred pain [5,7].

Ultrasound-guided diagnostic anesthetic or therapeutic anesthetic and steroid hip injections are commonly ordered for patients with hip pain, in whom intra-articular pathology is suspected. The rationale is that relief of symptoms after injection of anesthetic confirms an intra-articular pain generator, which includes labral pathology among other etiologies [8]. Studies have demonstrated that fluoroscopic-guided diagnostic hip injections are 88% sensitive and 100% specific for detecting an intra-articular etiology of hip pain [9,10].

For various reasons, a diagnosis of labral tear may have not been established at the time an ultrasound-guided hip injection is performed. Preprocedural imaging is often not available, having not been performed or performed at another institution, and cartilage loss or labral pathology has not been confirmed. Furthermore, magnetic resonance imaging (MRI) and magnetic resonance arthography (MRA) examinations, while the best imaging tests available, are not always definitive.

At our institution, direct MRA is frequently performed following ultrasound-guided intra-articular injection of a dilute gadolinium mixture. Intra-articular contrast injection distends the joint capsule in a similar manner to therapeutic hip injection, and the greater volume (10-15 cc) used for arthrography has the potential to provide greater joint distention than the smaller volume used for a diagnostic/therapeutic injection. Sonographic interrogation of the anterosuperior acetabular labrum following ultrasound-guided gadolinium contrast injection provided an opportunity for same day correlation of findings with MRA. Therefore, our aim is to see if the anterosuperior labrum and chondrolabral junction could be evaluated by ultrasound after an intra-articular injection (“sonoarthrography”) to detect and confirm labral pathology and compare it to same-day MRA as a reference standard, and arthroscopy when available.

Materials and Methods

Patient Selection and Data

This retrospective study was approved by the local Institutional Review Board and complied with local ethical standards. All patients were referred from local orthopedic surgery or sports medicine practices to our radiology department for an ultrasound-guided injection of intra-articular dilute gadolinium contrast for MRA examination. Standard practice including informed consent was followed. Patient’s age, gender, sidedness of study, and body mass index (BMI) were recorded.

Inclusion and Exclusion Criteria

Patients between the ages of 18-65 referred to the department of radiology for ultrasound-guided hip MRA injection between October 2013 and August 2014 were included in our study. Patients were excluded if they had prior labral surgery or were contraindicated for MRI or gadolinium administration.

Ultrasound-Guided Intra-Articular Injection

Intra-articular injection was performed according to standard
institutional protocol. All studies were performed using the Acuson S2000 (Siemens Acuson, Mountainview, CA). A standard anterior approach to the hip was used, and a longitudinal image of the femoral head-neck junction using a 6 Megahertz (MHz) curved transducer provided pre-procedure localization. After standard sterile prep and skin anesthesia, an appropriate length, 22-gauge spinal needle was advanced into the hip joint under real-time sonographic guidance. Once intra-articular position was confirmed, a dilute gadolinium solution consisting of 0.1 cc gadobutrol (Gadavist, Bayer, Whippany, NJ) gadolinium contrast and 10 cc sterile normal saline was instilled into the joint.

Ultrasound Labral Evaluation

Following the injection, a sonographic examination of the anterosuperior labrum was performed with a 9 MHz linear transducer by a single musculoskeletal radiologist with 25 years of ultrasound experience, incorporated as part of the radiologist’s routine post-injection protocol. The labrum was examined in a supine, neutral position from lateral to medial, with long axis images of the labrum obtained from the rectus femoris origin superiorly to the iliopsoas tendon anteriorly.

MRA Labral Evaluation

All patients underwent subsequent direct MRA examination and were scanned on a 3.0 Tesla system (Skyra, Siemens, Munich, Germany) with an 18-channel, body, phased-array coil. Patients were imaged supine with hip extended. The hip MRA protocol consists of the following: (1) Coronal short-tau inversion recovery (STIR) sequence (repetition time/echo time/inversion time, 4000/35/200 milliseconds; slice thickness, 3 mm; intersection gap, 0 mm; field of view, 150 mm²; matrix, 384 x 216; number of signals acquired, 1); (2) Sagittal fat-suppressed T1-weighted sequence (repetition time/echo time, 500-700/minimum possible milliseconds; slice thickness, 3 mm; intersection gap, 0 mm; field of view, 150 mm²; matrix, 320 x 256; number of signals acquired, 1); (3) Transaxial-oblique fat-suppressed proton density (PD)-weighted sequence (repetition time/echo time, 500-746/minimum possible milliseconds; slice thickness, 3 mm; intersection gap, 0 mm; field of view, 160 mm²; matrix, 320 x 240; number of signals acquired, 1); (4) Coronal fat-suppressed T1-weighted sequence (repetition time/echo time, 500-746/minimum possible milliseconds; slice thickness, 3 mm; intersection gap, 0 mm; field of view, 160 mm²; matrix, 320 x 320; number of signals acquired, 1); (5) Transaxial T1-weighted sequence (repetition time/echo time, 500-700/minimum possible milliseconds; slice thickness, 4 mm; intersection gap, 0 mm; field of view, 160 mm²; matrix, 256 x 256; number of signals acquired, 1); and (6) Radially oriented fat-suppressed PD-weighted sequence (repetition time/echo time, 2800/35 milliseconds; slice thickness, 3 mm; field of view, 150 mm²; matrix, 320 x 320; number of signals acquired, 1) with 12 radial slices based off the transaxial T1-weighted sequence.

Image Review

The ultrasound images were reviewed retrospectively by a single experienced (25 years) musculoskeletal radiologist (RA) and a musculoskeletal radiology fellow (TS) in conjunction. MRA examinations were reviewed retrospectively by a single experienced (13 years) musculoskeletal radiologist (CP). Both sets of images were reviewed independently without knowledge of the original reports, results from other interpretations, or clinical follow-up. For both ultrasound and MRA, the labrum was divided into three anatomic zones: (1) Below the rectus femoris tendon, (2) Between the rectus femoris and iliopsoas tendons, and (3) Below the iliopsoas tendon. The transverse acetabular ligament cannot be seen with ultrasound, so the clock-face system was not used. On both ultrasound and MRA, the presence or absence of the following pathologic findings was recorded in each anatomic zone: (1) Abnormal morphology (either abnormal shape/contours or heterogenous echogenicity/signal intensity), (2) Chondrolabral junction cleft (hypoechoic/gadolinium cleft passing along the medial aspect of the labrum), and (3) Labral cleft (hypoechoic/gadolinium cleft extending partially or completely through the articular surface) (Figure 1-4).

Arthroscopic Surgery

The operative reports, in which the surgeon described the position of the tear according to a clock-face system, were retrospectively reviewed when available.

Statistics

Logistic regression for clustered data was used to compare zones in terms of the components of diagnostic accuracy of ultrasound for the detection of each abnormality relative to MRA as the reference standard. The analysis accounted for the clustering of zones within patients. The overall accuracy, sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), negative likelihood ratio (-LR), and positive likelihood ratio (+LR) were calculated.

Figure 1: Thirty seven-year-old woman with poorly localized anterior left hip pain for three years and a normal labrum. Radial fat-suppressed PD-weighted MRA image (A) demonstrates an intact, triangular, low signal intensity acetabular labrum (arrow) obtained in zone 2. Long-axis post-injection ultrasound image obtained in zone 3, (B) shows a triangular, homogenously echo acetabular labrum (white arrow), located between the iliopsoas tendon (dashed arrow) and the femur head (star). Note there is no hypoechoic cleft between the acetabular osseous rim and the labrum.
Results

Study Population

The patient population consisted of 26 patients who underwent same-day ultrasound-guided hip arthrogram injection, post-injection hip ultrasound, and MR arthrogram. There were 11 male and 15 female patients with age range of 15 to 52 years (mean ± standard deviation age, 33 ± 9.1 years). Eleven injections were performed in the left hip and 15 were performed in the right hip. The mean body mass index (BMI) was 23.7 (range of 18-33; standard deviation of 4.1). The ultrasound examination took three minutes to complete and the MRA protocol took 33 minutes.

Six of twenty six (23%) of the patients were taken to arthroscopy at the discretion of the attending orthopedic surgeon, all of whom are experienced hip surgeons at the same institution. The mean time between same-day ultrasound/MRA and surgery was 55.5 days (range of 25-98 days; standard deviation of 25.9 days). In no cases did the surgeon mention a detailed description of the type of tear in the operative report.

Comparison of Findings from Ultrasound with MRA as Reference Standard

Overall, ultrasound and MRA had exact correlation in 124/234 (53%) of the data points, e.g., whether or not a chondrolabral junction cleft was present in zone 1 for a given patient. Ultrasound demonstrated labral pathology in 26/26 (100%) patients. MRA demonstrated labral pathology in 23/26 (88.5%) patients. Using MRA as the reference standard, ultrasound demonstrated a sensitivity of 1.000 for labral pathology on a per-patient basis, but incalculable specificity, NPV, and -LR as no labrum was called normal on ultrasound.

When each labrum was subdivided into three zones, ultrasound demonstrated labral pathology in 67/78 (85.90%) zones and MRA demonstrated pathology in 53/78 (67.95%) zones. Using MRA as the reference standard, ultrasound demonstrated a sensitivity of 0.868 and a specificity of 0.160, PPV and NPV of 0.687 and 0.364, and +LR and -LR of 1.033 and 0.825, respectively.

When only zone 1 (below the rectus femoris tendon, at approximately 12 o’clock) was evaluated, ultrasound demonstrated labral pathology in 26/26 (100%) patients. MRA was positive for labral pathology in 15/26 (57.69%) patients. When only zone 2 (between the rectus femoris and iliopsoas tendons, at approximately 1-2 o’clock) was evaluated, ultrasound was positive for labral pathology in 26/26 (100%) patients. MRA was positive...
for labral pathology in 18/26 (69.23%) of patients (Table 1). In zones 1 and 2, specificity, NPV, and -LR were incalculable. When only zone 3 (below the iliopsoas tendon, at approximately 3 o’clock) was evaluated, ultrasound was positive for labral pathology in 15/26 (57.69%) patients. MRA was positive for labral pathology in 20/26 (76.92%) patients. Ultrasound had sensitivity and specificity for labral pathology in zone 3 of 0.650 and 0.667, respectively, with PPV and NPV of 0.867 and 0.364, respectively, and +LR and -LR of 1.950 and 0.525, respectively.

When analysis was limited to evaluating for labral or chondrolabral junction clefts (abnormal morphology excluded), ultrasound demonstrated clefts in 64/78 (82.05%) zones, compared to 52/78 (66.67%) for MRA. The sensitivity and specificity for ultrasound for detecting labral or chondrolabral junction clefts was 0.827 and 0.192, respectively. PPV and NPV of 0.672 and 0.357, respectively, and +LR and -LR of 1.024 and 0.900, respectively.

With regard to labral clefts only, ultrasound was positive in 48/78 (61.54%) zones, compared to 27/78 (34.62%) for MRA. Using MRA as the reference standard, ultrasound had sensitivity and specificity of 0.741 and 0.451, respectively. PPV and NPV of 0.417 and 0.767, respectively, and +LR and -LR of 1.349 and 0.575, respectively.

With regard to chondrolabral junction clefts only, ultrasound was positive in 49/78 (62.82%) zones, compared to 45/78 (57.69%) for MRA. There was poor correlation between the two modalities, with ultrasound reporting sensitivity and specificity of 0.578 and 0.303, respectively. PPV and NPV of 0.531 and 0.345, respectively, and +LR and -LR of 0.829 and 1.393, respectively.

With regard to morphology, ultrasound demonstrated abnormal morphology in 46/78 (58.97%) zones, compared to 21/78 (26.92%) for MRA. Using MRA as the reference standard, ultrasound had sensitivity and specificity of 0.810 and 0.491 respectively. PPV and NPV of 0.370 and 0.875, respectively, and +LR and -LR of 1.591 and 0.388, respectively (Table 2).

Comparison of Findings from Ultrasound and MR Arthrogram with Arthroscopy

All six patients who went to arthroscopy had labral tears identified, and all six patients had an abnormality on ultrasound and MRA (Table 3).

Re-Review of Discrepant Cases

After data collection and analysis, the five cases with US and MRA discrepancies in ≥ 2 zones, including the three false-positive US cases, were re-reviewed by consensus. After review of the images, none of the original scores were definitively changed, leaving some discrepancies in grading between the two data sets (Figure 5). None of the discrepant cases went to arthroscopy.

Discussion

The acetabular osseous rim is covered by the triangular fibrocartilaginous labrum. The labrum augments the depth of

**Table 1:** Pathology (any abnormality) by zone depicted by ultrasound and MRA. Within each zone for each patient the presence of abnormal morphology, chondrolabral junction cleft, or labral cleft was noted on ultrasound and MRA.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Pathology - US</th>
<th>Pathology - MRA</th>
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<tbody>
<tr>
<td>1</td>
<td>26/26 (100%)</td>
<td>15/26 (57.69%)</td>
</tr>
<tr>
<td>2</td>
<td>26/26 (100%)</td>
<td>18/26 (69.23%)</td>
</tr>
<tr>
<td>3</td>
<td>15/26 (57.69%)</td>
<td>20/26 (76.92%)</td>
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</table>

**Table 2:** Test characteristics for ultrasound using magnetic resonance arthrography (MRA) as a reference standard. For each zone, the presence or absence of abnormal morphology, chondrolabral junction (CLJ) cleft, and labral cleft was noted using ultrasound and MRA. Using MRA as the reference standard, test characteristics, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (+LR), and negative likelihood ratio (-LR) were calculated.
the acetabulum by up to 21%, enhancing joint stability [11]. In addition, by increasing surface area by approximately 28%, load distribution is expanded and therefore force on the acetabular articular surface is decreased [6,9,11]. The labrum also forms a seal that keeps synovial fluid between the acetabular and femoral head articular cartilage, optimizing joint lubrication and further decreasing pressure on the articular surfaces by allowing some of the load to be borne by fluid pressurization [6,9,12-14].

A tear of the acetabular labrum is thought to be a common cause of hip pain, with studies demonstrating labral tears occurring in 22-55% of patients with hip pain [1-6], and in over 90% of cadaveric studies [15]. In Western populations, most (over 86%) of labral tears occur in the anterosuperior quadrant [15,16]. The goals of evaluating the patient with hip pain include confirmation of the intra-articular etiology and characterization of associated structural abnormalities in order to customize treatment [17].

Acetabular labral tears typically occur through one of five mechanisms: Trauma, femoroacetabular impingement, capsular laxity/hip hypermobility, hip dysplasia, and degeneration [5,14,15,18,19]. While 90% of patients diagnosed with acetabular labral tears complain of dull anterior hip or groin pain, other symptoms may include hip clicking, locking, or instability [25,17,20,21]. Clinically, the most accurate physical examination test is the anterior hip impingement test [2,19,22]. However, the differential diagnosis for anterior hip and groin pain is wide and clinically challenging, and therefore patients may see multiple health care providers before obtaining a diagnosis [6,9,16]. Labral tears are thought to predispose to adjacent chondral damage [1]. Goals of surgical labral tear treatment have shifted from debridement to repair in order to prevent subsequent development of osteoarthritis and to eliminate pain and discomfort from unstable flap tears [5,21].

Patients are often referred to radiology for diagnostic or therapeutic intra-articular hip injections for suspected intra-articular hip pathology. Invariably, some of these patients will have previously undergone an MRI study of the hip without intra-articular contrast. There has been considerable variation among studies evaluating the utility of conventional MRI to detect labral tears. A recent meta-analysis, which included 19 studies reported a pooled sensitivity of 0.66 (95% CI: 0.59 to 0.73) and a pooled specificity of 0.79 (95% CI: 0.67 to 0.91) [18]. The same meta-analysis also compared 15 studies evaluating the test characteristics for MRA. The authors found less variation among the MRA studies when compared to the conventional MRI studies. The pooled sensitivity for MRA was 0.87 (95% CI: 0.84 to 0.90) and pooled specificity was 0.64 (95% CI: 0.54 to 0.74). Interestingly, conventional MRI had a higher specificity than MRA, but MRA’s higher ROC curve indicated superior overall diagnostic accuracy [18]. MRA is also superior to conventional MRI for the diagnosis of other subtle intra-articular

<table>
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<tr>
<th>Patient</th>
<th>Zone</th>
<th>US</th>
<th>MRA</th>
<th>Arthroscopy Notes</th>
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<tr>
<td>1</td>
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<td>+</td>
<td>+</td>
<td>Diffusely macerated with peripheral osteophytes.</td>
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<td>2</td>
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<td>+</td>
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<tr>
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<td>3</td>
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<td>2</td>
<td>1</td>
<td>+</td>
<td>-</td>
<td>11 to 1 o’clock tear</td>
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<td>3</td>
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<td>+</td>
<td>+</td>
<td>12 to 2:30 o’clock tear</td>
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<td>3</td>
<td>2</td>
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<td>-</td>
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<td>12 to 2 o’clock tear</td>
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Table 3: US and MRA correlation with arthroscopy. Six patients went to arthroscopy. If any pathology was called on ultrasound (US) or magnetic resonance arthrographic (MRA) then (+) is placed in the zone. Otherwise, the zone was negative (-). The surgeons’ comments regarding the location of the labral tear are noted.

Figure 5: Twenty-year-old female ballet dancer with left hip pain for one month and discordant US and MRA findings of labral tear. Radial fat-suppressed PD-weighted MRA image in zone 3 (A) shows a normal, triangular shaped acetabular labrum (white arrow) located just deep to the iliopsoas tendon (star). Corresponding long-axis post-injection ultrasound image obtained in zone 2 (B) shows a blunted acetabular labrum with mixed, inhomogenous echogenicity (white arrow) located deep to the iliopsoas tendon (star). On re-review as a group, the scoring of both lesions remained the same and the zone was discordant.
pathology such as cartilage disorders, hip plicae, and synovial/capsular abnormalities, although neither technique is very reliable for non-labral intra-articular pathology [8].

In 2006, Solka, et al. reported post-therapeutic injection findings of a series of 21 patients suspected of having labral tears [23]. However, no surgical confirmation was obtained in any case, and only 67% of cases had MR correlation, which were not necessarily contemporaneous occurring up to seven years after injection. Their study was performed using therapeutic injections, so microbubbles were present in the post-injection hip. Imbition of microbubbles into the labrum may have contributed to the diagnostic accuracy of ultrasound. With our study, the patients were receiving injections for arthograms, and gas injection was minimized. In the current study, we sought to determine whether fluid imbition would enable detection of labral pathology on post-injection ultrasound imaging. This would in principle provide useful adjunctive information, particularly when there is no established diagnosis on pre-injection imaging. Correlation with same day MRA provided a useful method to make this assessment, although the lack of microbubbles in the injectate may have limited the specificity of post-injection imaging, in as much as microbubble imbition can only occur in the setting of a labral tear; whereas hypoechoic clefts may be a common finding of unknown significance.

More recently in 2012, Jin, et al. published a retrospective series of 16 patients, comparing routine ultrasound of the acetabular labrum to MRA and arthroscopy [24]. In this study only the presence or absence of an anterosuperior labral tear on ultrasound was correlated with arthroscopy, with ultrasound determining the correct diagnosis in 75% of cases. In 5/16 patients, no tear was seen on MRA (three were negative on both ultrasound and MRA), but they proceeded to arthroscopy in order to establish the cause of hip pain. Therefore, only 11/16 patients had labral tears, which is a lower incidence than in our patient cohort. In order to improve on these prior studies, we attempted to provide same-day ultrasound evaluation with MRI after intra-articular contrast injection, and tried to spatially localize abnormal findings within the labrum on ultrasound and MRA to be certain that the same pathology was being recognized.

In our series, 23/26 patients had labral tears by MRA and 26/26 patients had labral tears by sonoarthrography. With a reported sensitivity of 0.87, it is possible that the three labrums reported as negative by MRA could represent false negatives. All six of the patients in our series taken to arthroscopy had labral tears. In addition, all six of those patients had labral tears called on US and MRA. While there was some discordance involving the specific zones called abnormal, the correlation was subjectively good and discrepancies likely represented misregistration between the two modalities.

Given the high prevalence of labral tears in our patient population, we postulated that accurately depicting the location of the labral tear would lead to a more precise comparison between the two modalities in determining whether or not a tear was present. We chose to use anatomic landmarks in place of the more commonly used “clock-face” notation for intra-articular pathology as it does not rely on identification of the transverse acetabular ligament which is not visible via anterior ultrasound approach. On MRA, the labrum was evaluated in radial, transaxial, and transaxial/coronal/sagittal oblique sequences. Labral pathology close to the corresponding zonal borders was a potential source of discrepancy between the two modalities due to the lack of true spatial registration. The only way to eliminate the lack of spatial registration between the two modalities would be to use registration software for ultrasound and MRI, which would require prospective evaluation, after the MRA.

Consistent with the results of the 2012 study by Jin, et al., sonoarthrography had more difficulty with chondrolabral junction tears than with abnormal morphology or labral substance tears. This may be secondary to several factors including: (a) Shadowing from the acetabular osseous rim [25,26] (Figure 6). (b) Hypoechoic cartilage present between bone and labrum, or (c) Intra-articular fluid imbining into a sublabral recess. The therefore, chondrolabral junction clefts should be interpreted with caution. Sonoarthrography was fairly sensitive for detecting labral tears and abnormal morphology, with sensitivities of 0.741 and 0.810, respectively by zone, and sensitivities of 1.000 and 1.000, respectively by patient, with MRA as the reference standard. Demonstrating pathology in zone 3 (beneath the iliopsoas tendon) was challenging due to the close proximity of the tendon to the labrum, even with fluid distention. Likewise, refractile shadowing from the tendon may have partially obscured the labrum (Figure 7). Sensitivity of sonoarthrography in this zone was lower than in zones 1 and 2 at 0.650, but positive results were more likely to be true positives on
MRA, with a positive likelihood ratio of 1.95.

The study was limited by the small patient sample size for which surgical correlation was present, and in those patients, the surgical description of the labral tear was limited by lack of description of the labral tear type. The study was further limited as the sonograms were interpreted by two radiologists in conjunction and the MRAs were interpreted by a single radiologist, although each was blinded to the original read. Documenting inter-observer reliability among multiple radiologists would be helpful to note the consistency of the methods. However, no changes to the original scores were made on the re-review of discrepant cases. The lack of optimal spatial registration between modalities somewhat limited assessment of specific anatomic zone, although ultrasound imaging in long axis probably most closely approximates either oblique transaxials and/or radial imaging. In as much as this patient cohort went to MRA rather than for therapeutic injection, the lack of intra-articular gas may also diminish the accuracy of ultrasound, in as much as gas imbibition may be a more specific indicator of pathology than a hypoechoic cleft alone. Some tears were much more conspicuous than others and no measure of diagnostic confidence for each lesion was made, which could have further strengthened the study.

Conclusion

Our study suggests that post-injection, “sonoarthrographic” visualization of the anterosuperior labrum has some diagnostic utility. In particular, it appears to be a sensitive examination for detecting labral substance tears and abnormal labral morphology. Chondrolabral junction tears however, are easy to overlook on this modality and should be interpreted with caution. Diagnostic and therapeutic hip injections are not uncommon procedures for patients with anterior hip pain, and many times these patients may not have diagnoses available prior to injection. Post-injection ultrasound adds approximately three minutes to the examination and may supply additional useful diagnostic information, helping provide useful information for the delineation of hip pain.

References