Acetabular Labrum

Donna G. Blankenbaker, MD*, Michael J. Tuite, MD

KEYWORDS

• MR • MR arthrography • Hip • Labrum • Sublabral sulcus

KEY POINTS

- MR arthrography is the imaging technique of choice for evaluation of labral pathology.
- Intra-articular anesthetic injection at the time of MR arthrography is key to many ordering providers in determining if hip pain is related to an intra-articular cause and helps guide treatment.
- Using all MR imaging planes aids in detection of labral tears.

INTRODUCTION

The acetabular labrum is an important structure within the hip that is believed to provide joint stability,[1] although the exact role of the labrum continues to be studied. Labral pathology is a known cause of hip pain in the active population. Labral abnormalities are associated with femoroacetabular impingement and are a significant factor in the development and progression of degenerative joint disease. Those patients with labral abnormalities may have acute or chronic symptoms of widely ranging intensities, locations, and duration. Clinical findings are highly variable, and numerous regional anatomic structures can make the clinical evaluation difficult. Demands for improved diagnosis of hip conditions continue with several advanced imaging techniques, including MR imaging, MR arthrography, CT arthrography, and sonography (**Box 1**). This article reviews the normal anatomy, imaging techniques, imaging findings, pathology, and pitfalls in the assessment of the acetabular labrum.

NORMAL ANATOMY

The acetabular labrum is a fibrocartilagenous structure that is located circumferentially around the acetabular perimeter and attaches to the transverse acetabular ligament posteriorly and anteriorly. The acetabular labrum is attached to the perimeter of the acetabular hyaline cartilage.[2,3] The appearance of a cleft or sulcus can often be seen between the labrum and transverse ligament where they join.[4] The labrum is primarily composed of circumferential type I collagen fibers.[5] The labrum is triangular in cross-section, with a base approximately 4.7 mm wide at the osseous attachment by approximately 4.7 mm tall.[6] The medial extent of the labrum from the acetabular rim varies by subject and location within the acetabulum.[6,7]

The labrum is innervated by nerves that play a role in proprioception and pain production.[8] The vascular supply to the labrum is from capsular blood vessels that are derived from the obturator, superior gluteal, and inferior gluteal arteries.[5,9,10] The labral substance blood supply is from small vessels along the capsular side of the labrum. The vessels do not penetrate deeply, which limits the blood supply such that the majority of the labrum is avascular and, therefore, an injured labrum has limited potential to heal.[5,6,10–12] The healing potential is greatest at the peripheral capsulolabral junction, where the blood supply is greatest, an important factor when considering whether a labral tear is repairable.[9]

The labrum is believed to have several important functions, including the containment of the femoral head during acetabular formation and stabilization

Department of Radiology, University of Wisconsin School of Medicine and Public Health, E3/366 Clinical Science Center, 600 Highland Avenue, Madison, WI 53792-3252, USA
* Corresponding author. University of Wisconsin School of Medicine and Public Health, Department of Radiology, E3/366 Clinical Science Center, 600 Highland Avenue, Madison, WI 53792-3252.
E-mail address: dblankenbaker@uwhealth.org

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Box 1
What the referring physician needs to know

- Early diagnosis and treatment of acetabular labral tear is important to help provide pain relief and may prevent the early onset of osteoarthritis.
- MR arthrography is the imaging technique of choice for the detection of acetabular labral tears.

of the hip by deepening the acetabulum[13,14] and maintaining hip joint congruity. The hip joint is subject to a large transmitted load. The acetabular labrum is placed under undue stress in conditions where the morphology of the hip is abnormal, such as in developmental dysplasia and femoroacetabular impingement. Biomechanical studies have shown that the labrum aids in sealing the hip joint and preventing the expression of fluid when the joint is stressed.[1] This sealing effect is believed to offer cartilage protection within the hip joint.[1,15] The labrum is not designed to withstand significant weight-bearing forces; when subjected to such forces, it eventually degenerates and tears.

The normal anatomy of the hip has been reviewed earlier within this issue by Chang and Huang. The relationship of the joint capsule and the iliopsoas tendon with the acetabular labrum is discussed in this article. The proximal attachment of the capsule of the hip joint is along the osseous rim of the acetabulum. Typically, the capsule inserts near the base of the labrum, creating the perilabral recess.[2,16] Anteriorly and posteriorly, the capsule courses further away from the acetabular margin and the recess is deeper, particularly anteriorly.[2] The capsule attaches distally along the anterior aspect of the femoral neck at the base of the trochanters.[16] A series of ligaments helps reinforce the capsule and the iliofemoral, ischiofemoral, and pubofemoral ligaments. There is also a circular layer of fibers along the deep surface of the joint capsule at the base of the femoral neck, called the zona orbicularis. The iliopsoas tendon is closely related to the anterior aspect of the hip joint and lies adjacent to the anterior aspect of the acetabular labrum at the level of the acetabular rim.

CLINICAL PRESENTATION

Diagnosis of acetabular labral tears can be difficult and they are a known cause of mechanical hip pain. Labral tears can be seen in patients with femoroacetabular impingement (see article by Bredella and colleagues in this issue discussing femoroacetabular impingement), hip dysplasia, slipped capital femoral epiphysis, Legg-Calvé-Perthes disease, osteoarthritis, and trauma. Labral tears often occur in young patients with normal radiographs and no history of prior trauma.[13,17] More recently, iliopsoas impingement has been identified as a cause of labral pathology.[18] Athletic activities that involve repetitive pivoting movements or repetitive hip flexion are recognized as additional causes of acetabular labral injury, and tears of the acetabular labrum have become increasingly recognized disorder in young adult and middle-aged patients.[10,11,17,19,20] Labral tears as the culprit for hip pain may be due to the increasing recognition of changes associated with femoroacetabular impingement. The mechanism of injury is commonly reported as a sudden twisting or pivoting motion, with a pop, click, catching, or locking sensation.[21] More commonly, the symptom presentation is subtle, characterized by dull activity-induced or positional pain that fails to improve over time. Patients may describe a deep discomfort within the anterior groin or lateral hip pain proximal to the greater trochanter or posteriorly.[11,22,23] A clicking mechanical symptom may suggest an acetabular labral tear although other entities, such as snapping iliopsoas tendon, may give a similar presentation.

The impingement test, in which the hip is flexed to 90° with maximum internal rotation and adduction, may produce pain and is associated with intra-articular hip pain; it is useful for diagnosis of femoroacetabular impingement and potentially associated with labral pathologic conditions.[21] The labral stress test, in which the hip is brought into flexion, abduction, and external rotation and then extended as the extremity is adducted and internally rotated, may reproduce pain and/or cause a clunk of a labral tear.[21] Together, the clinical and imaging tests help diagnose labral pathology. Early diagnosis and treatment of acetabular labral tear are important because they not only provides pain relief but may prevent the early onset of osteoarthritis.[10,24]

IMAGING TECHNIQUE

MR imaging remains the imaging technique of choice in the evaluation of the acetabular labrum. Both conventional MR imaging and MR arthrography are commonly used to diagnose internal derangements of the hip joint.[3,25] Hip MR imaging is best performed on 1.5-T or 3-T magnets because higher field strength provides a higher intrinsic signal-to-noise ratio, which is critical for high-resolution imaging. Hip imaging should be performed with either a surface phased array coil or a multiple channel, cardiac coil.