

ANSWER KEY

PRESENTATION 1: **Diagnosing Acetabular Labral Tears & Pitfalls**

QUESTION 1

Which of the following is true in regard to MR arthrography of the hip?

- a. Joint distention is achieved by injection of more than 20 ml of a dilute solution of gadolinium.
- b. Posterior acetabular labral tears are the most commonly encountered labral tear.
- c. MR arthrography has a high sensitivity and accuracy of at least 90% for labral tears.
- d. Labral tears are recognized by interposition of contrast material between the P
- e. In asymptomatic individuals, the labrum is typically rounded or blunted.

DISCUSSION RE: ANSWER OPTIONS

Answer: C

- a. Adequate hip joint distension for MR arthrography can be achieved with a volume of 12-15 cc. False
- b. In several studies, around 90% of acetabular labral tears occur in the anterior superior labrum. False
- c. A study by Czerny et al. reported a sensitivity of 90% and a specificity of 91% for MR arthrography of labral tears. True
- d. Labral tears appear on MR arthrography as either increased signal that extends to the surface of the labrum, or abnormal interposition of contrast between the labrum and acetabulum. Interposition of contrast material at the acetabular labral junction can also be seen normally posteroinferiorly where it represents a normal recess. Some authors believe that a shallow smooth sulcus can occur at other regions involving the acetabular labral junction, including the anterior superior acetabulum. False
- e. In asymptomatic individuals the most common appearance of the labrum is triangular, seen in 66%-80% of people at MR arthrography. A minority of asymptomatic individuals may have a blunted or rounded shape to the labrum, and this is more common as people get older.

REFERENCE FOR QUESTIONS 1

1. Byrd JW, Jones KS. Diagnostic accuracy of clinical assessment, magnetic resonance imaging, magnetic resonance arthrography, and intra-articular injection in hip arthroscopy patients. *Am J Sports Med* 2004;32(7):1668-1674.
2. Fitzgerald RH Jr. Acetabular labrum tears. Diagnosis and treatment. *Clin Orthop Relat Res* 1995;311:60-68.
3. Czerny C, Hofmann S, Neuhold A, Tschauer C, Engel A, Recht MP, Kramer J. Lesions of the acetabular labrum: accuracy of MR imaging and MR arthrography in detection and staging. *Radiology* 1996;200(1):225-230.
4. Dinauer PA, Murphy KP, Carroll JF. Sublabral sulcus at the posteroinferior acetabulum: a potential pitfall in MR arthrography diagnosis of acetabular labral tears. *AJR Am J Roentgenol* 2004;183(6):1745-1753.
5. Abe I, Harada Y, Oinuma K, Kamikawa K, Kitahara H, Morita F, Moriya H. Acetabular labrum: abnormal findings at MR imaging in asymptomatic hips. *Radiology* 2000;216(2):576-581.

QUESTION 2

What is an MR imaging feature seen with a sublabral sulcus?

- a. Paralabral cyst
- b. Depth more than entire labral thickness
- c. Linear shape
- d. Adjacent cartilage damage
- e. Osseous abnormalities

DISCUSSION RE: ANSWER OPTIONS

- a. Paralabral cysts are associated with labral tears. False
- b. A sulcus is shallow typically less than one-half the labral thickness. False
- c. A sulcus is more common to be linear in shape, not gaping or complex in appearance. True
- d. Adjacent cartilage lesions are found commonly with labral tears, not with a sulcus. False
- e. Osseous abnormalities (subchondral cystic change, bone marrow edema) are found in association with labral tears and cartilage wear. False

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REFERENCE FOR QUESTIONS 2

Studler U, Kalberer F, Leunig M, Zanetti M, Hodler J, Dora C, Pfirrmann CWA. MR arthrography of the Hip: Differentiation between an Anterior Sublabral Recess as a Normal Variant and a Labral tear. *Radiology* 2008;249(3):947-954.

PRESENTATION 2: **Imaging Femoroacetabular Impingement**

QUESTION 3

Anatomic abnormalities leading to femoroacetabular impingement are divided into two main types: cam and pincer. Which of the following anatomic or imaging features is associated with cam impingement?

- a. Acetabular retroversion
- b. Coxa profunda
- c. Crossover sign
- d. Acetabular rim ossification
- e. Bone prominence of the femoral head-neck junction

DISCUSSION RE: ANSWER OPTIONS

Answer: E.

- a. Femoroacetabular impingement (FAI) caused by the acetabular rim contacting a normal proximal femur in a patient with acetabular retroversion is classified as the pincer type. False
- b. Coxa profunda refers to a deep acetabular fossa, and is associated with pincer-type FAI. False
- c. The crossover sign is when the anterior rim of the acetabulum projects inferior to the posterior rim in the lateral portion of the hip joint as seen on an anteroposterior radiograph. As the anterior rim is followed medially, its projection ‘crosses over’ the posterior rim as it continues toward the superior pubic ramus. This radiographic sign of acetabular retroversion is associated with the pincer type of FAI. False
- d. Anterior acetabular rim ossification can be seen in patients with osteoarthritis and in patients with FAI. In FAI, this results in further deepening of the acetabular fossa and therefore is considered a pincer-type. False
- e. Bone prominence at the anterior femoral head-neck junction is associated with, and considered to be the anatomic cause of cam-type FAI. True

REFERENCE FOR QUESTIONS 3

1. Blankenbaker DG, Tuite MJ. The painful hip: new concepts. *Skeletal Radiol* 2006; 35:352-370.
2. [Beall DP](#), [Sweet CF](#), [Martin HD](#), [Lastine CL](#), [Grayson DE](#), [Ly JQ](#), [Fish JR](#). Imaging findings of femoroacetabular impingement syndrome. [Skeletal Radiol](#) 2005;34(11):691-701.

QUESTION 4

What is correct in regard to the alpha angle?

- A. Associated with pincer impingement
- B. Abnormal if less than 50 degrees
- C. Seen in symptomatic and asymptomatic individuals
- D. Angle between the fovea and medial sourcil

DISCUSSION RE: ANSWER OPTIONS

Answer: C

- A. An abnormal alpha angle is associated with cam impingement.
- B. An abnormal alpha angle is considered greater than 55 degrees. Some consider increasing the threshold values to 60 degrees to reduce false positives while maintaining reasonable sensitivity.
- C. An abnormal alpha angle can be found in both symptomatic and asymptomatic individuals.
- D. The alpha angle is formed by a line from the center of the femoral head down the axis of the femoral neck and a second line connecting the center of the femoral head with the site at which the femoral neck bump exits the sphericity of the femoral head.

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REFERENCE FOR QUESTION 4

1. Sutter R, Dietrich TJ, Zingg PO, Pfirrmann CW. How useful is the alpha angle for discriminating between symptomatic patients with cam-type femoroacetabular impingement and asymptomatic volunteers? *Radiology* 2012; 264(2):514-521.
2. Nötzli HP, Wyss TF, Stoecklin CH, Schmid MR, Treiber K, Hodler J. The contour of the femoral head-neck junction as a predictor for the risk of anterior impingement.
3. *J Bone Joint Surg Br* 2002;84(4):556-560.

PRESENTATION 3: MRI of Cartilage and Osteochondral Injury

QUESTION 5

Which of the following is true in regard to MRI of cartilage?

- a. The “black line sign” in trochlear cartilage is now known to represent a normal variant.
- b. Subchondral bone marrow edema-like signal is common, often transient, and may be associated with a variety of causes.
- c. Subchondral bone marrow edema-like signal is NOT associated with the development of future subchondral cysts.
- d. Subchondral bone marrow edema-like signal is NOT associated with pain.
- e. Subchondral bone marrow edema-like signal is NOT associated with site specific cartilage defect progression or overall cartilage volume loss.

DISCUSSION RE: ANSWER OPTIONS

CORRECT ANSWER: B

- A. False. In fact, the cartilage “black line sign” refers to a deep fissure in cartilage that does not contain fluid.
- B. TRUE. Subchondral bone marrow edema-like signal is common, often transient, and may be associated with a variety of causes (e.g., stress reaction, contusion, fracture, AVN, OCD, chondrosis, OA).
- C. False. In fact, subchondral bone marrow edema-like signal is associated with the development of future subchondral cysts.
- D. False. In fact, subchondral bone marrow edema-like signal is significantly associated with pain (i.e., a moderate pain predictor, with an odds ratio of 2-5x in 22 studies).
- E. False. In fact, subchondral bone marrow edema-like signal is associated with site specific cartilage defect progression (odds ratio of 2-4x) and overall cartilage volume loss over 2-3 years.

REFERENCE FOR QUESTION 5

1. Wissman RD, et al. *Skeletal Radiology* 2012; 1121–1126
2. Stephens T, et al. *Skeletal Radiology* 2011; 113–116
3. Crema et al. *Radiology* 2010; 256:855-862
4. Yusuf et al. *Ann Rheum Dis* 2011; 60-7
5. Dore et al. *Arthritis Res Ther* 2010; 222
6. Tanamas et al. *Rheumatology* 2010; 2413

QUESTION 6

Which of the following is true regarding osteochondritis dissecans (OCD)?

- a. Juvenile OCD characteristically is develops in sedentary individuals.
- b. Most juvenile OCD lesions are unstable and do not heal.

DISCUSSION RE: ANSWER OPTIONS

CORRECT ANSWER: D

- A. False. In fact, most juvenile OCD cases likely result from a repetitive stress injury and are found in very active children, often in high-level athletes.
- B. False. In fact, most *juvenile* OCD lesions are stable and do heal.

ORGANIZATION: **Los Angeles Radiological Society**
VENUE: **66th Annual Midwinter Radiology Conference**
DATE: **February 22, 2014 – Saturday, 10:00am – 11:30am**
TITLE: **Advances in Imaging the Labrum, FAI, and Cartilage**

Presenters:

Donna G. Blankenbaker, MD – Professor of Radiology, Medical Director of Outpatient Radiology, University of Wisconsin Hospital & Clinics
Robert D. Boutin, MD – Professor of Clinical Radiology UC Davis Health System

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| <p>c. Most adult OCD lesions are stable and do heal.</p> <p>d. MRI findings of an unstable juvenile OCD lesion include: fractures in the subchondral bone plate on T2 imaging, fluid signal deep to the OCD lesion, and cyst formation in the cancellous bone (>5mm or multiple cysts).</p> <p>e. Compared to OCD at the femoral condyles, normal evolution in ossification tends to be observed at an older age, be isolated to the anterior third of the femoral condyle, and is associated with bone marrow edema.</p> | <p>C. False. In fact, most <i>adult</i> OCD lesions are unstable and do not heal.</p> <p>D. TRUE. MRI findings of an unstable juvenile OCD lesion include fractures in the subchondral bone plate on T2 imaging, fluid signal deep to the OCD lesion, and cyst formation in the cancellous bone (>5mm or multiple cysts).</p> <p>E. False. In fact, compared to OCD at the femoral condyles, normal evolution in ossification tends: to occur at a <i>younger</i> age (girls <10; boys < 13); to be isolated to the <i>posterior</i> third of the femoral condyle, and <i>not</i> be associated with bone marrow edema.</p> |
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REFERENCE FOR QUESTIONS 6

1. Laor T, et al. Juvenile osteochondritis dissecans: is it a growth disturbance of the secondary physis of the epiphysis? AJR 2012; 199:1121-8
 2. Kijowski R, et al. Juvenile versus adult osteochondritis dissecans of the knee: appropriate MR imaging criteria for instability. Radiology. 2008;248:571-8.
 3. Jans LB, et al. MRI differentiates femoral condylar ossification evolution from osteochondritis dissecans. A new sign. Eur Radiol. 2011;21:1170-9
 4. Jans LB, et al. Evolution of femoral condylar ossification at MR imaging: frequency and patient age distribution. Radiology. 2011;258:880-8.
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