

ORGANIZATION: **Los Angeles Radiological Society**
 VENUE: **66th Annual Midwinter Radiology Conference**
 DATE: **February 22-23, 2014**

TITLE: **Musculoskeletal Imaging: Infection, Post-Op Shoulder, Anterior Cruciate Ligament and Image Guided Injections**

Presenters:

Jon A. Jacobson, MD – Prof. of Radiology, Director of MSK Radiology, University of Michigan Health System
Mark Schweitzer, MD – Prof. and Chair of Radiology, Stony Brook University School of Medicine
Joseph C. Giaconi, MD – Dir. MSK Radiology Fellowship, Cedars-Sinai Medical Ctr, Asst Prof. of Radiology, Keck School of Medicine of USC
Eric A. White, MD – Assistant Professor of Radiology, Chief of MSK Radiology, Keck School of Medicine of USC

ANSWER KEY

PRESENTATION 1: Musculoskeletal Infection

QUESTION 1	DISCUSSION RE: ANSWER OPTIONS
Regarding soft tissue infection, which is true? a. Ultrasound can distinguish between septic and aseptic fluid b. The classic location for cat-scratch disease is the lateral elbow c. At ultrasound, a soft tissue abscess can be hyperechoic d. For deep infection of the hip and pelvis, ultrasound performs better than CT or MRI	Answer: c Explanation: Imaging in general cannot differentiate aseptic from septic fluid, which is why percutaneous aspiration is required. Cat-scratch disease involves the epitrochlear lymph nodes of the medial elbow and the axilla. Abscesses at ultrasound range from anechoic to hyperechoic. Deep infection is best evaluated with CT or MRI instead of ultrasound.

REFERENCE FOR QUESTIONS 1

Turecki, MB, Taljanovic MS, Stubbs AY, Graham AR, Holden DA, Hunter TB, Rogers LF. Imaging of musculoskeletal soft tissue infections. *Skeletal Radiol* 2010; 39:957-971.

QUESTION 2	DISCUSSION RE: ANSWER OPTIONS
Regarding osteomyelitis of the foot, which is true? a. High marrow signal on fluid-sensitive sequences excludes osteomyelitis b. Marrow replacement on T1-weighted images is a normal finding c. Gadolinium is required to diagnose osteomyelitis d. Absence of soft tissue ulcer and midfoot involvement suggest neuropathic changes	Answer: d Explanation: The findings of high marrow signal on fluid-sensitive sequences and marrow replacement on T1-weighted sequences adjacent to a soft tissue ulcer is diagnostic for osteomyelitis. Gadolinium is not required for the diagnosis but adds information regarding ring-enhancing abscess. Osteomyelitis usually occurs at pressure points with adjacent soft tissue ulceration, unlike neuropathic changes that are typically midfoot without adjacent ulceration.

REFERENCE FOR QUESTIONS 2

ACR appropriateness criteria on suspected osteomyelitis in patients with diabetes mellitus. J Am Coll Radiol 2008; 5:881-886

PRESENTATION 2: MRI of the Post-Operative Shoulder

QUESTION 3	DISCUSSION RE: ANSWER OPTIONS
Which of the following is correct 1. Tendon to bone anastomosis is the most common type of cuff repair 2. Most impingement surgery is done open 3. All cuff repairs are water tight 4. All the above	Option 1-correct answer Option 2-nearly all surgeries are now done arthroscopically rather than open Option 3-both by traditional and MR arthrography leakage of contrast may be seen as the repairs are NOT water tight

REFERENCE FOR QUESTION 3

Duquin TR, Buyea C, Bisson LJ. Which Method of Rotator Cuff Repair Leads to the Highest Rate of Structural Healing? A Systematic Review, *AM j of sports med* 2010. 38:4. 835-841

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QUESTION 4	DISCUSSION RE: ANSWER OPTIONS
<p>In terms of instability surgery</p> <ol style="list-style-type: none"> 1. The labrum is often debrided 2. Heat capsular shrinkage is currently used often 3. Labral repairs look like a virgin labrum 4. Associated cuff tears are quite rare 	<p>Option 1 - this is almost never done, as it decreases shoulder function</p> <p>Option 2 - since complications, especially capsule tearing, are common this procedure is rarely performed currently</p> <p>Option 3 - Correct Answer -</p> <p>Option 4 – associated cuff tears are common in older patients, and are a major reason to do imaging</p>

REFERENCE FOR QUESTION 4
<p>Wagner SC, Schweitzer ME, Morrison WB, Fenlin JM Jr., Bartolozzi, AR Shoulder Instability: Accuracy of MR Imaging Performed after Surgery in Depicting Recurrent Injury—Initial Findings, Radiology. 2002 Jan;222(1):196-203.</p>

PRESENTATION 3: Image Guided Platelet Rich Plasma Musculoskeletal Injections

QUESTION 5	DISCUSSION RE: ANSWER OPTIONS
<p>Which of the following is the appropriate order of overlapping phases of the wound healing process, from earliest to latest?</p> <ol style="list-style-type: none"> A. Platelet activation, inflammation, remodeling, and proliferation B. Inflammation, platelet activation, proliferation, and remodeling C. Inflammation, platelet activation, remodeling, and proliferation D. Platelet activation, inflammation, proliferation, and remodeling 	<p>Answer: D.</p> <p>Wound healing involves an intricate process of 3 overlapping phases, starting with inflammation, which begins with platelet activation, followed by proliferation and remodeling. Once tissue injury occurs, platelets adhere to exposed collagen creating a clot, and the inflammatory phase begins with activation of platelets resulting in release of bioactive growth factors. Within a few days of the injury, the proliferative phase begins, characterized by angiogenesis, collagen deposition, granulation tissue, epithelialization, and wound contraction. After a few weeks to months from the injury, the remodeling phase involves collagen maturation an apoptosis of excess cells.</p>

REFERENCE FOR QUESTIONS 5
<p>Lee, KS, et al. "Musculoskeletal applications of platelet-rich plasma: fad or future?" Am J Roentgenol 2011; 196:628-636.</p>

QUESTION 6	DISCUSSION RE: ANSWER OPTIONS
<p>Which of the following are biological effects of platelet rich plasma injection on normal soft tissues in a rabbit model:</p> <ol style="list-style-type: none"> A. New collagen deposition at tendon and ligament injection sites B. Villous synovial hyperplasia and chronic synovitis at intra-articular injection sites C. Fibrosis, muscle necrosis, and calcium deposition at muscular injection sites D. All of the above 	<p>Answer: D.</p> <p>In order to assess the biologic activity of platelet rich plasma injections, 18 adult New Zealand rabbits were injected with autologous platelet rich plasma at different sites in one side of the body and normal saline on the other. Injection sites at 2, 6, and 12 weeks were analyzed histologically. All PRP specimens showed an inflammatory infiltrate with lymphocytic and monocytic predominance. Tendon and ligament injection sites showed new collagen deposition. Intra-articular injection sites showed villous synovial hyperplasia and chronic synovitis. Intra-muscular injection sites showed fibrosis, muscle necrosis, and calcium deposition.</p>

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ANSWER KEY

REFERENCE FOR QUESTIONS 6

Harris NL, et al. The effect of platelet-rich plasma on normal soft tissues in the rabbit. J Bone Joint Surg Am 2012; 94:786-793.

PRESENTATION 4: Anterior Cruciate Ligament: Normal and Abnormal, Pre-and Post-Op

QUESTION 7

DISCUSSION RE: ANSWER OPTIONS

Regarding anterior cruciate ligament (ACL) graft complications, which is true?

Answer: D

- A. The femoral tunnel should be located in the "12 'clock" position.
- B. Localized arthrofibrosis typically limits full flexion of the knee.
- C. Tibial tunnel positioning is not the primary factor affecting impingement.
- D. Fluid signal can normally be seen between strands of a hamstring tendon graft.

Explanation: If a clock face is superimposed on an anteroposterior radiograph or a coronal MR image with the center at the intercondylar notch, the tunnel should be oriented between 10- and 11-o'clock on the right knee or between 1- and 2-o'clock on the left knee. Localized arthrofibrosis is typically seen just anterior to the distal end of the graft between the femur and tibia. This area of fibrosis limits complete extension of the knee because the graft is trapped between the femur and tibia. Tibial tunnel positioning is the primary factor affecting impingement. If the tibial tunnel is positioned too far anteriorly the graft can become impinged on by the roof of the intercondylar notch. Because the doubled semitendinosus and gracilis tendon graft is composed of four separate strands, intermediate signal and even fluid signal can normally be seen between the strands of the graft on T2-weighted sequences.

REFERENCE FOR QUESTION 7

Meyers AB, Haims AH, Menn K, Moukaddam H. Imaging of anterior cruciate ligament repair and its complications. AJR American journal of roentgenology. 2010; 194(2):476-484.

QUESTION 8

DISCUSSION RE: ANSWER OPTIONS

Regarding anterior cruciate ligament (ACL) avulsion fractures, which is true?

Answer: D

- A. They are caused by a different mechanism than typical ACL tears.
- B. Type I injuries are best treated surgically.
- C. They are typically treated with ACL graft reconstruction.
- D. Treatment of ACL avulsion fractures includes immobilization for nondisplaced fractures and surgical fixation for displaced fractures.

Explanation: ACL avulsion fractures are caused by the same mechanism as typical ACL tears. Type I injuries are best treated conservatively. The treatment of the more typical intrasubstance anterior cruciate ligament injury is ACL graft reconstruction, however, the treatment of ACL avulsion fractures is typically closed or arthroscopic reduction internal fixation. Treatment of ACL avulsion fractures includes immobilization for nondisplaced fractures and surgical fixation for displaced fractures.

REFERENCE FOR QUESTION 8

White EA, Patel DB, Matcuk GR, Forrester DM, Lundquist RB, Hatch GF, 3rd, et al. Cruciate ligament avulsion fractures: anatomy, biomechanics, injury patterns, and approach to management. Emergency radiology. 2013; 20(5):429-440.