1. A 20-year-old baseball pitcher with shoulder pain undergoes an MRI arthrogram. Injected contrast is present on coronal T1-weighted images between the superior labrum and glenoid, beneath the long biceps tendon attachment point to the superior labrum. There is no contrast within the labrum, and no contrast under the labrum posterior to the biceps tendon attachment point. The best descriptor of this configuration of the superior labrum is a:
   a. Sublabral recess
   b. Sublabral foramen
   c. Buford complex
   d. Type II SLAP lesion
   e. Type IV SLAP lesion

Correct answer: (a)

Explanation: Both normal variants (options (a) – (c)) and pathologic tears (options (d) – (e)) are common around the superior glenoid labrum. The key to distinguishing the variants form the tears is the relationship of any imaging abnormalities to the location of the biceps anchor (the attachment point of the long head biceps tendon), which is most reliably shown on MRI arthrography. Tears of the superior labrum that extend anterior and posterior to the anchor are called SLAP tears. The patient described does not have an abnormality posterior to the biceps anchor, excluding (d) and (e). A sublabral recess, the most common variant, is defined as a synovial-lined spaced (which thus fills with injected contrast) beneath below the biceps anchor, making (a) the correct choice. Both the sublabral foramen (b) and Buford complex (c) involve an abnormality anterior to the biceps anchor, not under it.

References:

Modality: C01.G; Primary Content: C01.A; Anatomy: C01.H; Pathology: C01.J

2. A small child shows up to your practice for a MRI examination of the knee. Your technologist tells you that there are two cylindrical, whole-volume knee coils available to use on your 1.5-T system, and that the patient’s knee would fit into either one. Both coils are receive-only and contain the same number of elements and channels. You tell the technologist that using the smaller coil will result in a better quality examination because:
   a. The smaller coil will result in less wrap (aliasing) artifact.
b. The smaller coil will cover more of the relevant anatomy.
c. The smaller coil will result in images with a higher signal-to-noise (SNR) ratio.
d. The examination will be faster with the smaller coil because it will allow you to use parallel imaging.
e. The examination will be faster with the smaller coil because it will allow you to use a shorter TR for your sequences.

Correct answer: (c).

Explanation: Choosing the optimal RF coil is one of the keys to producing high-quality, diagnostic MRI images of the extremities. The coil should match the size of the limb as closely as possible; specifically, the smallest possible coil will result in the highest signal-to-noise ratio (SNR). While both a large and small coil will receive the same amount of signal (originating from the stimulated protons in the imaged body part), the larger coil will also detect more noise from sources other than the protons in the body, resulting in a lower SNR for the larger coil (answer (c) is correct). The amount of aliasing only has to do with the size of the imaged field-of-view in the phase-encoding direction, independent of the coil size, eliminated answer (a). Parallel imaging is possible with any coil having more than one channel, (choice (d) is incorrect). Coil size does not affect the choice of pulse sequence parameters like TR, so option (e) is incorrect. The main disadvantage of a smaller coil is decreased anatomic coverage (option (b) is incorrect) – if more coverage is required and an array composed of several linked smaller coils (like most spine arrays) can provide increased coverage without sacrificing SNR.

References:

Modality: C01.G; Primary Content: C01.J; Anatomy: C01.G; Pathology: C01.H

3. In patients with established rheumatoid arthritis, what finding in the wrists and hands on a baseline MRI examination is the strongest predictor for the development or progression of radiographically-evident erosions later?
   a. Tenosynovitis involving the carpal tunnel.
   b. Erosions of the second metacarpal heads.
   c. Symmetric synovitis in the wrist joints.
   d. Osteitis in the carpal bones or metacarpal heads.
   e. Soft tissue necrobiotic (rheumatoid) nodules.

Correct answer: (d)

Explanation: Both MRI and ultrasound have added value in imaging patients with rheumatoid arthritis. Both studies can demonstrate synovitis, tenosynovitis, and erosions. Only MRI can show osteitis (sometimes referred to as bone marrow edema), which is a geographic region of high-signal intensity in the marrow on water sensitive images that enhances following intravenous contrast administration. Osteitis corresponds to a cellular inflammatory infiltrate histologically. The presence of osteitis is the only independent predictor of development or progression of radiographic erosions at 2 years, and the best predictor of development or progression of radiographic erosions at 5 years, making choice (d) the best response. The presence of synovitis (c) is an indicator of current disease activity; synovitis is also a predictor of future erosions developing one year later on a follow-up MRI examination, but it is weaker predictor compared to osteitis. Baseline erosions (b), symmetric synovitis (c),
and flexor tenosynovitis (a) each increased the risk of a patient with undifferentiated arthritis developing classic rheumatoid arthritis in the future, especially when a serologic abnormality like a positive anti-CCP antigen is present, but do not have independent prognostic value, especially once a diagnosis of rheumatoid arthritis is established. Rheumatoid nodules (e), may be visible on MR images in patients with seropositive rheumatoid arthritis, but their presence is not related to risk of future erosions.

References:


Modality: C01.G; Primary Content: C01.B; Anatomy: C01.D; Pathology: C01.C

4. A previously healthy 15-year-old girl suffers a lateral patellar dislocation while playing soccer. The dislocation spontaneously reduces. Three days later her orthopedic surgeon requests a knee MRI examination to see if he can manage her conservatively. What MRI finding is an indication for surgery in patients after a first-time patellar dislocation injury?

a. Bone marrow contusions in the medial patella and lateral femoral condyle.

b. An osteochondral fracture of the patella with a loose intraarticular body.

c. A tibial tubercle-trochlear groove (TTTG) measurement greater than 20 mm.

d. A hypoplastic femoral trochlear groove.

e. A large knee joint effusion.

Correct answer: (b).

Explanation: Bone bruises in the medial patella and lateral femoral condyle (a) are indicators that a recent lateral patellar dislocation-relocation injury occurred, but their presence does not influence management. Similarly, a large effusion (e) is expected after a patellar dislocation, but is nonspecific (for example, virtually all patients with acute ACL tears will also have a large knee effusion), and does not influence treatment decisions. Most first-time patellar dislocation injuries can be treated conservatively, with immobilization followed by quadriceps muscle strengthening exercises. However, the presence of an unstable osteochondral fracture and/or an osteocartilagenous loose body is an indication for arthroscopic loose body removal or primary osteochondral repair, making (b) the correct response. In knees with recurrent patellar instability, the decision to operate and the choice of surgery can be influenced by a laterally inserting patellar tendon – which is quantitated by the TTTG distance (c), insufficiency of the medial patellofemoral ligament, or hypoplasia of the trochlear groove (e), but these are not indications for surgery in the acute setting.
5. A 27-year-old man had his first anterior shoulder dislocation after a hockey injury at age 17. Since that time he has had “more than 50” repeated dislocations of the same shoulder with lesser degrees of trauma, and now reports that his shoulder will sometimes dislocate when he rolls over in bed. He is able to reduce his dislocated shoulder easily. He has not had prior surgery, but his orthopedist is planning to do an arthroscopic anterior soft tissue stabilization procedure. What MRI imaging finding should serve as a warning that a different procedure should be performed?

a. A Hill-Sachs deformity of the humeral head.
b. A tear of the anteroinferior glenoid labrum, extending from 3:00-6:00.
c. A rupture of the anterior band, inferior glenohumeral ligament.
d. Stripping of the anterior glenohumeral capsule from the scapular neck.
e. Anterior glenoid bone loss affecting 30% of the articular surface.

Correct answer: (e).

Explanation: Patients with recurrent anterior shoulder dislocations following initial trauma will typically have imaging findings in the proximal humerus, joint soft tissues, and/or glenoid. An impaction injury of the posterolateral superior humeral head (a Hill-Sachs lesion) is a marker indicating a previous traumatic, anterior dislocation, but its presence is not a contraindication to a soft tissue repair (answer (a) is incorrect). Lesions of the anteroinferior soft tissues (labrum, articular cartilage, capsular, ligamentous, and scapular periosteum) are all variations of a Bankart lesion, and are addressed with primary soft tissue repair and/or capsular shift or tightening. Thus answers (b), (c), and (d) are not correct. Chronic remodeling and loss of anterior glenoid bone is common, especially in patients with recurrent dislocations. Bone loss is now recognized as a main cause of failed soft tissue operations (which both fail to provide the support of the missing bone and result in non-anatomic soft tissue reconstructions where the torn structures are reattached too far posteriorly on the remaining glenoid). Once bone loss exceeds 15-20% most surgeons will combine some form of glenoid augmentation (like a Laterjet) procedure with a soft tissue reconstruction. Severe bone loss is also considered a contraindication to an arthroscopic approach to instability surgery by many authorities. Thus answer (e) is correct. Identifying unsuspected bone loss is one way that cross-sectional imaging (with MRI or CT) has added value in patients with recurrent shoulder instability.

References:


**Modality:** C01.G; **Primary Content:** C01.B; **Anatomy:** C01.H; **Pathology:** C01.J