The imaging findings may be attributable to a mass within the:

A. Suprascapular Notch.
B. Spinoglenoid Notch.
C. Quadrilateral Space.
D. No mass, more likely Parsonage-Turner Syndrome.
Shoulder Denervation

• Findings of denervation:
  o Acute:
    • Increased signal on fluid sensitive sequences
  o Chronic:
    • Fatty atrophy on T1W imaging
    • Affected nerve may exhibit abnormal size and signal
    • Search for a pattern of denervation and a mechanical cause
  o Our case → Quadrilateral space

• Mechanical causes of denervation:
  o Fracture deformity
  o Neoplasm
  o Cyst (paralabral)
  o Hematoma
  o Varices


<table>
<thead>
<tr>
<th>PATTERN</th>
<th>NERVE</th>
<th>ENTRAPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraspinatus and infraspinatus muscles</td>
<td>Supraspinatus nerve</td>
<td>Supraspinatus notch</td>
</tr>
<tr>
<td>Infraspinatus muscle</td>
<td>Supraspinatus nerve</td>
<td>Spineglenoid notch</td>
</tr>
<tr>
<td>Teres minor +/- deltoid muscle</td>
<td>Axillary nerve</td>
<td>Quadrilateral space (bounded by the biceps, Long head triceps, teres minor, and teres minor)</td>
</tr>
<tr>
<td>Variable, as the entire bursal planus can be affected</td>
<td>Peroneus-Teres Syndrome (Bursal Planus Incoordination)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Table 4. Denervation patterns of the shoulder (23)

Axial PD FS

What is the yellow arrow pointing to on the right?

A. Periosteal attachment of a torn labrum.
B. Intra-articular body.
C. Periosteal attachment of a torn and displaced labrum.
D. Inferior glenohumeral ligament.
Bankart Tear and Variants

• Findings of labral tear:
  - Abnormal increased signal within the labrum
  - May have an accompanying paralabral cyst
  - With arthrography, fluid insinuation into the tear may be present

• Bankart tear:
  - The consequence of anterior shoulder dislocation (glenohumeral instability)
  - Tear involving the inferior glenoid labrum
  - Distinguishing the difference amongst these lesions may be challenging.
  - Our case → Perthes


What structure prevents retraction when the above tendon is ruptured?

A. Brachialis muscle.
B. Lacertus fibrosus.
C. Surrounding neurovascular bundle.
D. Ulnar collateral ligament.
Rupture of the Biceps Tendon

• Findings of biceps tendon rupture:
  o Fiber discontinuity
  o Complete – absence of the distal biceps tendon with replacement by edema (our case)
  o Partial – thinned or thickened tendon, abnormal intrasubstance signal, marrow edema at radial tuberosity, fluid within bicipitoradial bursa

• Background:
  o Tear is rare, more often complete than partial
  o Usually the result of a single traumatic event
  o Tear typically occurs at radial tuberosity

• Bicipital aponeurosis/Lacertus fibrosis:
  o Continuation of the anteromedial fascia of the distal biceps, inserting onto the deep fascia of the forearm
  o If intact, the tendon will not retract

Rupture of the Biceps Tendon

• DDx for biceps tendon tear
  o There is considerable overlap between chronic tendinosis and partial thickness tearing
  o Beware isolated bicipitoradial bursitis, which may also simulate a mass

The structure avulsed in these images is comprised of how many components?

A. 1  
B. 2  
C. 3  
D. 4

Ulnar Collateral Ligament Tear

- Findings of UCL tear:
  - Typically full thickness, and usually midsubstance
  - Partial tears usually affect the undersurface
  - Amorphous, redundant appearance, fiber discontinuity, abnormal intrasubstance signal, and periligamentous edema

- Background:
  - 3 bundles: anterior, posterior, and transverse
    - Anterior bundle is clinically relevant (major stabilizer against valgus and rotary stress)
    - 2 bands: anterior and posterior
    - From medial humeral epicondyle to sublime tubercle of coranoid process
    - Most often injured due to chronic repetitive stress from overhead throwing
  - Usually the result of a single traumatic event
  - Tear typically occurs at radial tuberosity
Ulnar Collateral Ligament Tear

• DDx of UCL tear:
  o Partial versus complete
  o Common flexor tendon injury


Contrast within the DRUJ following injection into the RCJ implies discontinuity of the:

A. Scapholunate ligament.
B. Lunotriquetral ligament.
C. Triangular fibrocartilage.
D. Dorsal intercarpal ligament.

Coronal T1 FS
Triangular Fibrocartilage

• Findings of TFC tear:
  o Hypointense centrally/radially, with two peripheral arms that appear striated
  o Full thickness (communicating) or partial thickness (non-communicating)
  o Contrast extravasation into the DRUJ with RCJ injection

• Components of the TFCC:
  o Triangular fibrocartilage (TFC) proper/disk
  o Dorsal and volar radioulnar ligaments
  o Meniscal homologue
  o Sheath of extensor carpi ulnaris tendon
  o Ulnar collateral ligament
  o Ulnolunate and ulnotriquetral ligaments

---

Triangular Fibrocartilage

<table>
<thead>
<tr>
<th>Traumatic (I)</th>
<th>Degenerative (II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Central perforation</td>
<td>A. TFC partial thickness tear</td>
</tr>
<tr>
<td>B. Ulnar avulsion</td>
<td>B. TFC partial thickness tear and chondromalacia (not reliably seen by MRI)</td>
</tr>
<tr>
<td>C. Distal avulsion (ulnolunate or ulnotriquetral ligament injury)</td>
<td>C. TFC perforation (which occurs centrally) and chondromalacia</td>
</tr>
<tr>
<td>D. Radial avulsion</td>
<td>D. TFC perforation, chondromalacia and ulnotriquetral ligament perforation</td>
</tr>
<tr>
<td>E. TFC perforation, chondromalacia, lunotriquetral ligament perforation, and ulnocarpal/ radioulnar arthritis</td>
<td></td>
</tr>
</tbody>
</table>

Palmer Classification of TFC Tears
Triangular Fibrocartilage


Bateni CP, Bartolotta RJ, Richardson ML, Makary H, Allan CI. Imaging key wrist ligaments: what the surgeon needs the radiologist to know. AJR. 2013 May;200(5):1089-95. doi: 10.2214/AJR.12.9758.


A non-viable proximal scaphoid pole following fracture will appear:

A. Dark on T1 and T2 FS.
B. Dark on T1 and bright on T2 FS.
C. Bright on T1 and bright on T2 FS.
D. Bright on T1 and dark on T2 FS.
Avascular Necrosis of the Scaphoid

- Findings of AVN involving the fractured scaphoid:
  - Hypointense signal on T1 and fat-suppressed fluid sensitive imaging
  - Hyperintense signal on fat-suppressed fluid sensitive imaging is non-specific
  - IV gad is confusing → necrotic bone can enhance

- Background:
  - AVN of the scaphoid is a potential complication of fracture
  - If non-union, bone graft is typically necessary during operative fixation
  - Vascularized bone graft is necessary if there is proximal pole AVN

- DDx:
  - Our case → viable proximal pole following fracture non-union
  - Non viable proximal pole following fracture non-union


The white and yellow arrows above point to (respectively):

A. Indirect and direct head rectus femoris.
B. Direct and indirect head rectus femoris.
C. Sartorius and rectus femoris.
D. TFL and sartorius.
Rectus Femoris Strain

• Anatomy of biceps femoris strain/tear:
  o Proximal
    ▪ Direct head – arises from AIIS
    ▪ Indirect head – arises from superior acetabular ridge and joint capsule
  o Form a conjoined but still distinguishable tendon 2 cm distal to their origin
    ▪ Direct head forms the superficial anterior tendon covering the proximal 1/3rd of the muscle
    ▪ Indirect head forms the deep intramuscular tendon and bipennate muscle, and is surrounded by the unipennate muscle of the direct head

• Variations of biceps femoris strain/tear:
  o AIIS avulsion
  o Injury at the tendon origin
  o Myotendinous junction injuries, both proximal and distal

• Features of biceps femoris strain/tear in our case:
  o *Bull's eye sign*
    ▪ Edema about the inner indirect tendon and its surrounding bipennate muscle
    ▪ Normal signal within the peripheral unipennate muscle

http://radsource.us/rectus-femoris-quadriceps-injury/
What does the arrow indicate?
A. Edema.
B. Subchondral collapse.
C. Unaffected bone.
D. Cartilage delamination.

Avascular Necrosis of the Femoral Head

• Features of femoral head AVN:
  - Ring-like serpiginous subchondral hypointense signal abnormality (represents the interface of repair tissue with the necrotic zone)
  - Inner border of the signal abnormality is bright on T2 weighted imaging, creating a double line sign (may be related to chemical shift artifact)

• Pain with AVN:
  - Pathogenesis: elevated pressure within medullary space, subchondral fracture, or increase in hydrostatic pressure caused by effusion are all theories
  - The presence of bone marrow edema, often associated with joint effusion, has a strong association with pain, and may be related to impending subchondral fracture

http://emedicine.medscape.com/article/386808-overview#a21
ACL Injury and Segond Fracture

- Findings of ACL tear:
  - Fiber discontinuity
  - Absent ACL
  - Abnormal horizontal or vertical orientation
  - Wavy contour
  - Edematous mass

- Secondary signs of ACL tear:
  - Bone bruise of posterolateral tibial plateau/lateral femoral condyle
  - Buckling of PCL
  - Posterior displacement of the posterior horn of lateral meniscus
ACL Injury and Segond Fracture

• **DDx:**
  o Partial thickness tear/sprain
  o Mucoid degeneration
    ▪ Celery stalk appearance
    ▪ Prior trauma, degeneration, or congenitally displaced synovial tissue

• **Segond fracture:**
  o Cortical avulsion fracture of proximal tibia, behind Gerdy’s tubercle
  o Excessive internal rotation and varus stress
  o High association with ACL and meniscal tears


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What sign is depicted on the sagittal image above?

A. Double PCL sign.
B. Anterior drawer sign.
C. Double delta sign.
D. Ghost meniscus sign.
Bucket Handle Meniscal Tear

• Findings of bucket handle meniscal tear:
  - Vertical longitudinal tear with displacement of the inner meniscal fragment into the intercondylar notch
  - Double PCL Sign
  - Absent bow tie sign – truncated body seen only on a single sagittal slice
  - Double delta sign – two apparent anterior horns

• Alternative forms of meniscal tear (ddx):
  - Horizontal cleavage
  - Vertical longitudinal
  - Radial
  - Oblique/flap

• General criteria for meniscal tear:
  - Abnormal signal that breaches the superior or inferior articular surface, or the meniscal apex
  - Look for a parameniscal cyst

http://www.eurorad.org/eurorad/case.php?id=8459
What disorder predisposes patients to insufficiency fractures of the calcaneus?

A. Scleroderma.
B. Hypertension.
C. Rheumatoid arthritis.
D. Diabetes mellitus.

Calcaneal Fatigue and Insufficiency Fractures

- Findings of stress and insufficiency fractures:
  - Hypointense linear fracture line with surrounding bone marrow edema
  - Fracture fragment may be displaced
  - Vascular calcifications often present in those with DM

- Background:
  - Fatigue fracture
    - Most often appears as line perpendicular to the primary trabeculae of the posterior process
  - Insufficiency fracture
    - Occurs most frequently at the posterior tuberosity of the calcaneus as well
    - Influencing factors include osteopenia and diabetic neuropathy