MR Imaging of the Shoulder: Instability

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Glenohumeral joint

- Small and shallow glenoid relative to humeral head
- Extensive range of motion
- Osseous anatomy does not provide stability

Shoulder stabilizers

- Static
  - Glenoid labrum
  - Capsule
  - Glenohumeral ligaments
- Dynamic
  - Rotator cuff muscles

Glenoid labrum

- Cuff of fibrous and fibrocartilaginous tissue surrounding glenoid fossa
- Largest superiorly and anteriorly
- Deepens glenoid circumferentially
- Serves as attachment site for the glenohumeral ligaments

Glenoid labrum

- Difficulties
  - Normal variation
  - Undercutting with hyaline cartilage
  - Magic angle artifact
  - Labral degeneration
  - Difficult to assess without joint fluid
  - Increased accuracy with MR arthrography

Cooper et al., JBJS 74A:46-52, 1992
Capsule

- Posterior capsule inserts onto labrum or immediately at base of labrum
- Anterior capsular attachment variable

<table>
<thead>
<tr>
<th>Type 1</th>
<th>Capsule attaches on labrum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2</td>
<td>Capsule attaches within 1 cm</td>
</tr>
<tr>
<td>Type 3</td>
<td>Capsule attaches far from labrum</td>
</tr>
</tbody>
</table>

YH Park et al, AJR 175:667, 2000

Ligaments

Superior GHL

Middle GH ligament

Buford complex

Inferior GH ligament
**ABER position**

- Humerus abducted and externally rotated
- Relaxes rotator cuff and places tension on inferior glenohumeral ligaments
- Image along humeral axis in coronal plane

**Classification**

**Degree**
- Dislocation
- Subluxation
- Microinstability

**Etiology**
- Ambri
- Tubus
- Aios

**Direction**
- Antero-inferior
- Posterior
- Superior
- Multidirectional

**AMBRI**

- Benign joint hypermobility syndrome
- Collagen? often familial
- Young females

**AIOS**

- Repetitive overuse leading to microinstability
  - Redundant capsule
  - Anterior capsule attenuation
  - Fibrosis of posterior capsule

**TUBS: Direction**

- Antero-inferior
- Posterior
- Superior
- Multidirectional
Anteroinferior labral pathology:
- Anterior shoulder dislocation
- Bankart
- Perthes
- ALPSA
- Hill-Sachs lesion
- Bony Bankart

Engaging
Nonengaging

Burkhart and De Beer. Arthroscopy 16:677, 2000
Bony Bankart

- Glenoid bone stock deficiency
- ≥25% bone stock loss, Bigliani
- Inverted pear configuration, Burkhart

Anteroinferior

<table>
<thead>
<tr>
<th>Bankart lesion</th>
<th>Torn labrum</th>
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<td>Torn periosteum</td>
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<th>ALPSA</th>
<th>Medialized labrum</th>
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Bankart lesion

- Normal
- Bankart
GLOM sign

Perthe’s lesion

Perthe’s lesion

ALPSA

ALPSA

GLAD

- Glenolabral articular disruption
- Impaction injury
- No capsular tear or periosteal stripping
- Not associated with instability
- Superficial tear of anterior labrum attached to fragment of articular cartilage

- Intact periosteum
- Labrum rotated and displaced medially
- May heal with synovialization in this position
- Can be difficult to see at arthroscopy

Waldt et al., Radiology 237:578, 2005
GLAD lesion

Anteroinferior

- Humeral avulsion fracture
- BHAGL
- Axillary pouch
- PHAGL
- Complete

IGHL Humeral failure

- HAGL
- Axillary pouch
- PHAGL
- Complete

PHAGL

CHUNG ET AL, AJR 183:355-359, 2004

HAGL

Injury and 10 month follow-up

IGHL central failure

CHUNG ET AL, AJR 183:355-359, 2004
Posterior dislocation

- Trough fracture
- Reverse bony Bankart
- Reverse Bankart lesion
- Posterior labral tear
- Capsule tear or stripping

Trough fracture

TS
DM

Trough fracture

RN
DA

Posterior labrum

DM

**Posterior**

- Bennett lesion
  - Extraarticular posterior capsule avulsive injury
  - Crescentic bony mineralization at posterior-inferior glenoid rim
  - Associated with posterior labral tears and rotator cuff tear

- Kim’s lesion
  - Glenoid internal rotation deficit
  - Tight posterior capsule in the throwing shoulder
  - Thickening of the posterior capsule and labrum

- GIRD
  - Glenoid articular rim divot
  - Osteochondral injury of posterior glenoid rim
  - Akin to GLAD lesion at posterior glenoid

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**Loss of posterior labral height & contour, cyst at junction of labrum and cartilage**
- Mechanism is force applied in posterior direction
- Force exerted on PIGHL leading to posterior labral tear, propagating in medial to lateral direction
- Preserved chondrolabral junction

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Glenoid dysplasia

Superior

SLAP impaction

SLAP

SLAP tear

Glenoid dysplasia

Superior subluxation with impaction

Traction by biceps anchor

Superior labral tear (SLAP 1-3)

Extension into biceps (SLAP 4)

Extension into MGHL (SLAP 7)

Humeral head osteochondral lesion

Extension into SGHL and coracohumeral ligament (SLAP 10)

• Tear of the biceps anchor/superior labral complex
• Acute trauma
• Repetitive throwing and other overhand activities
• “Superior labrum anterior posterior”

Cartland et al, AJR 159:787, 1992

Snyder et al, Arthroscopy 6:274, 1970
drawings from Beltran et al, Radiographics 17:657, 2007

Snyder et al, Arthroscopy 6:274, 1970
drawings from Beltran et al, Radiographics 17:657, 2007
SLAP tear

- Anterior to biceps anchor
- Thin (<2 mm wide)
- Short (<5 mm tall)
- Smooth and even
- Parallel to glenoid
- Normal cartilage

Smith DK et al, Radiology 201:251-256, 1996

Sublabral recess

Paralabral cyst


Shoulder Instability