MSK MRI
SHOULDER: LABRUM AND CAPSULE

Joint Department of Medical Imaging
University Health Network, Mount Sinai and
Women’s College Hospitals
Shoulder: Glenohumeral Joint

Greatest ROM of any joint in the body
Tremendously versatile & mobile

Mobility – at expense of stability

Normal function dependent upon

- balance between static and dynamic constraints of the joint
Injury that **disturbs balance** →

- Biomechanical changes
- Instability

Clinically manifest:

**Poorly localized pain/weakness**

**Mechanical symptoms**

- popping, catching, grinding
- GHJ dislocation
Stabilizing Restraints: Shoulder

**Active** (extrinsic)

- Rotator cuff and other musculature

**Passive** (intrinsic)

- Osseous geometry
- Labrocapsular complex
  - Labrum, Capsule & Glenohumeral ligaments
Labrum

Fibrocartilagenous tissue
Stabilizer - GH joint

Encircles glenoid
Increases depth/volume
  glenoid 50%

Pressure seal

Primary attachment
  • LH Biceps, GH ligaments
MR Imaging

Fibrocartilagenous labrum

Usually of low signal on MR sequences

Best evaluated

• MR arthrography
Glenohumeral Ligaments

Critical passive stabilizers GHJ

Condensations joint capsule

Superior GHL

Middle GHL
  - Most variable in size
  - Thickened or absent

Inferior GHL
  - Ant & Post bands, Ax recess
**Inferior GHL**

Lax – neutral position  
Taught – abduction  
“Hammock” humeral head

Major passive stabilizer GHJ  
Stability Anterior joint capsule
Normal Glenohumeral ligaments

MR - Low signal capsular folds

Best evaluated MR Arthrography
- Axial
- Sagittal oblique
Etiology Shoulder Instability

Traumatic (TUBS)  Microtraumatic  Atraumatic (AMBRI)

Unidirectional  Multidirectional

Less laxity  More laxity

Rationale MR Imaging - Define anatomic lesion(s)
- Cause instability, Result of instability
Types of Instability

TUBS
- Traumatic
- Unidirectional
- Bankart

AMBRI
- Atraumatic
- Multidirectional
- Bilateral
- Rehab
- Inferior

2% Prevalence Surgery for treatment
Unidirectional Anterior Shoulder Instability

- Usually related to Traumatic Dislocation
- Represents 95-97% of all shoulder dislocations
- Mechanism: classically - abduction with external rotation
Anterior Dislocation

Injury Osseous + ST restraints

Posterior superior
- Humeral Hill Sachs lesion
- RTC contusion/tear

Anterior Inferior
- Fx Glenoid rim (oss bankart)
- Labrocapsular injuries
  - detachments from glenoid
Management perspective
Information critical to surgeon

Labral tearing - Extent/Pattern
Capsular glenohumeral lig lesion (HAGL)
Rotator cuff lesion
Osseous deficiency
Anterior Dislocation
Anterior Dislocation – Bankart Lesion
Anterior Dislocation – Bankart Lesion
Labrocapsular injuries - Anterior Dislocation

Avulsive stress - AIGHL
Tearing Ant/Inf labrum
- weak link

→ classic ‘Bankart’ lesion
variants
Perthes
ALPSA

* Potential implications clinical management
Fibrocartilagenous Bankart
Osseous Bankart
GLAD

Glenoid labral

Articular disruption
Glenolabral Articular Disruption
Forced adduction injury (humeral head impacts the glenoid fossa)
Clinically a stable lesion
Partial tear anteroinferior labrum/articular, cartilage injury
GLAD
GLAD LESION
Labral Capsular Abnormalities:
Classic Bankart lesion

- Avulsion of labrum from osseous glenoid
- Periosteal attachment torn

* Distinguishing feature from others
Pitfall - Buford Complex
Pitfall - Buford Complex
Bankart lesion

- Anatomic extent tear

Tear extension
  - ? Posterior extension
  - ? Involve biceps anchor

Plan anatomic repair
  - Arthroscopic repair
  - Portal placement
Perthes lesion

- Nondisplaced avulsion of labrum from glenoid
- Scapular periosteal attachment intact

* ABER
ALPSA lesion

• **Anterior Labroligamentous Periosteal Sleeve Avulsion**

• Avulsion labrum from glenoid + displacement

• Intact scapular periosteum

  * fragment **displaces & rotates** inferomedially
Adherent ALPSA (scarred Bankart lesion)

important implications for surgical management

- cursory arthroscopic exam anteroinferior quadrant unremarkable
- surgical identification critical
  - mobilization/dissection
  - repair
Failure anterior labrocapsular tissues may also occur
- Humeral origin GHL

HAGL lesion

- More common – 1st time dislocators > 35yrs

< 30 yrs - labral tears
• **Partial/Incomplete tears**
  Managed conservatively

• **Complete tears**
  HAGL
  Osseous avulsion (BAGL)
  Prone - recurrent instability
  Open surgical repair
Osseous Lesions

- Greater tuberosity/coracoid
- Osseous Bankart
- Hill Sachs lesion

Clinical significance

Potential compromise
static stability GHJ
**Hill Sachs lesions**

- Important - large engaging lesions

Rare lesions

→ Recurrent/irreducible dislocation

*Rotation osteotomy*

*Osteoarticular allograft*
Osseous pathology: Radiographs

Avulsion fracture "Osseous Bankart"

Hill-Sachs lesion
Hill Sachs lesions - first 2 slices of the humeral head
At or above coracoid level
Remplissage
Osseous Bankart

Compromise static stability

→ Impaired containment humerus

• >25-30% AP glenoid
• SI length > max radius glenoid
Osseous Bankart

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Glenoid deficits - Repaired open surgical procedure osseous reconstruction or buttress (Bristow/Latarjet)

Bony defect before glenoid preparation
Loss of anterior / inferior bone from 3:00 to 6:00 position
Dot marks bare spot of glenoid

Coracoid fixed with 2 x 3.5mm screws with washer (screw heads on Superior coracoid surface)
Bristow/Latarjet
Surgical Repair Anterior GH Instability

• Usually reserved - failure conservative treatment
• First-time dislocation elite athlete (timing within season)

No consensus repair technique; *
  - arthroscopic vs open
  arthroscopic anatomic repair

MR imaging findings
  - specific to procedure performed

Indications MR imaging post - instability repair

Secondary degen arthritis
  • Anatomy altering procedures

Recurrent instability *
  • Soft tissue/bony deficiency
    • Reinjury
    • Repair failure
MRI post- instability repair

- Utilize MR arthrography
- Dx criteria - preop labrum
  - Fluid into or beneath labrum
  - Absence or displacement labrum

Accuracy Dx recurrent tears 89-97%

Probyn L et al. Radiology. 2007; 245:814
18 y.o. M - recurrent instability 1 year post anterior capsular stabiulization + Bankart repair
TP Anterior Inferior Labral Tear
Bankart repair: recurrent instability
Recurrent instability: osseous and soft tissue deficiency
Putti-Platt: secondary degenerative osteoarthritis
Posterior Glenohumeral Instability

Usually 2° traumatic dislocation

Direct trauma
Anterior trauma - shoulder
Axial load - flex, add, int rotated arm

Indirect trauma
Violent muscle contraction (seizures, elect shock)
Posterior Dislocation

Rare Injury
< 5% GHJ dislocations

Anterior
- Humerus reverse Hill Sachs
- RTC contusion/tear

Posterior
- Reverse Bankart Fx (glenoid)
- Labrocapsular injuries
Labral lesions - posterior dislocation

- Similar spectrum findings anterior dislocation

Reverse Bankart lesions
POLPSA lesions
Reverse HAGL (uncommon)
POSTERIOR LABRAL TEAR

Common in weightlifters
Extension from superior labral tear
Retroverted glenoid
Perilabral cysts
Easy for arthroscopist to miss
  • Look from anterior portal
POSTERIOR LABRAL TEAR
POSTERIOR LABRAL TEAR
Multidirectional Instability

• Refers to instability in >1 direction

• Related to ↑ looseness/laxity of supporting capsuloligamentous structures

Congenital - atraumatic (bilateral)

or

Developed – microtraumatic athletes
Acquired – multidirectional instability

• Seen in pts active in overhead sports (baseball, tennis, gymnastics, etc)

• Repetitive stretching capsule to extreme ranges of motion

→ microtraumatic injury capsule, ligaments, labrum alterations joint proprioception predisposition to joint dislocation
MR Imaging: Findings

Multidirectional instability

- Capacious joint capsule
- Joint subluxation
- Labral tearing
- +/- Hallmarks - jt dislocation
- Retroversion glenoid
  
  ? cause or consequence
Hockey player – “Shoulder instability”
– Hx symptomatic joint subluxation
SLAP Lesions

Tears superior labrum ant-to-post involving biceps anchor

Etiology - Traction (LHB)
- Compression (grinding)

Initially classified 4 types
Subclassification 10+ types

Sublabral recess
**SLAP I**

Fraying superior labrum

- Intact stable anchor
- Common – older pts, athletes

**SLAP II**

Superior labral tear, detachment biceps anchor

- Most common true tear
- May resemble sublabral recess

(irregular margins, separation labrum, extension post to anchor, lateral extension)
SLAP III
Bucket handle tear sup labrum
  • Intact biceps anchor

SLAP IV
Tear sup labrum extending into biceps tendon
  • Unstable biceps anchor + tendon
Summary

Physiologic and MR Imaging

Anatomic restraints GHJ
- Labroligamentous soft tissues
- Osseous (humerus, glenoid)

MRI findings
- Glenohumeral dislocation
- Postoperative Instability repair

Features – Important to surgical planning and management