OrthoCarolina

Anterior Shoulder Instability

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Outline

- Anatomy/Biomechanics
- Clinical Workup
- Traumatic Anterior Instability
- Multidirectional Instability (MDI)

Anatomy and Basic Science

Definitions

- ***Laxity*** = above average ROM/joint translation which is **asymptomatic**

- ***Instability*** = pathologic translation of the humeral head during active shoulder use that is **symptomatic**

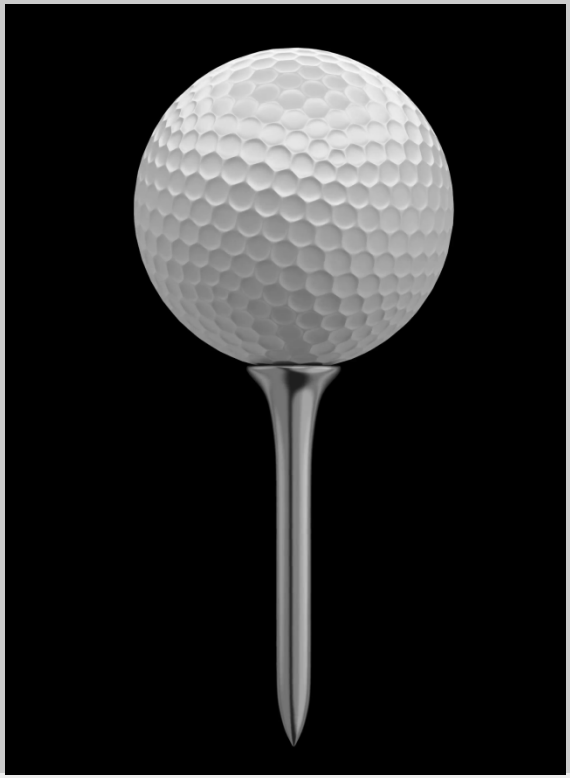
Stabilizing Factors
Dynamic

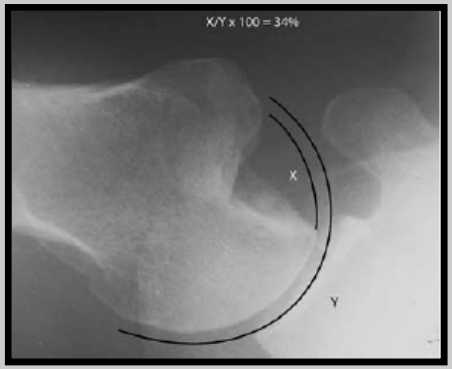
- **Scapular Rotators**
  - Create a stable glenoid platform
  - Maximize rotator cuff efficiency for articular compression

- **Rotator Cuff**
  - Centers the humeral head, stabilizing against anterior and inferior translation
    - Biceps a secondary stabilizer at lower elevation

Stabilizing Factors
Static

- Bone
  - **Like a golf ball on a tee…**





Hill-Sachs

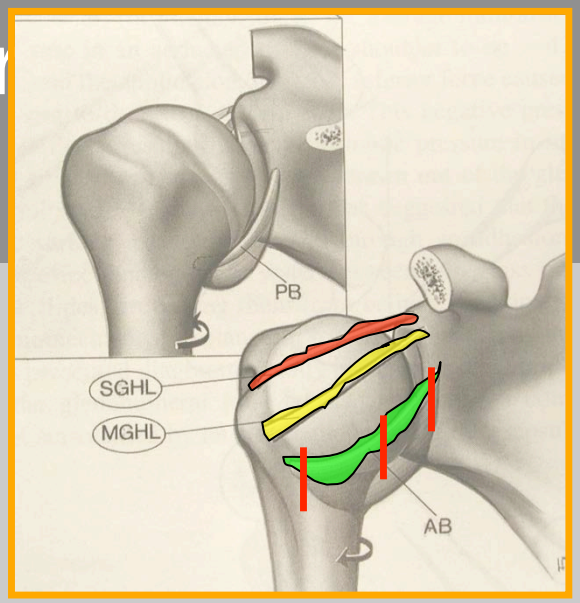
Bony Bankart

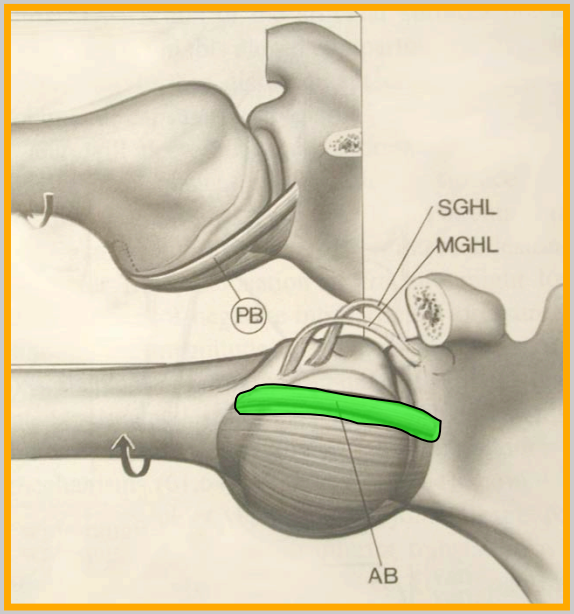
Stabilizing Factors
Static

- **Labrum**
  - ***Increases concavity, but mild contribution***
    - ***Speer, JBJS 1994:*** **sectioning the labrum increases anterior translation by *only* 3-4 m**

Stabilizing Factor
Static

- **GLENOHUMERAL LIGAMENTS**: Structural thickenings of capsule.
  - **Selective cutting studies (O'Brien AJSM 1990, Warner AJSM 1992):**
  - **SGHL**: supraglenoid tubercle →LT
    - *Inferior stability*: Prevents Inferior Translation/ER in positions of adduction
    - *Posterior stability*: Prevents posterior translation in positions of FF, Add, IR
  - **MGHL**: labrum → LT
    - *Inferior stability*: Prevents inferior translation/ER at ~45 of abduction
    - *Anterior stability*: Prevents anterior translation in midrange positions (ie. 45-60 abduction/ER)
  - **IGHL**: labrum → LT
    - Ant/Inf Stability: "Hammock effect" = ant/post bands prevent ant/post/inf translation at abduction >60 degrees
      - Ant band IGHL primary restraint to anterior translation in 90/90 position



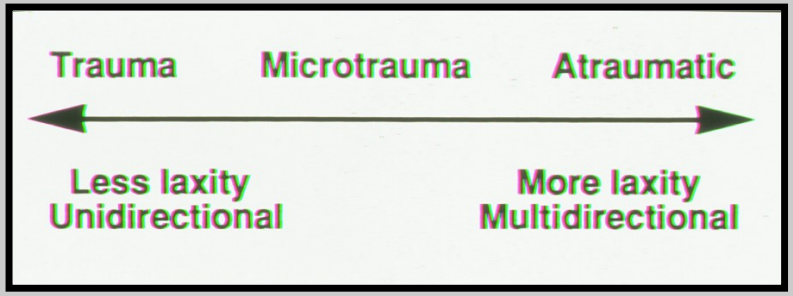


- ***Injury can occur at the labral interface (ALPSA), midsubstance, or off the humerus (HAGL)***

Clinical Workup

Classification

TUBS



AMBRI
(MDI)

- Traumatic
- Unidirectional
- Bankart lesion
- Stabilization/Surgery

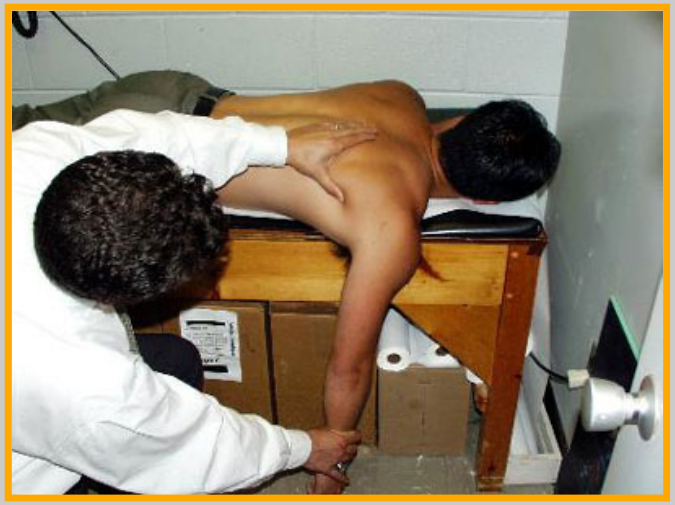
- Atraumatic
- Multidirectional
- Bilateral
- Rehab
- Inferior capsular shift

History

- Place them on the TUBS-AMBRI spectrum
  - Circumstances of first event, and all recurrences
  - Any problems on other shoulder, other joints

Closed Reduction

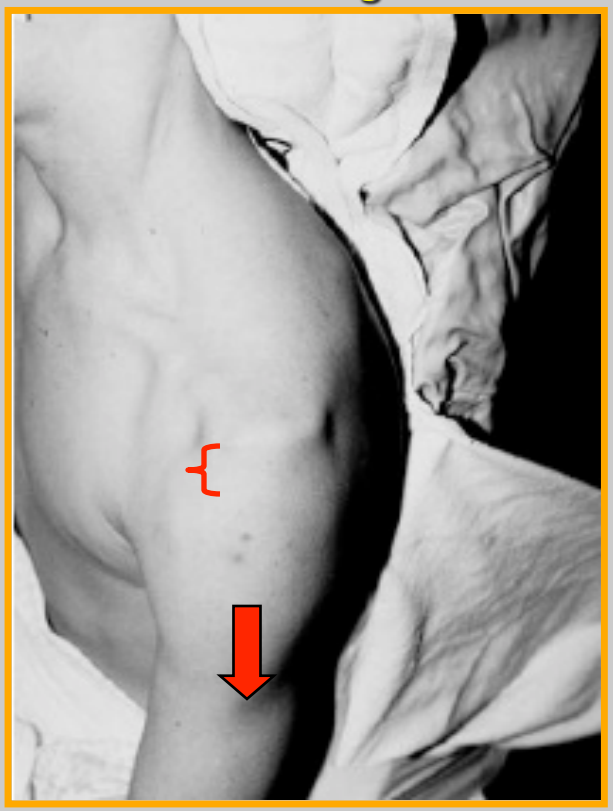
- **Traction/Countertraction**
  - Assistant at head with axillary sheet
- **Stimson**
  - Prone with weight (axial traction in flex)



Physical Exam

- Stability
  - Inferior
    - Sulcus
  - Anterior
    - Load shift: highly specific but poorly sensitive
    - Apprehension/Relocation

Sulcus Sign

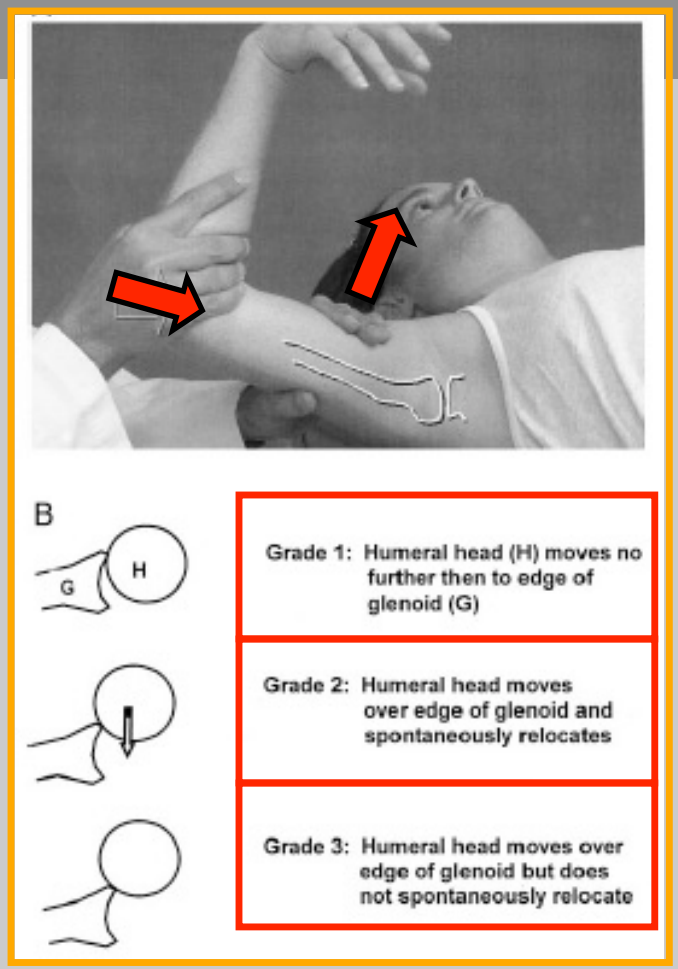


- **Abnormal if 2+ (>2cm) or more**
- **SGHL/CHL lax if sulcus persists in ER**

Physical Exam

- Stability
  - Inferior
    - Sulcus
  - Anterior
    - Load shift: highly specific but poorly sensitive
    - Apprehension/Relocation

Load Shift



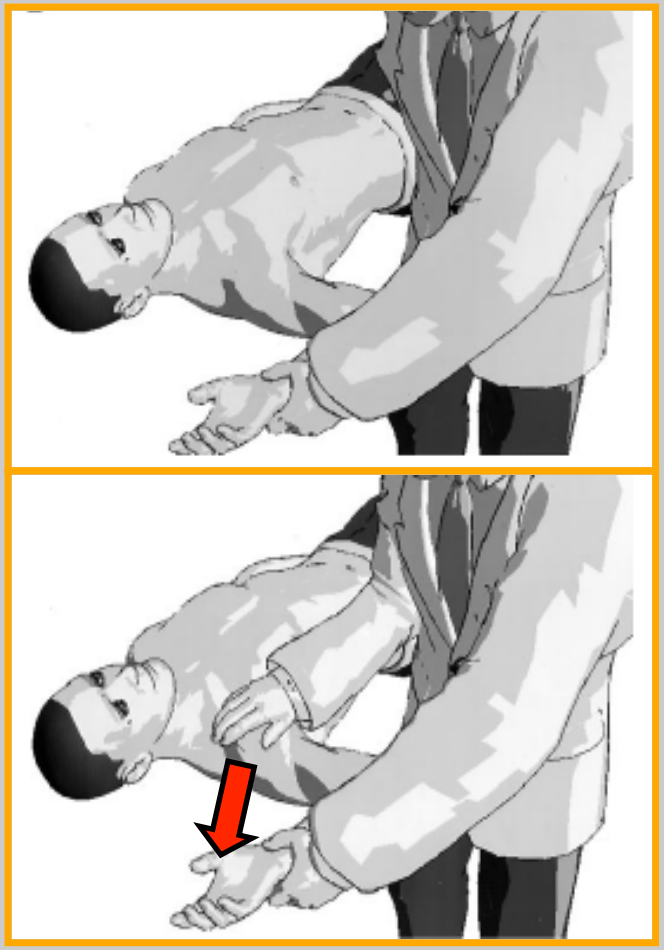
Accuracy improved when patient asleep

Physical Exam

- Stability
  - Inferior
    - Sulcus
  - Anterior
    - Load shift: highly specific but poorly sensitive
    - Apprehension/Relocation

Most accurate (85%) when apprehension (vs. pain) is the symptom that occurs and is relieved: 70% sensitive, 100% specific

Apprehension/Relocation

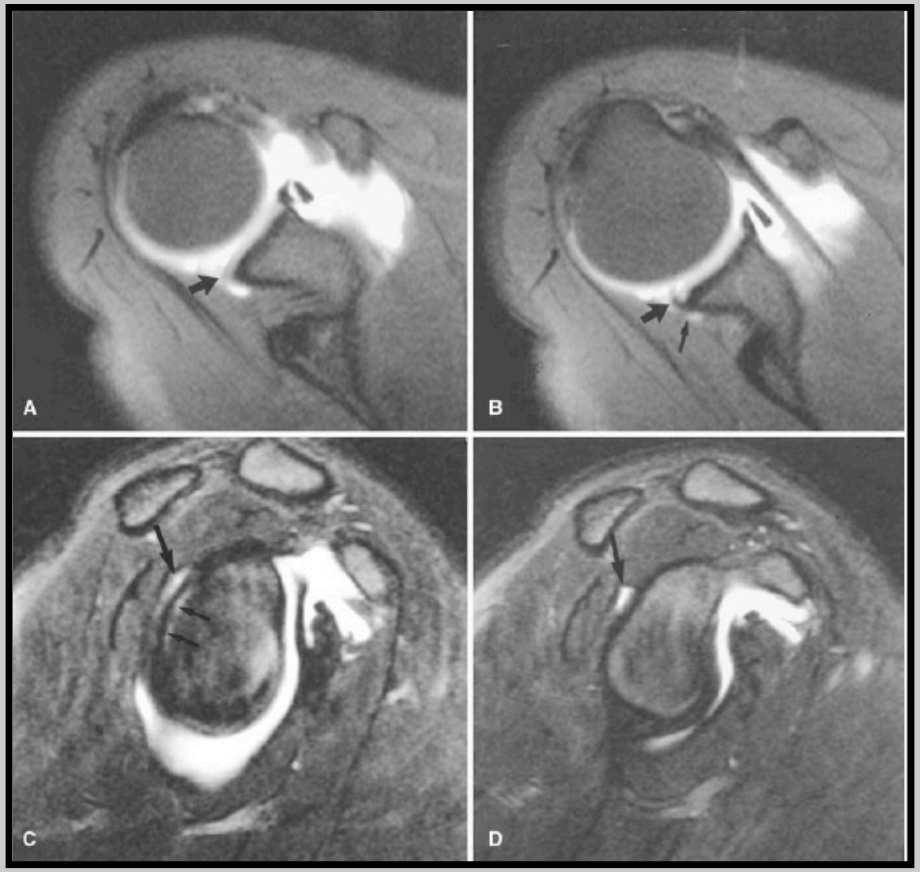


Imaging
Plain Films

- True AP
  - Should see ant/post glenoid
- AP int rotation
  - Hill-Sachs
- Scapular Lateral
- Axillary

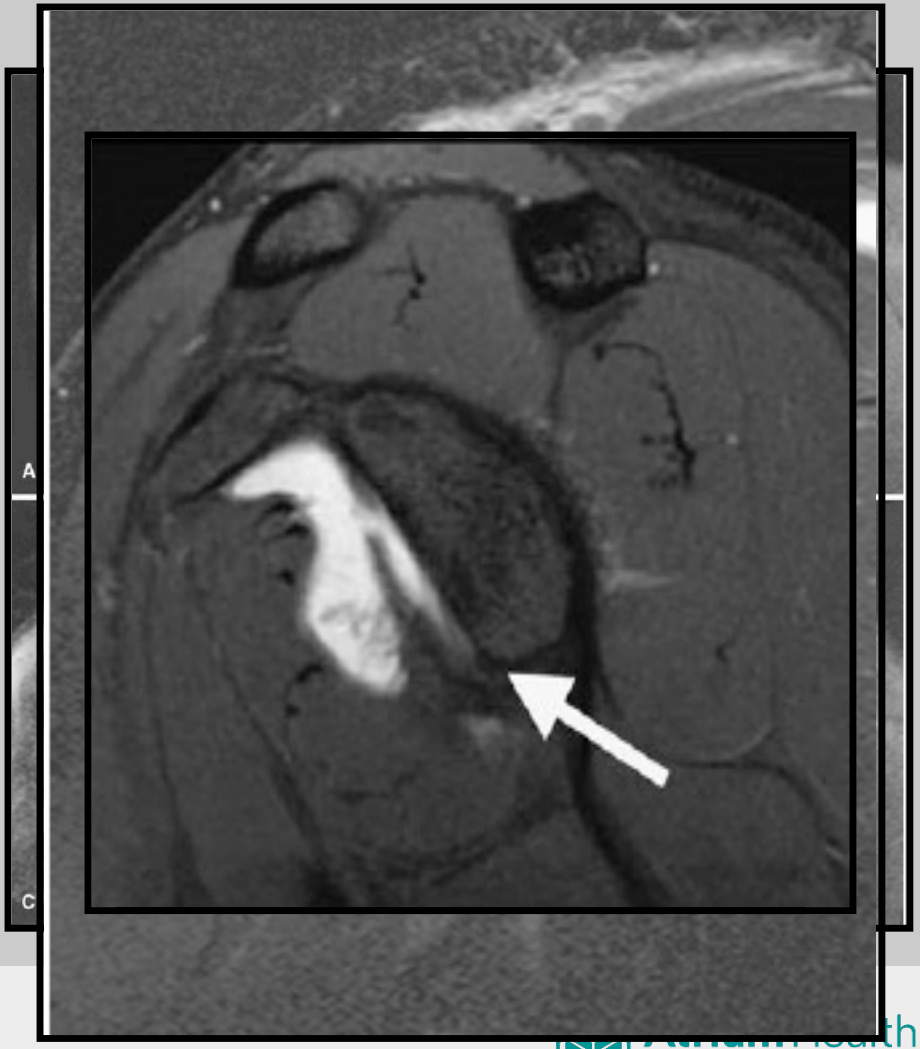
Imaging
MRI

- Not necessary for diagnosing a labral tear:
  - *A good PE may be as accurate…*
    - *Liu et al AJSM 1996*: sensitivity/ specificity of 59%/85% for MRI vs. 90%/85% for PE
  - *…most acute dislocations will have a classic labral tear:*
    - *Taylor and Arciero AJSM 1997:* 97% of first time dislocators with Bankart lesion



Imaging
MRI

- But provides important information for operative planning
  - Labral extension
  - Capsular injury (HAGL)
    - *Bui et al*: present in 1-9%
  - Cuff injuries
  - Bone loss



Imaging
CT with 3D Recon

- Valuab
  - Infe
    circl
  - ? 3D

Traumatic Anterior Instability (TUBS)

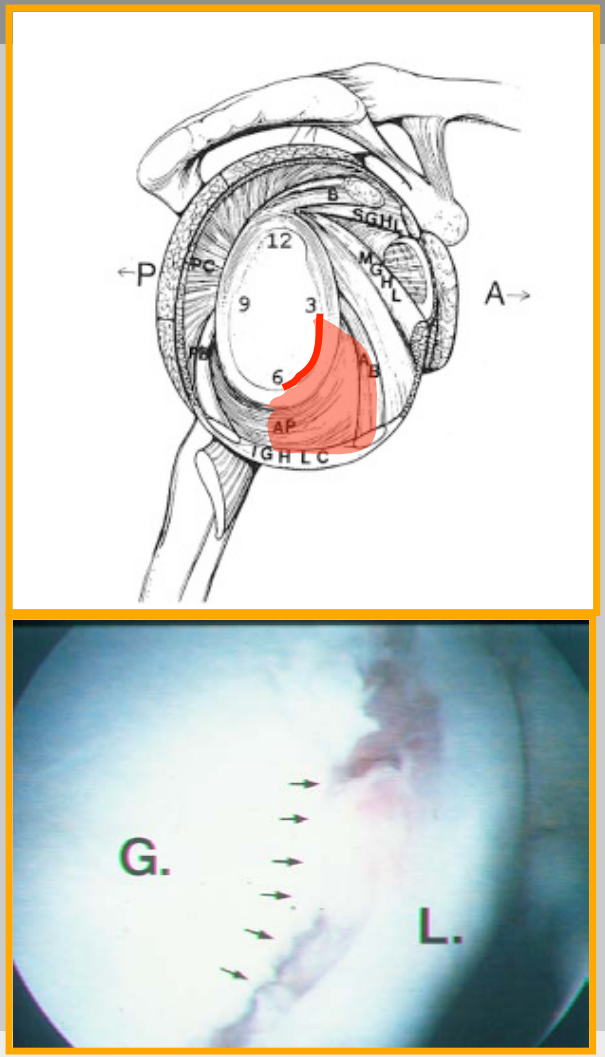
History

- Epidemiology
  - 11.2 per 100K
  - 90% anterior
- Presentation
  - Traumatic: stiff arm (rugby) vs. ER/abduction (football)

Pathoanatomy

- The essential lesion is compromise of the anterior IGHL complex:
  - *Most often involves a combination of anterior glenoid labral tear and capsular stretching…*
    - 97% with anterior labral tears (“Bankart”) *(Taylor AJSM 1997)*
    - *..,.but capsule stretches FIRST (Bigliani et al JOR 1992)*

******Must address both labral and capsular elements during surgery***



Pathoanatomy

- But can also occur with capsular avulsion from the humeral side ("HAGL")
  - *Taylor et al*: 2% with HAGL
  - *Bui et al*: 1-9%, occurring both anteriorly and posteriorly

Natural History

- **Recurrence rates of traumatic anterior instability are predictable**
  - Age: 15-20 = 70-100%; 20-30 = 50-60%; >30 = 30%
  - Gender: F = ½ M
  - Associated bone loss:
    - **Glenoid**
      - >25-30% glenoid bone loss = 89% failure rate in contact athletes
    - **Humeral Head**
      - Hill-Sachs lesions of only 13% can increase recurrence

Natural History

- **Recurrent dislocations damage the joint**
  - *Hovelius JSES 2009*: prospective 25 yr data.
    - Arthropathy not significantly different between one-time dislocators vs. those with a few events prior to surgery (18 vs. 26%)
    - **But… for chronic dislocators: 39%**

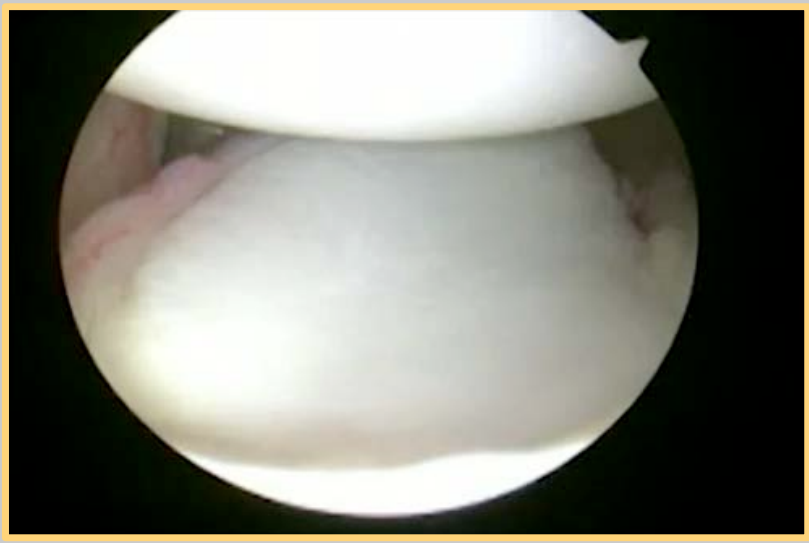
Nonsurgical Options

- **Generally do not work well**
  - IR bracing
    - *Hovelius JBJS 1996*: prospective 10 yr study with patients randomized to IR x 3-4 wks vs. sling for comfort
      - **No difference in recurrence rates**
  - ER bracing
    - *Itoi et al JBJS 2007*: prospective RCT of first time dislocators, IR vs. ER x 3 wks.
      - **Significant risk reduction for patients <30 yrs (50-60% recurrence for IR vs. 20-40% for ER)**
      - **RTP only 60% in both groups**
      - ***Finestone et al JBJSBr 2009*: RCT with 100% compliance; NO DIFF**
  - Thus… OK to mobilize quickly
    - *Buss et al AJSM 2004*: RTP in-season with 40% recurrence, no change in ultimate surgical procedure or outcome

Current approach in high risk patients is *usually operative*

ADDRESS THE PATHOANATOMY

DIAGNOSTIC SCOPE



MOBILIZE LABRUM

PREPARE GLENOID

ANCHORS

BEFORE REPAIR

AFTER REPAIR

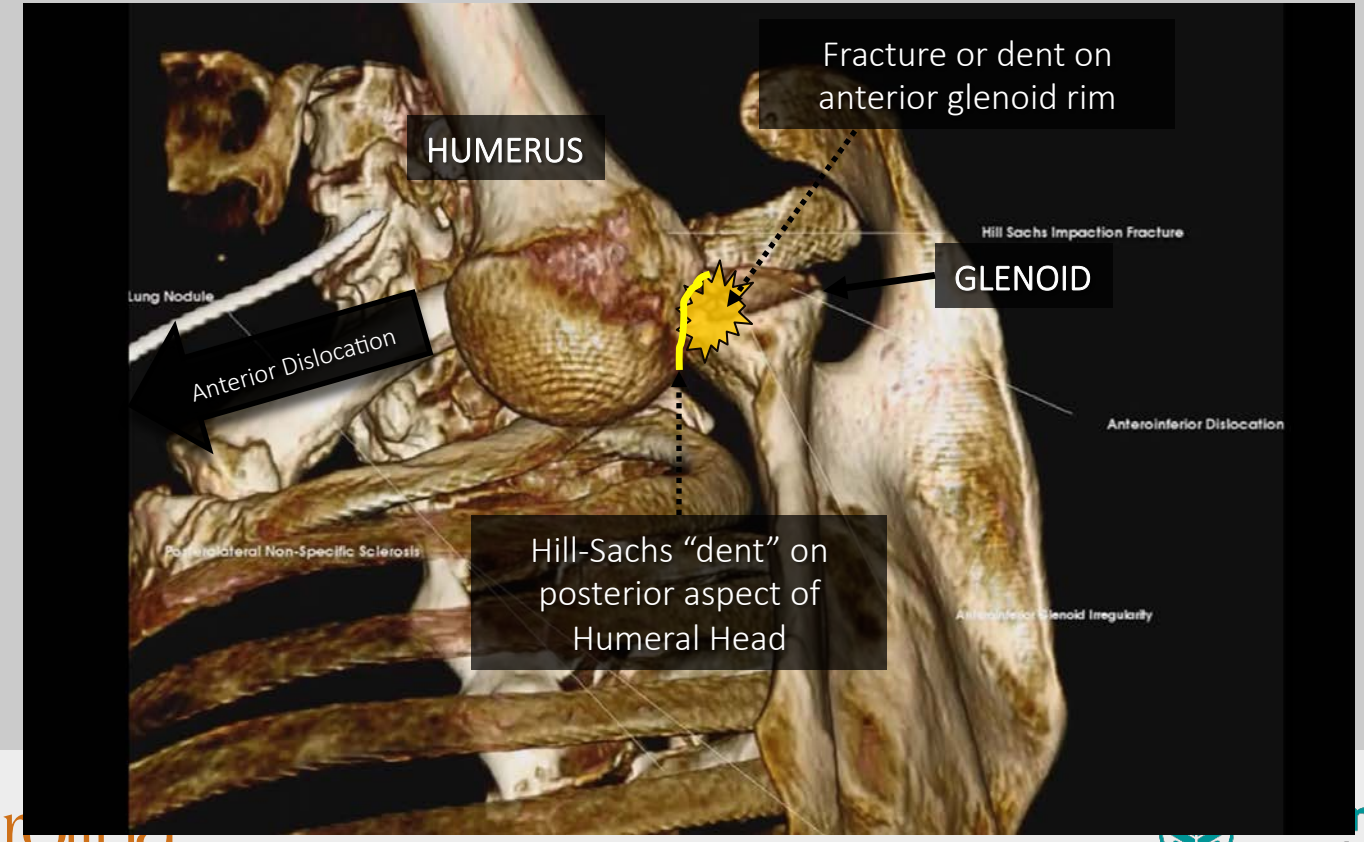
View from Posterior Portal

View from Superior Portal

Bone Loss

Treatment
Bone Loss

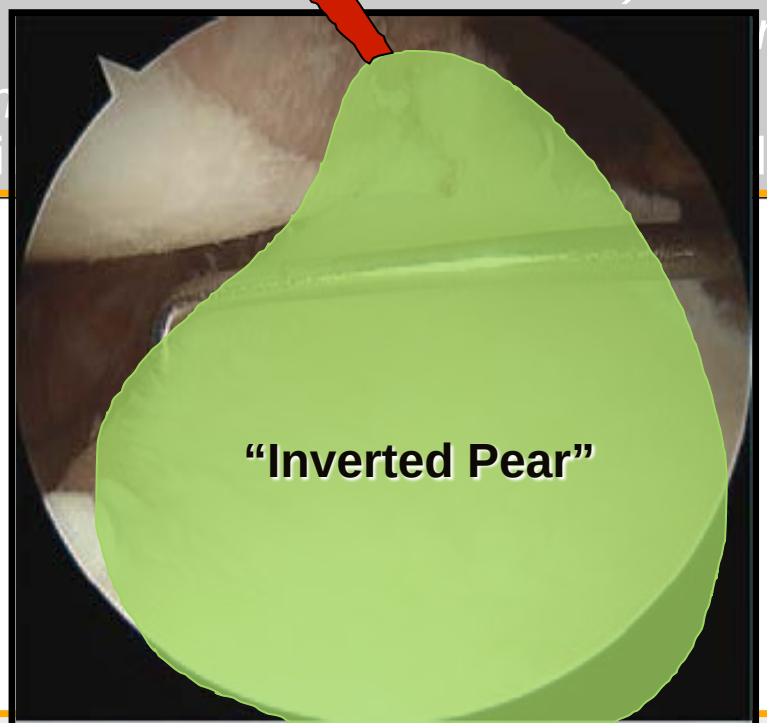
- Glenoid and Humeral bone loss can increase the risk of recurrence.



Treatment
Bone Loss

- Glenoid and Humeral bone loss can increase the risk of recurrence.

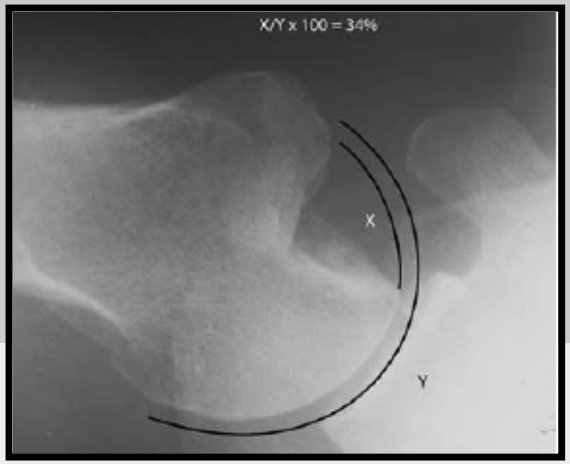
- Glenoid
  - >13.5% bone loss = **worsened outcome scores** (WOSI) *(Shaha AJSM 2015, Shin AJSM 2017)* and **recurrent instability** *rthop 2017)*
  - *Burkhart ar* have ~90% **recurrent i** .



Treatment
Bone Loss

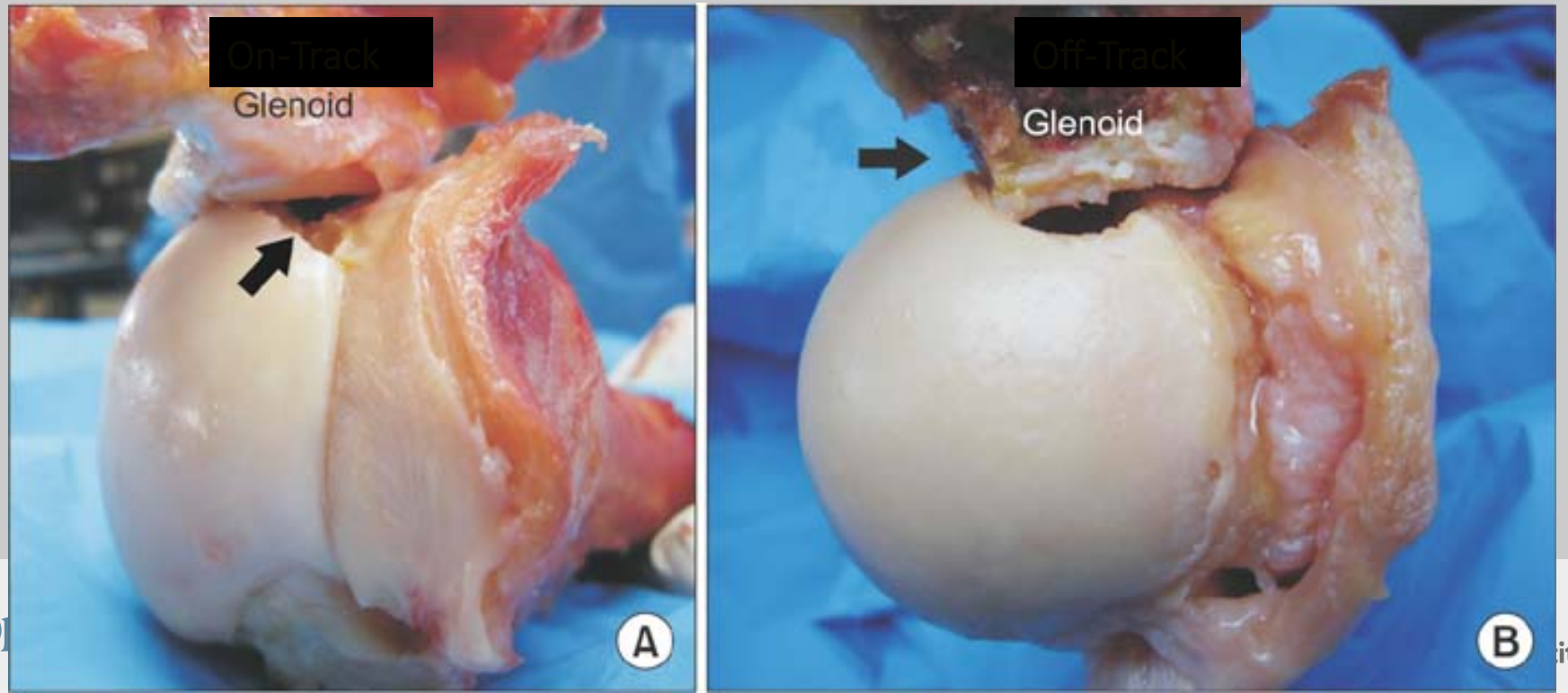
- Glenoid and Humeral bone loss can increase the risk of recurrence.

- Humerus (“Hill-Sachs”)
  - Any “Off-Track” lesion (>25-30% almost always will be) likely to be significant.
    - *Sekiya 2010*: >12.5% of articular arc will destabilize the shoulder at 60 degrees
    - *Charrouset 2010*: Depth >15-20% of HH diameter = >60% recurrence



Treatment
Bone Loss

- Glenoid and Humeral bone loss can increase the risk of recurrence.
- **Have an additive effect when both present…**
  - "On-Track" vs. "Off-Track" – *Yamamoto JSES 2007*



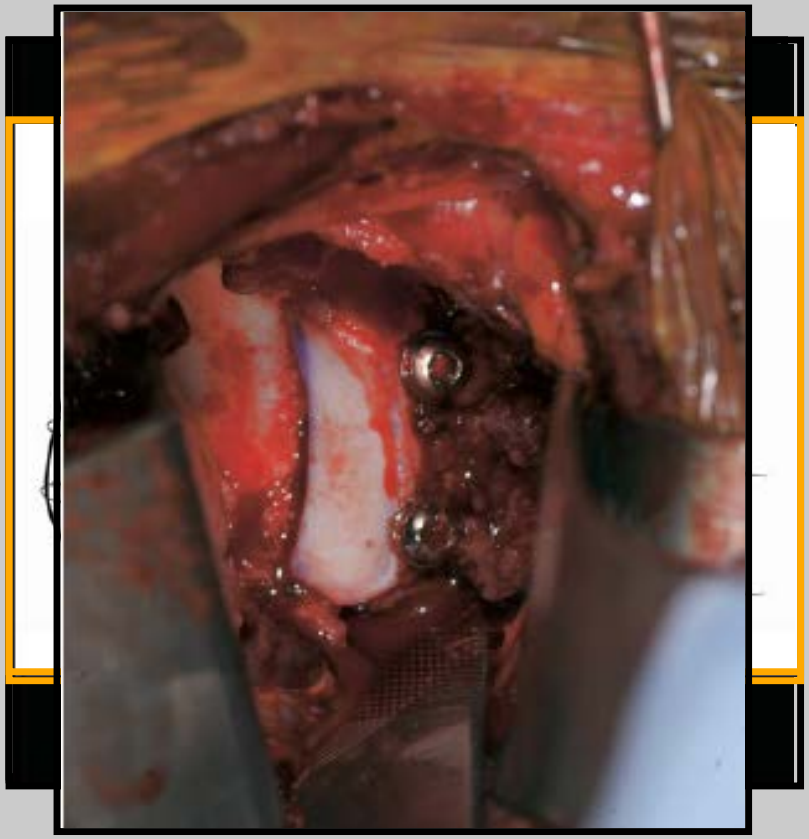
Treatment
Bone Loss

- Glenoid and Humeral bone loss can increase the risk of recurrence.
  - **Have an additive effect when both present…**
    - *Tokish et al OJSM 2015*: Presence of "Off-Track" bone loss resulted in 75% recurrent instability if not addressed
    - *Arciero et al AJSM 2015*: Small (8-15%) glenoid defects become significant when paired with Hill Sachs lesions (1.47 cm^3, 0.87cm^3, resp.)

•>30% on either side will likely be significant in most patients if not addressed (15% significant if combined and Off-Track)

Treatment
Bone Loss

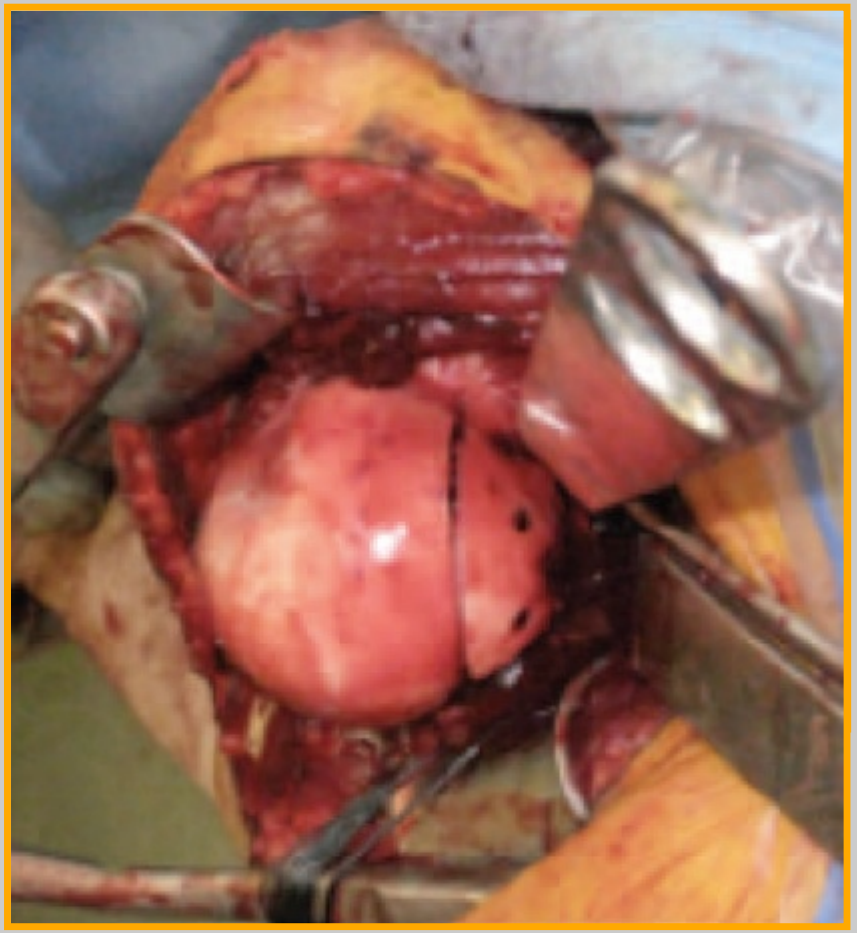
- Options for glenoid bone restoration
  - If +bony bankart, repair the fragment
    - Arthroscopic (anchors) vs. ORIF (cannulated screws)
  - If no bone fragment left, take bone from elsewhere***
    - Coracoid (Latarjet)
    - ICBG (auto or allo)
    - Distal tibial OC graft
    - Distal clavicle



None perfectly recreate axial and longitudinal curvature (Willemot Arthroscopy 2017), and… 10X complication rate + 30% failure of TSRs s/p Latarjet (Willemot JSES 2018)

Treatment
Bone Loss

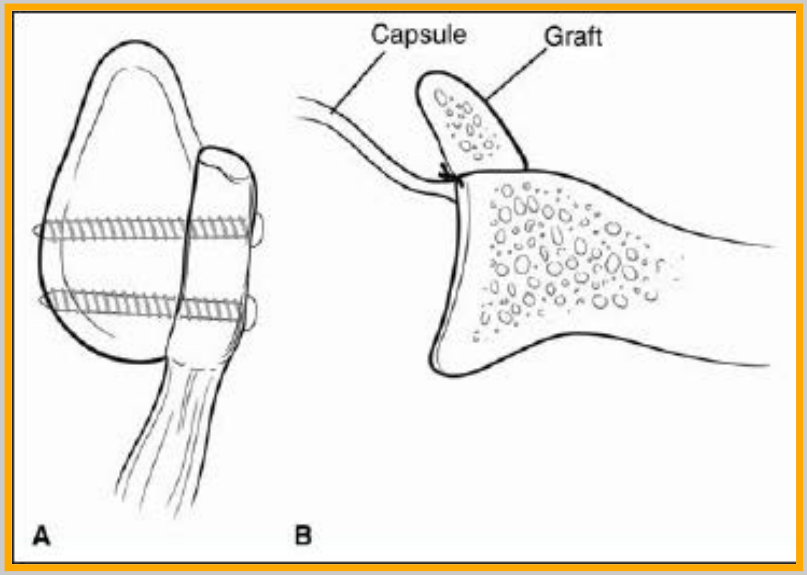
- **Options for Hill-Sachs lesions**:
  - **Remplissage (30-40%)**
    - *Elkinson JBJS 2012* (cadaveric) and Bah et al OTSR 2017 (clinical): 30% defects effectively stabilized when remplissage added to Bankart
      - Downside: decreased ER
    - *Nourissat AJSM 2011, Franceschi AJSM 2012*:
      - No difference in ER
      - Less recurrence than with Bankart alone
  - **Latarjet (30-40%)**
    - *Bah et al OTSR 2017:* low recurrence rate, and better ROM/pain than Remplissage
  - **OC grafts (>40%)**
    - *Diklic JBJS 2010, Miniaci Tech S/E 2004*
      - High rate of stabilization
      - Up to 30% complication rate
  - **Prosthetic replacement**

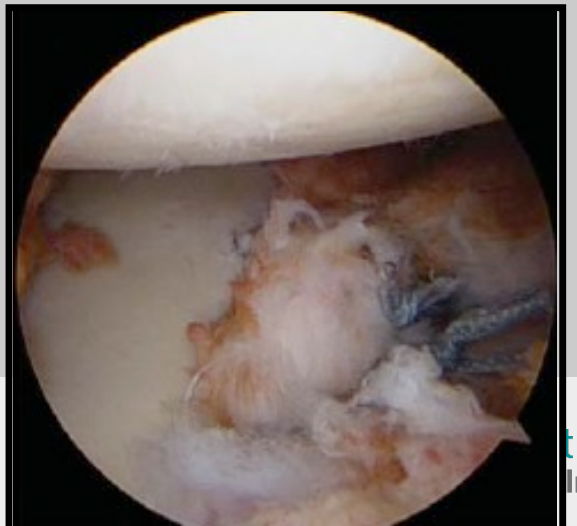


Treatment
My Algorithm**

****assumes no repairable bony Bankart**

- Preop Assessment of Bone Loss with CT…
  - Isolated Glenoid:
    - 15-25% = patient specific factors
    - 25-35% = Latarjet
    - >35% = distal tibial OC graft
  - Isolated Hill-Sachs:
    - On-Track = ignore
    - Off-Track = Remplissage (OC graft if >40%)
  - Combined Defects *(minimum 8% glenoid, "Off-Track" Hill Sachs)*
    - ≤15% glenoid = usually Bankart + Remplissage (unless revision or *high* risk)
    - >15% glenoid = bone augmentation+/- Remplissage *(esp. if HS >30%, Patel AJSM '16)*





Current Approach
Summary

- The chief goal of treatment is to minimize recurrence while maintaining activity level
- Nonsurgical treatment does not alter recurrence
  - Early mobilization and RTP is acceptable in many patients
- Surgical treatment is indicated in patients with a high risk of recurrence
  - The best results can be expected if all relevant pathoanatomy is addressed

Multidirectional Instability (MDI)

Spectrum

"Classic" (Neer)

- Capsular laxity
- Multiple loose joints
- Probably collagen disorder
- Neuromuscular imbalance?

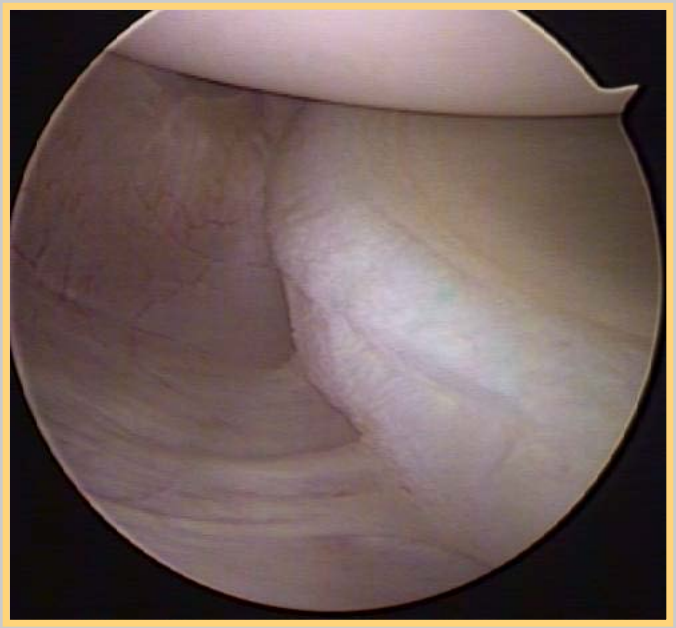
Traumatic MDI

- Specific event(s)
- "Bidirectional"
- Not systemic (ie. opposite shoulder and other joints with "normal" laxity)
- Extensive labral tear

Pathoanatomy of MDI

Proposed:

- Redundancy of the Inferior Glenohumeral Ligament Complex → Increase capsular volume
- Large Rotator Interval
- Neuromuscular (?)



Other possible contributors:

- Loss of (-) pressure
- Flat glenoid
- Scapular version

MDI has two defining clinical features:

- Symptoms occur in midrange of glenohumeral motion when the ligaments are normally lax
- Symptoms in 2 or more directions, with one of them ***inferior***.

History

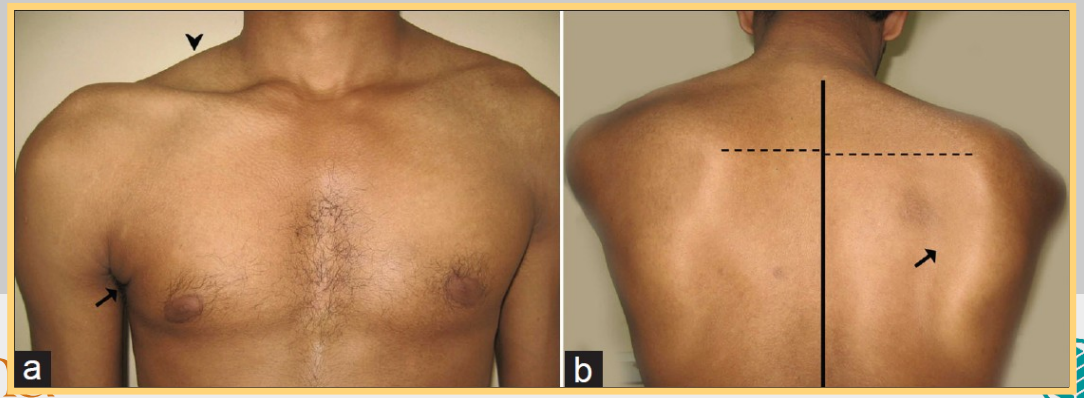
- Symptoms result from inability of dynamic stabilizers to compensate
  - Cuff bursitis/biceps tendonitis
  - Neck / Scapular pain
  - Neurological symptoms

- Worsened complaints with muscular fatigue

BEWARE of voluntary dislocators/psychosocial comorbidities

Physical Examination

- Inspect
  - Symmetry/muscle wasting
- Neuro exam
  - r/o scapular winging (trap, serratus palsy)
  - Deltoid and/or cuff dysfunction



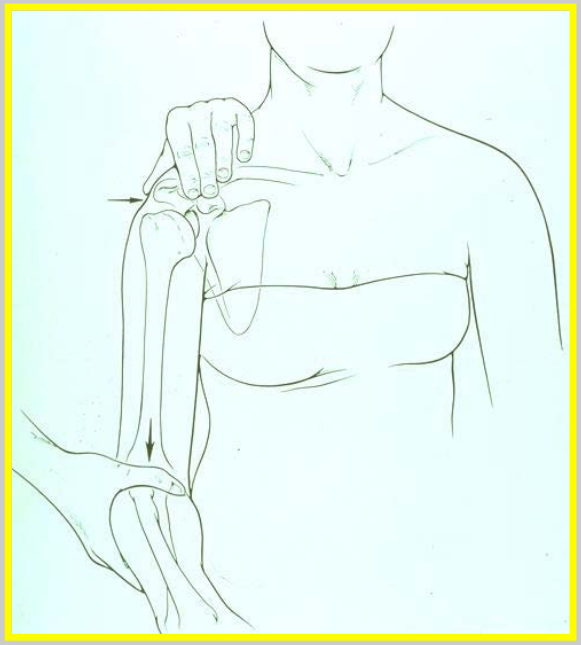
Physical Examination
Systemic Laxity

Elbow hyperextension

Thumb MP flexion to forearm

Scapular dyskinesis

Sulcus Sign



Symptoms reproduced?

Nonoperative Treatment

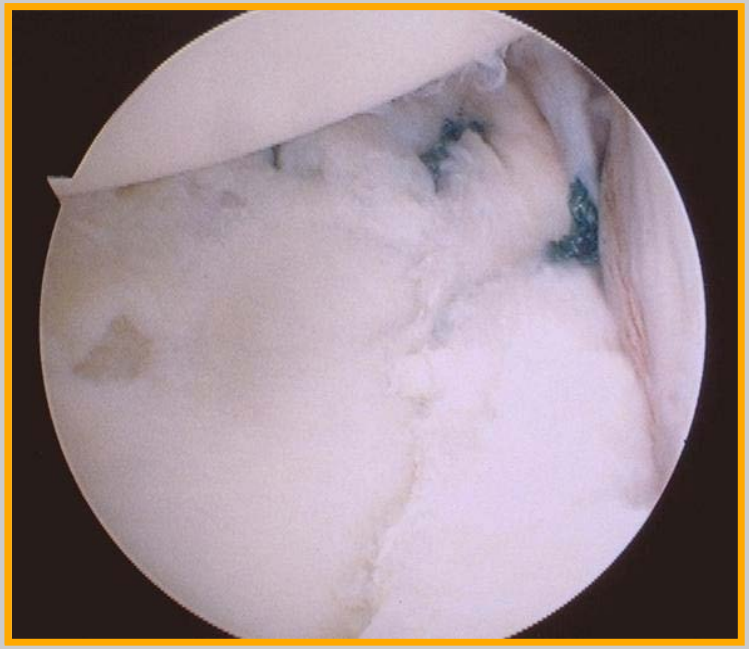
- Patient Education
- Physical Therapy
  - Rotator Cuff exercises
  - IR for anterior component/ ER for posterior component
- ≥ 6 Months Rx
  - *Burkhead and Rockwood, JBJS 1992*: HEP x >6 mo with 80% G/E results

Always the first choice…

Atrium Health Musculoskeletal Institute

Goals of Surgical Treatment for Instability

- **Tighten ligaments/reduce capsular volume**
  - **Address all pathology (including RI if lax)**
- **Repair labrum**
  - **Anchors**



Outcomes

Open

- **~85+% G/E results**
  - *Neer and Foster JBJS 1980*: no recurrences
    - Posterior approach in select cases
  - *Cooper JBJS 1992*: 86% success
    - Anterior approach in all

Arthroscopic

- **~90+% G/E results**
  - *Gartsman et al*: capsular plication with RI closure = 7% recurrence, mean ER 90
  - *Kim et al*: posteroinferior labral repair/capsular plication with RI closure = 3% recurrence, mean loss ER 2 degrees

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