Common Orthopaedic Conditions of the Shoulder: From Young Athlete to Weekend Warrior

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A PA's Guide to the Musculoskeletal Galaxy
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Disclosures

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AMBITION

THE JOURNEY OF A THOUSAND MILES SOMETIMES ENDS VERY, VERY BADLY.

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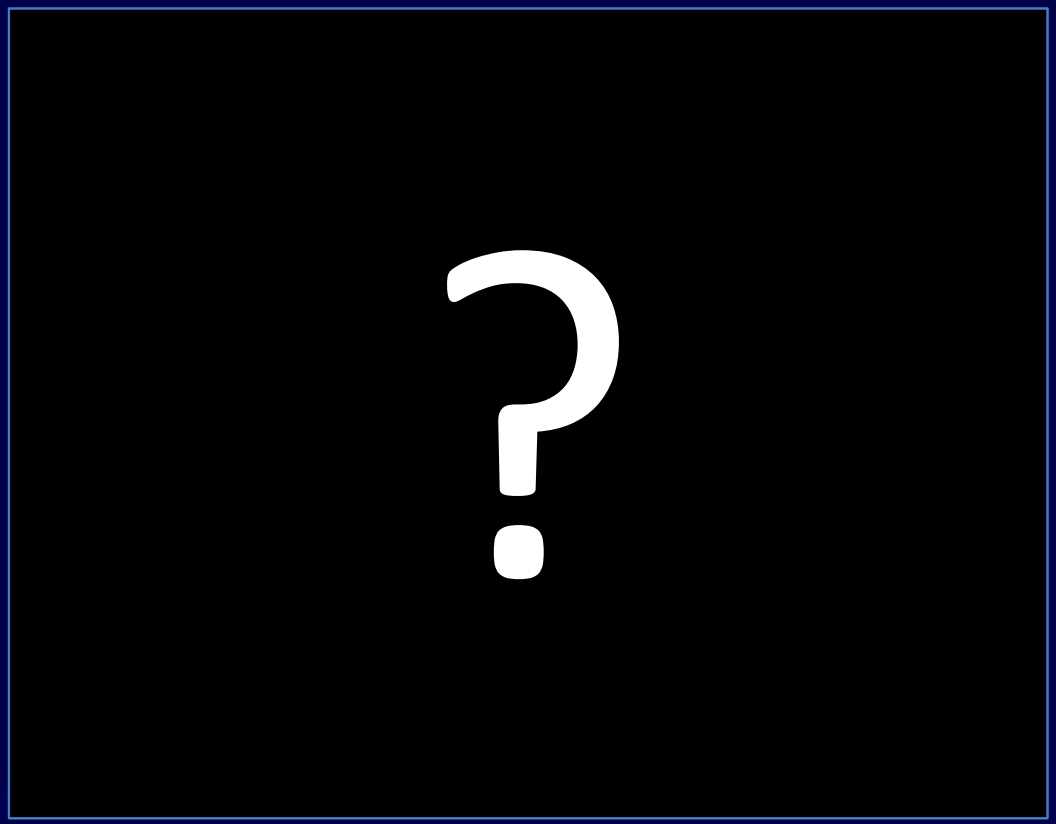
Objectives

- Know how to properly evaluate an athlete with shoulder injury or other symptoms
- Formulate an appropriate differential diagnosis based on history and PE findings
- Recommend initial treatment plans for patients with AC seprations, shoulder instability, and labral injuries

The Shoulder - An Intern's View



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Introduction

- Shoulder anatomy
- SLAP Lesions
- Shoulder dislocations
- Shoulder instability
- Labral injuries
- AC joint separations

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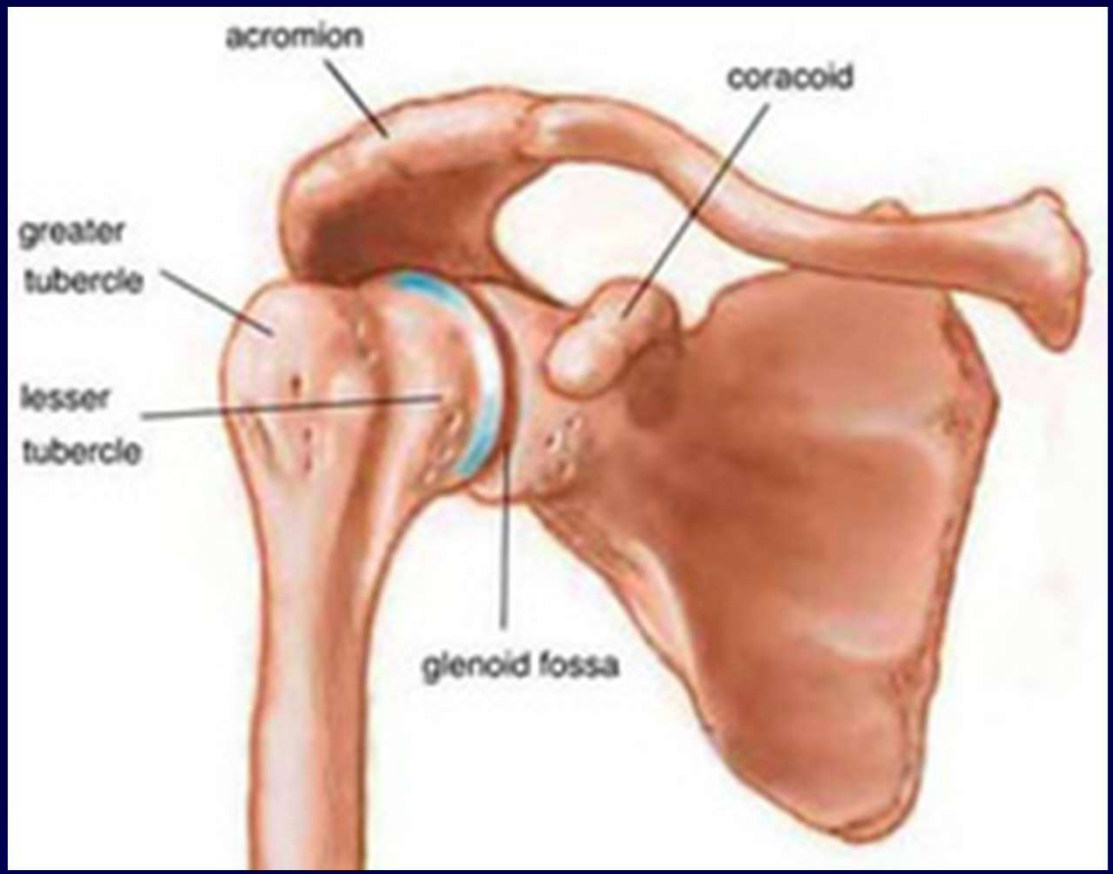
Shoulder anatomy

- Three bones
  - Scapula
  - Humerus
  - Clavicle
- Joints
  - Glenohumeral
  - Acromioclavicular
  - Sternoclavicular
  - Scapulothoracic



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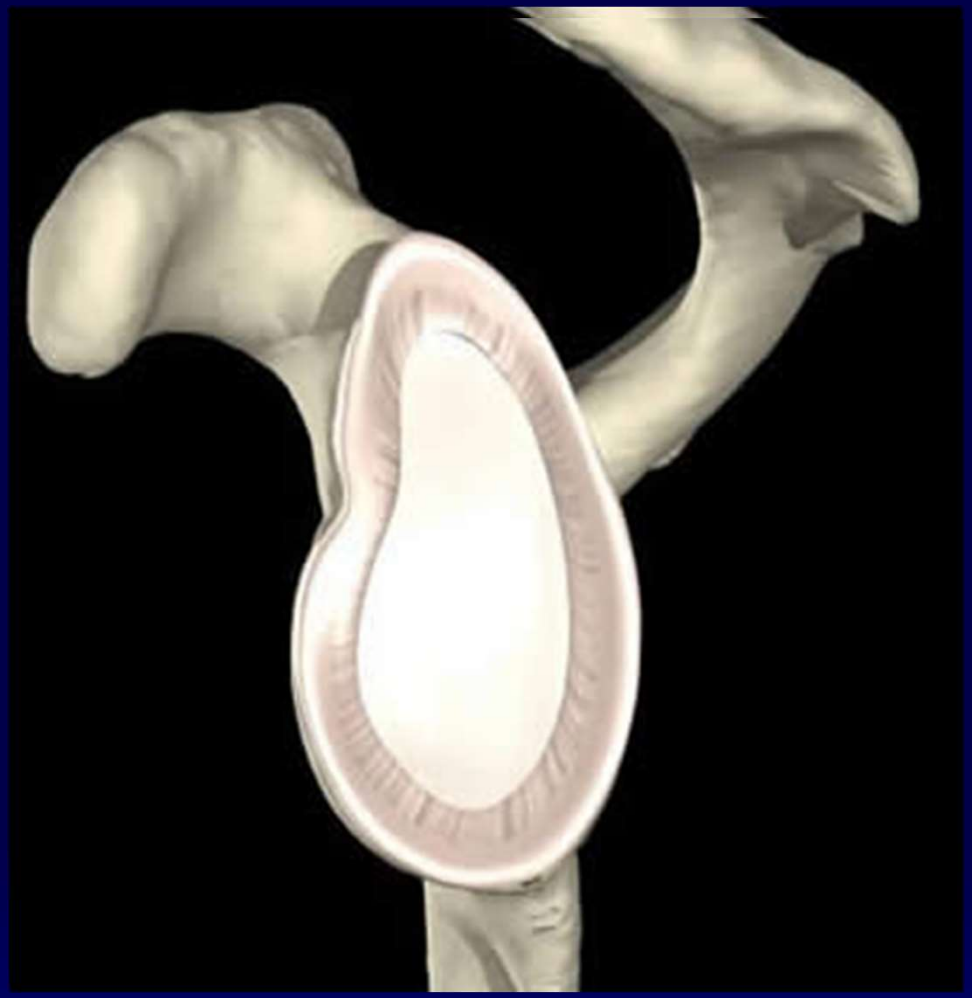
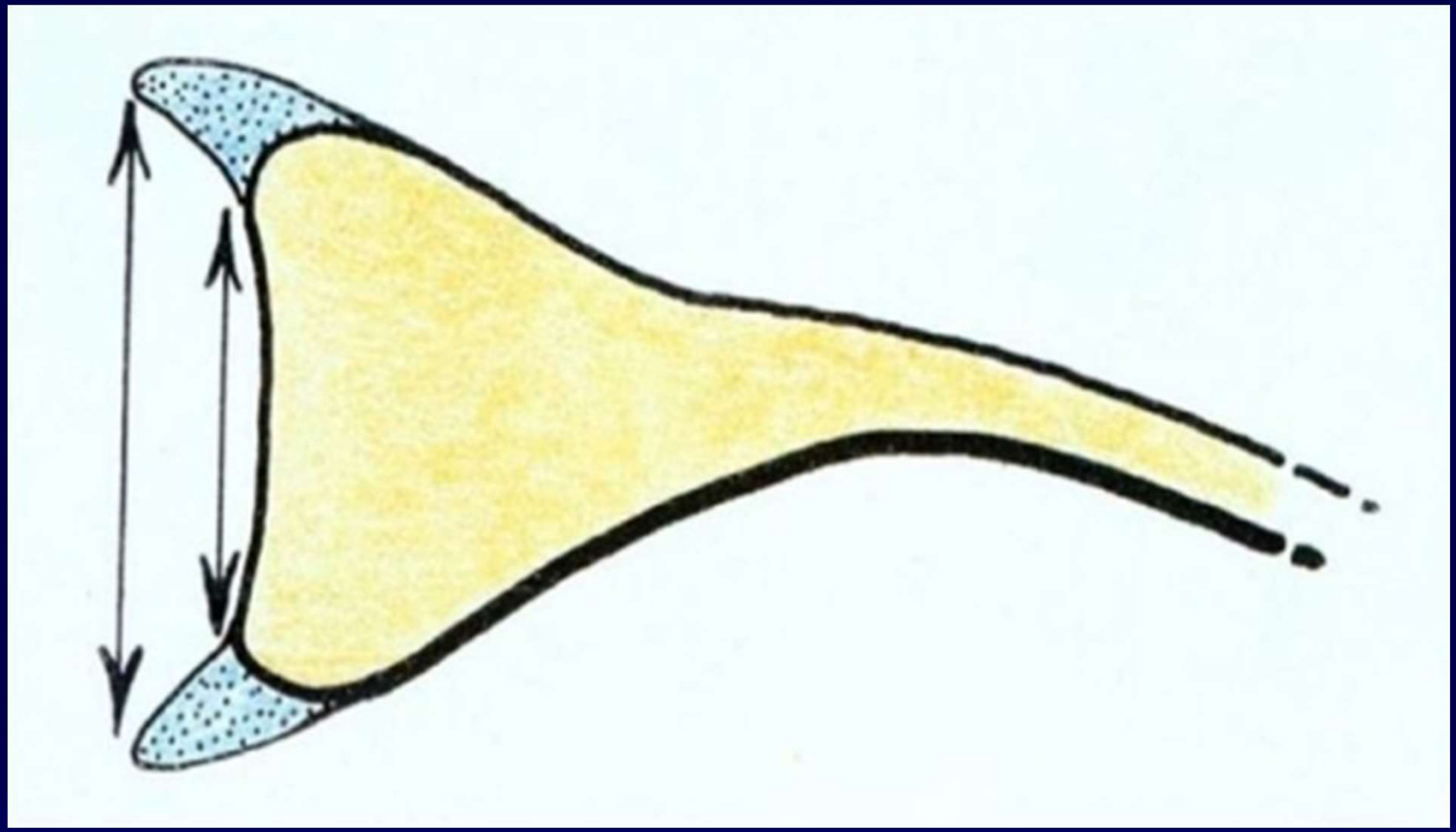
Labral anatomy

- Soft tissue sleeve surrounding glenoid
- Contiguous with joint capsule
- Clock face nomenclature
- LH Biceps attaches on the supraglenoid tubercle at 12 o'clock



Labral anatomy



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Case #1

- 24yo RHD collegiate baseball pitcher presents with 3 month h/o intermittent right shoulder pain
- Exacerbated by throwing, lost velocity
- Localized deep and radiates down the front of his upper arm
- Aggravated by overhead reaching
- Relieved by NSAIDs

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Case #1

- Exam reveals good ROM except slightly limited internal rotation
- Positive O'Brien's test
- Positive biceps load test
- No significant weakness
- Plain x-rays normal
- Any other studies?

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CAUTION

Knee MRI Magnetic Field!
Electromagnetic forces may cause doctor to lose common sense!

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Case #2

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Case #1

- Diagnosis?

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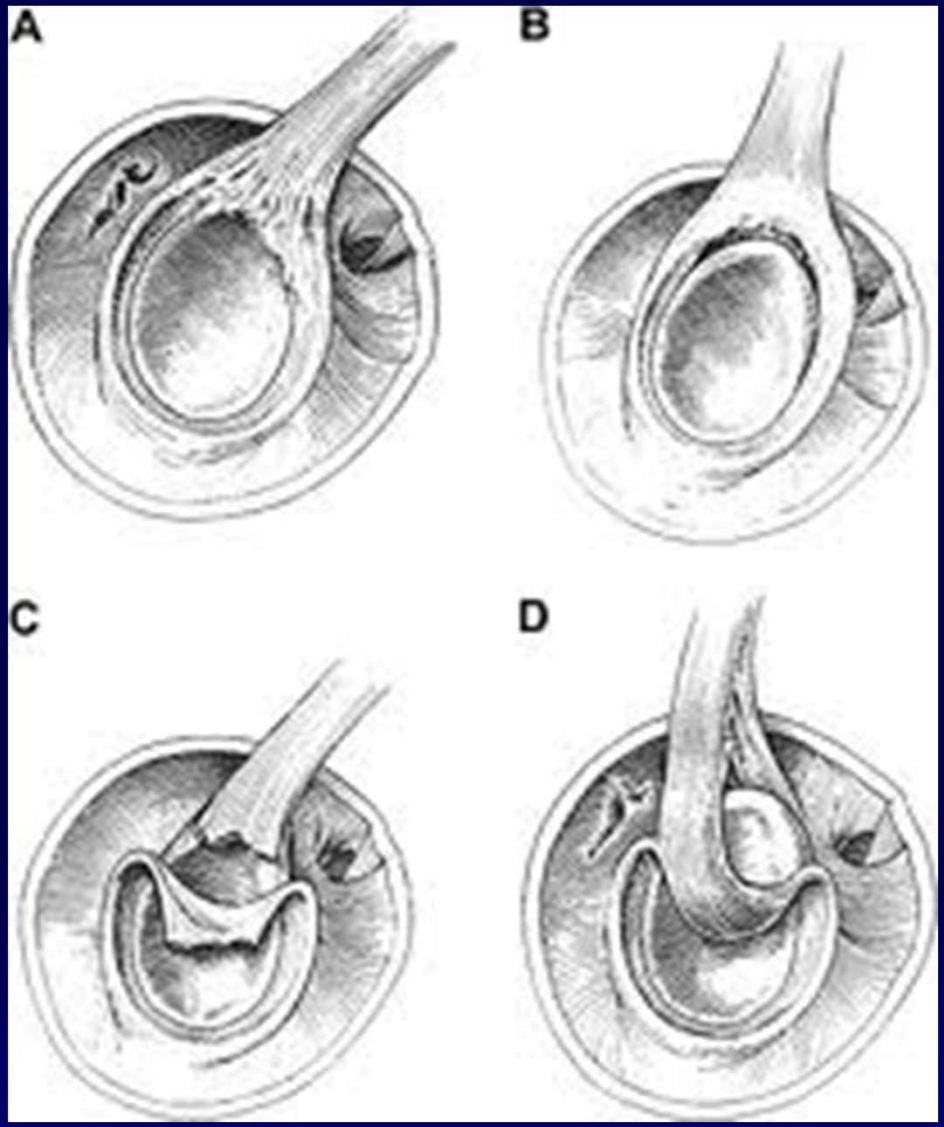
SLAP Lesions

- Superior Labral Anterior Posterior
- Common in overhead athletes
- Degenerative, attritional injury
- Labral tear of variable size at biceps anchor
- May involve a portion of the biceps

Snyder et al. Arthroscopy, 1990.

SLAP Lesions



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SLAP Lesions

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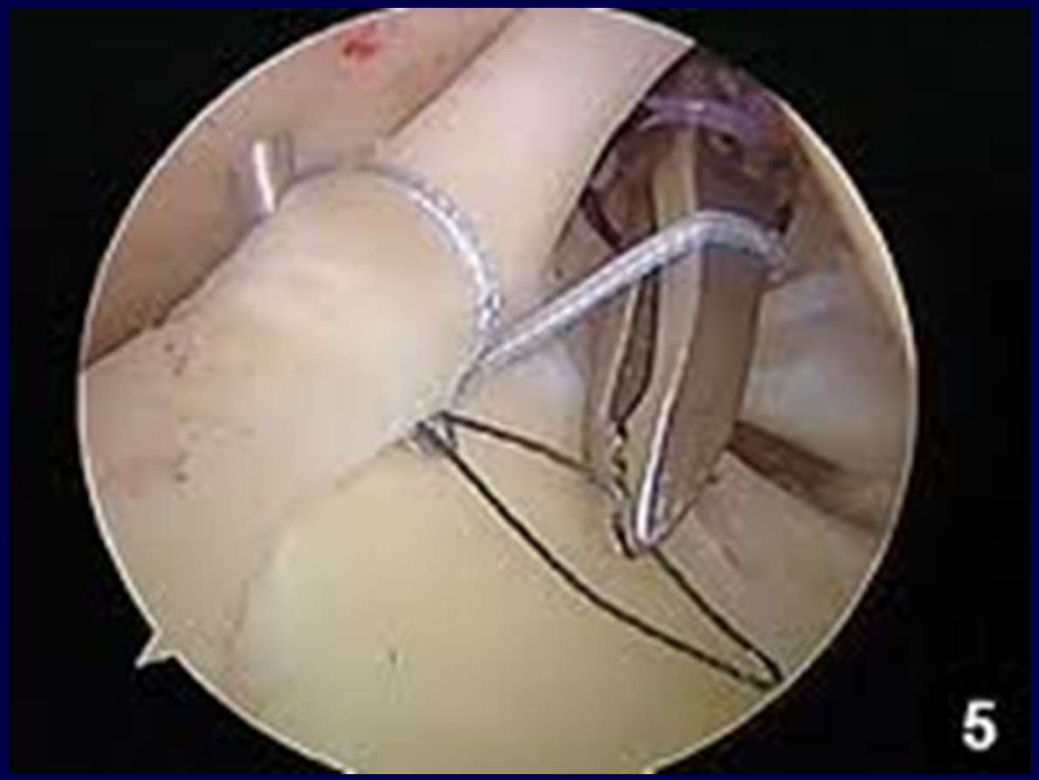
SLAP Lesions

- Conservative treatment includes rest, PT with ROM and terminal stretching exercises
- Associated GIRD
- NSAIDs for pain
- Acitivty modification – difficult for pitchers!
- Most often result in arthroscopic repair in young patients

SLAP Repair



Case #2

- 28 yo male skier attempting a “jump” crashes and lands awkwardly
- Notices pain and deformity at top of his right shoulder
- Presents to the ED

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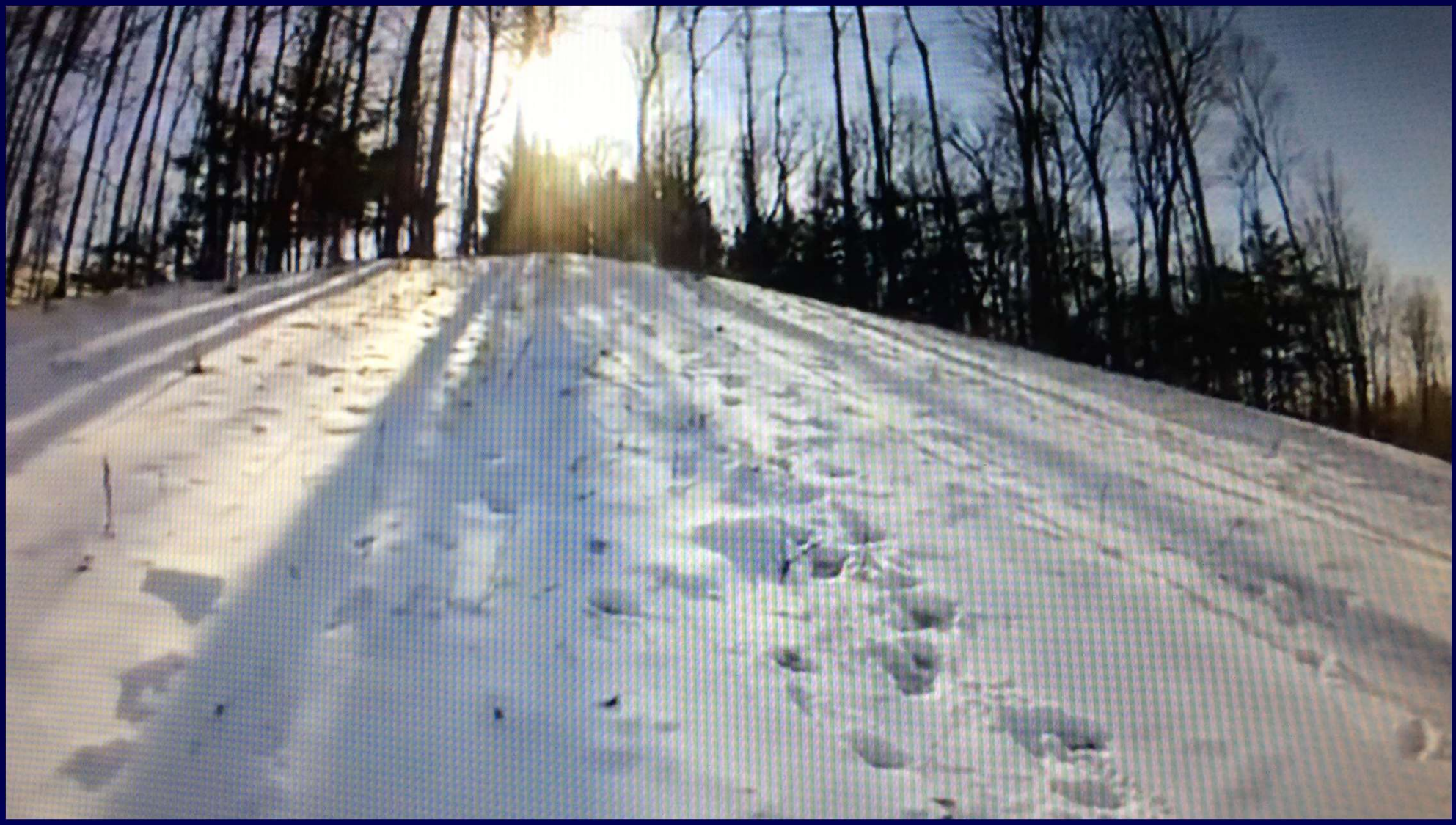

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Case #2

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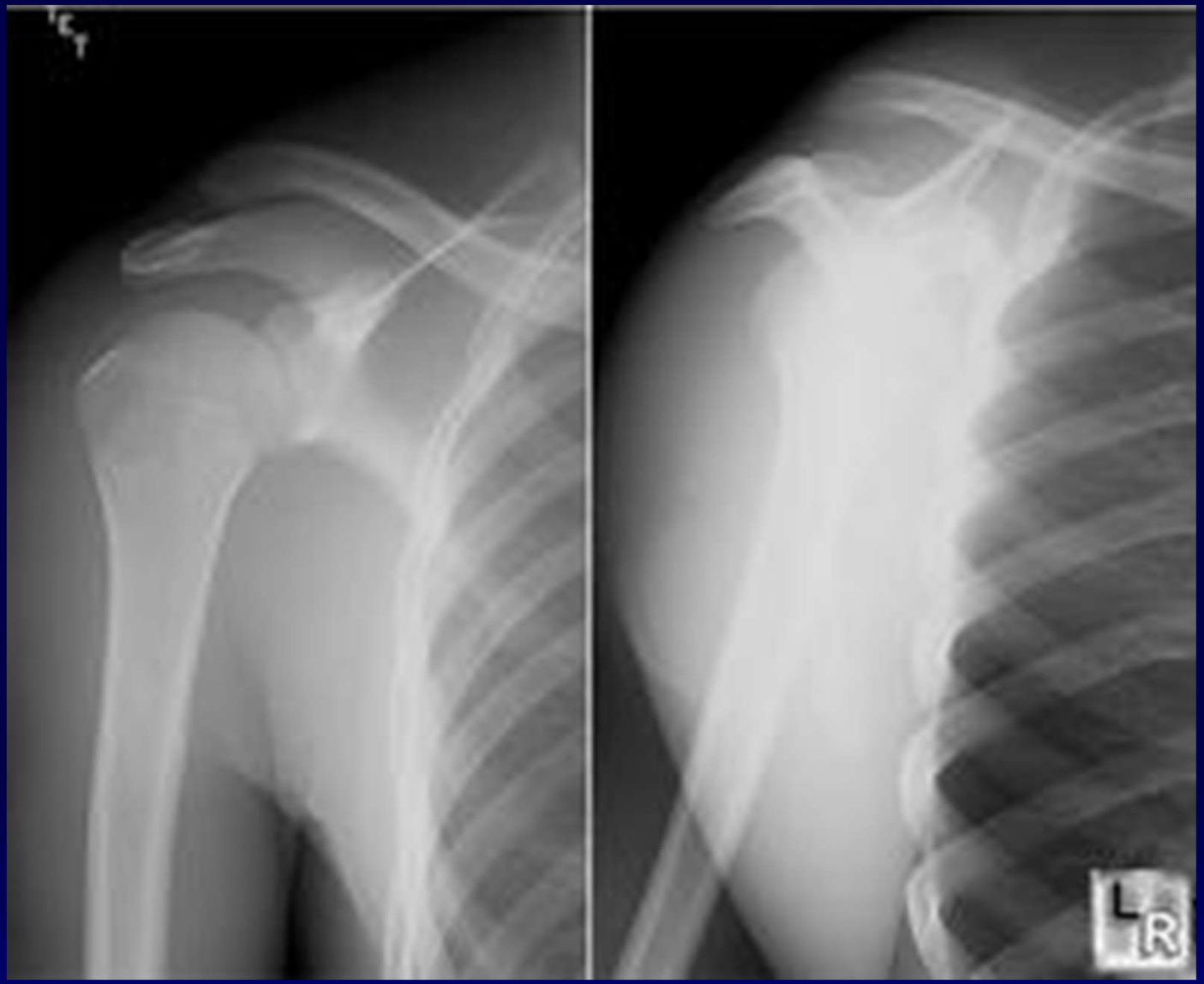
Case #2



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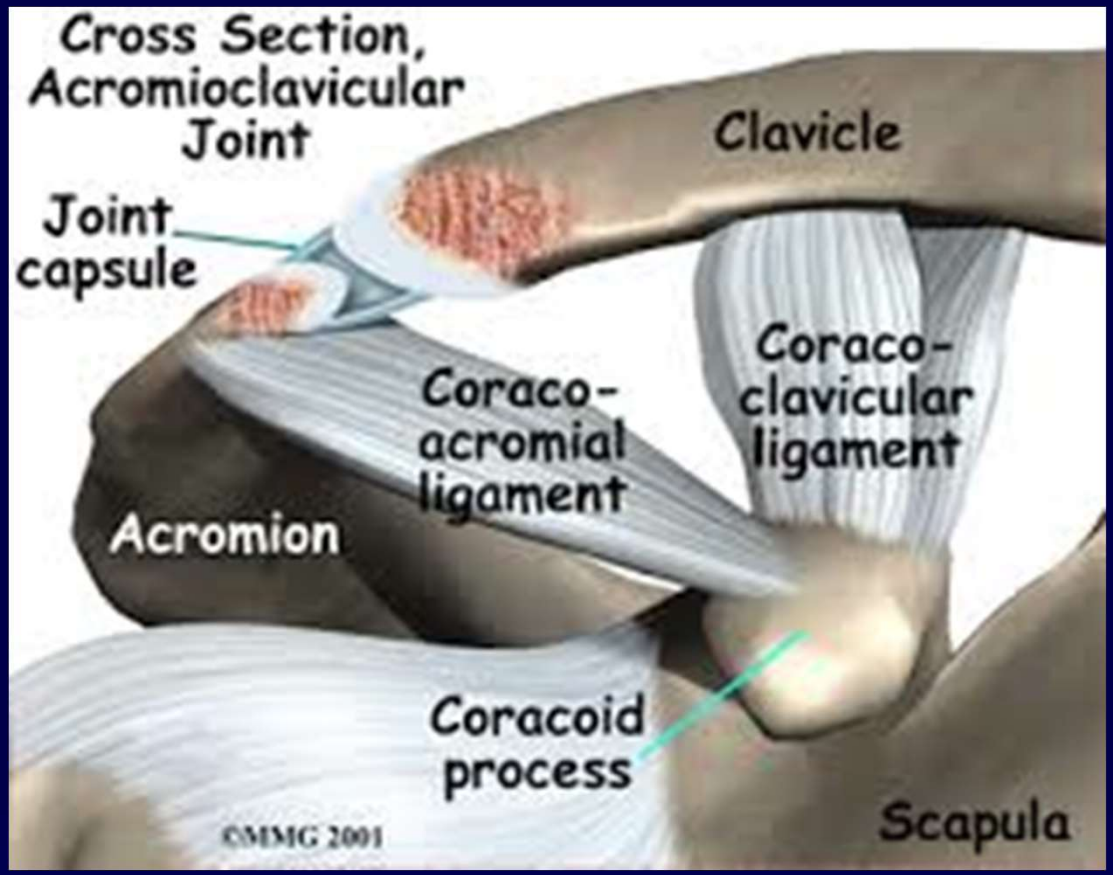
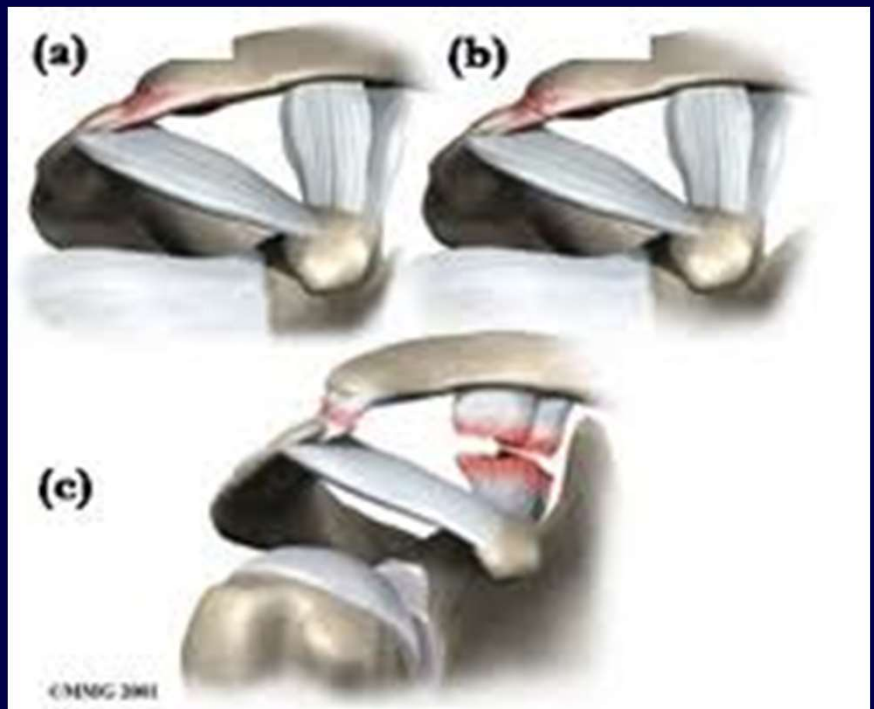
Acromioclavicular separations

- Relatively common injury resulting from a direct blow to top of shoulder
  - Bicycling
  - Snowboarding
  - Skateboarding
  - Football

Acromioclavicular Separations





Fifure 2.4 Ligament sprains

(a) Grade I (b) Grade II (c) Grade III

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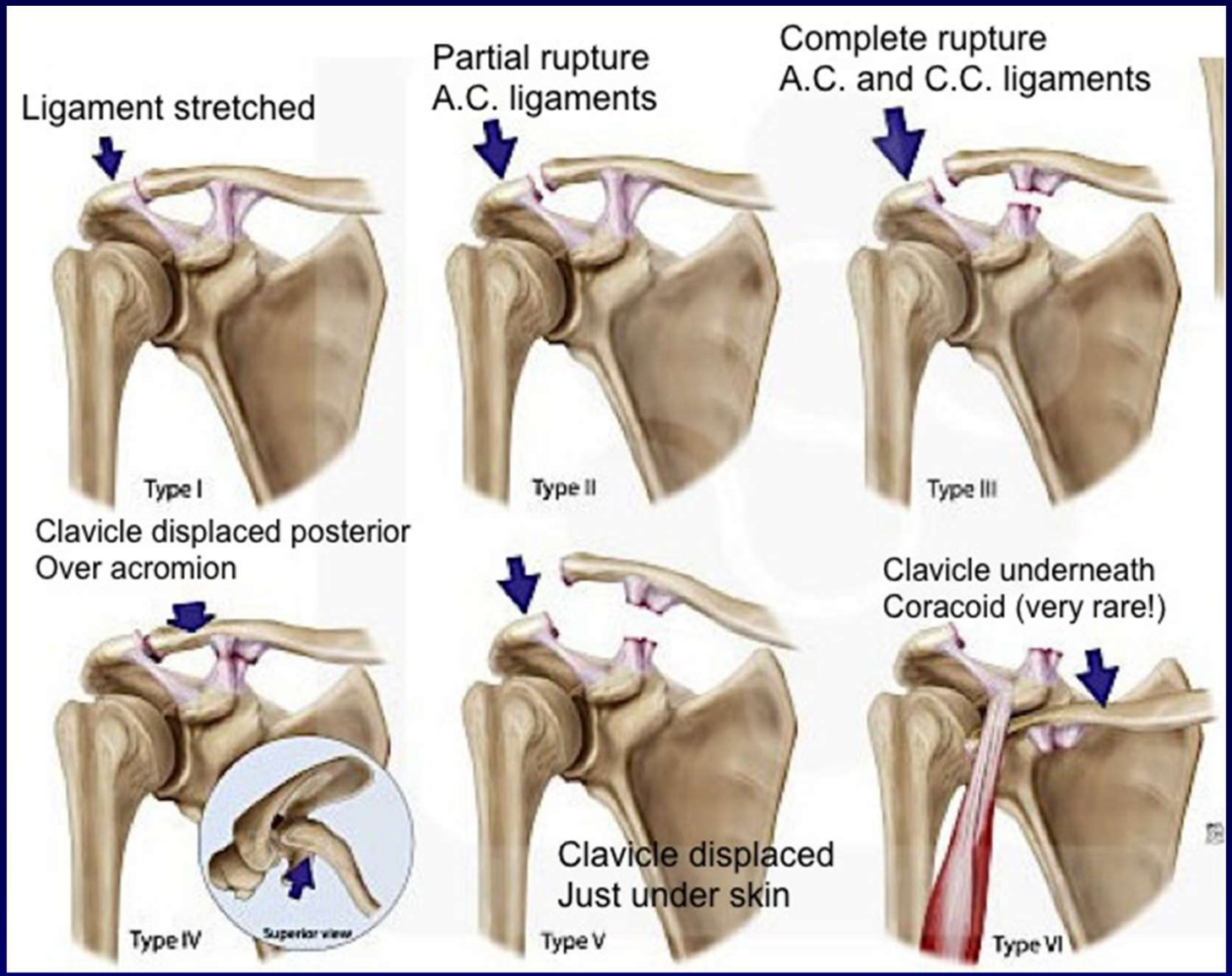
Acromioclavicular separations



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Acromioclavicular separations

- Grade of injury directs management
  - 1-2: Conservative
  - 3: Controversial
  - 4+: Operative
- Numerous procedures described
- Acute injuries can be repaired/stabilized
- Anatomic reconstruction of coracoclavicular ligaments is probably best in chronic cases

Acromioclavicular separations

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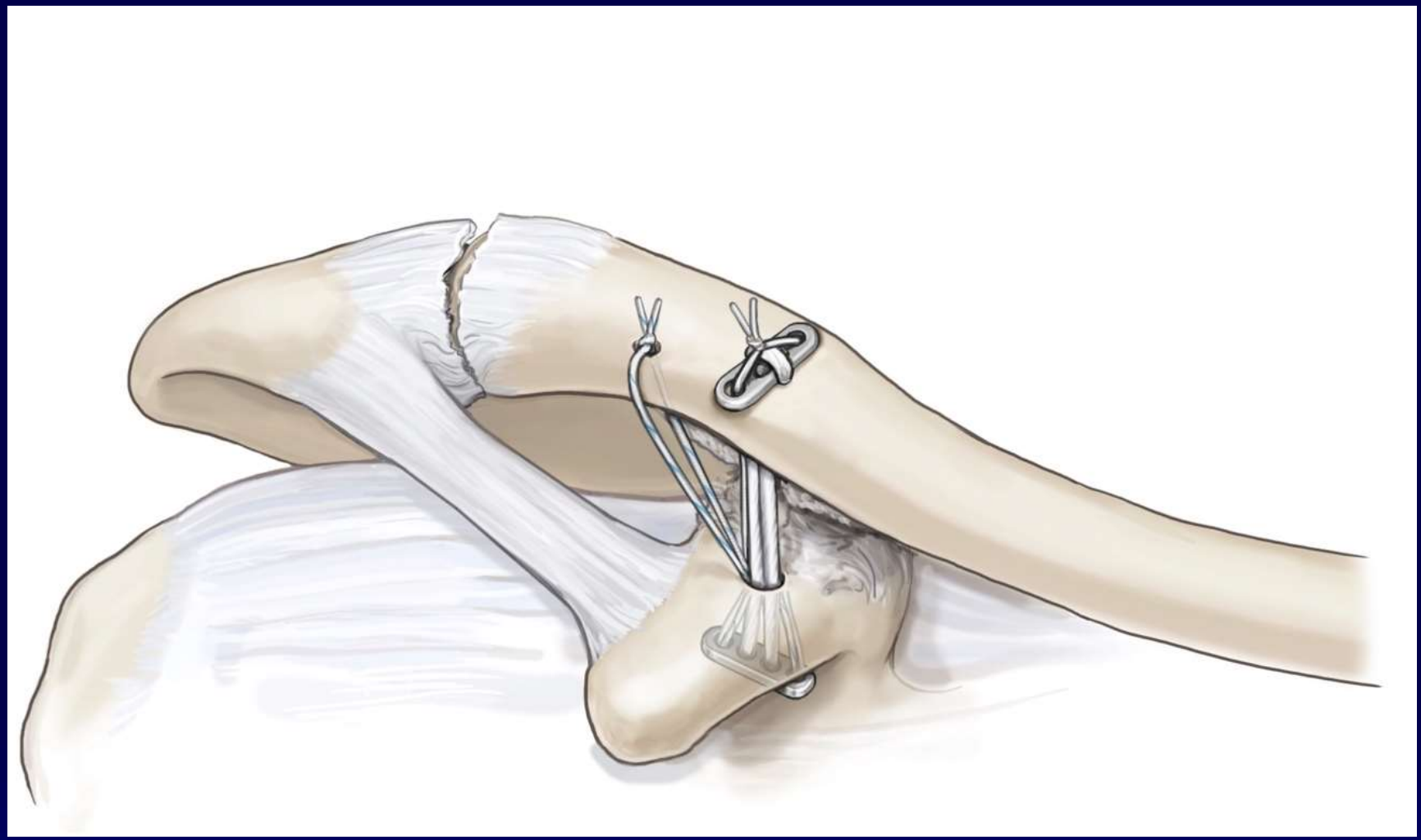
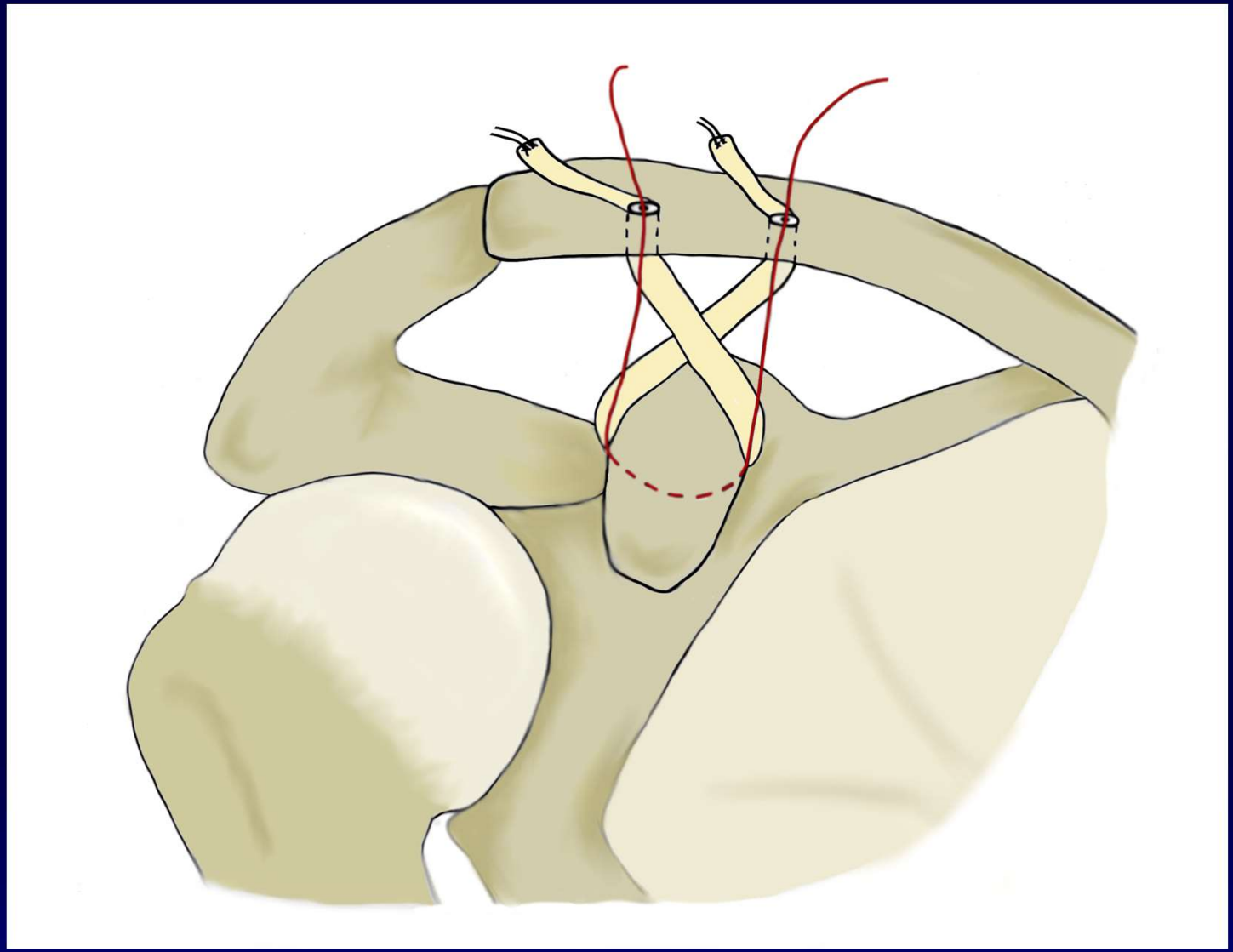
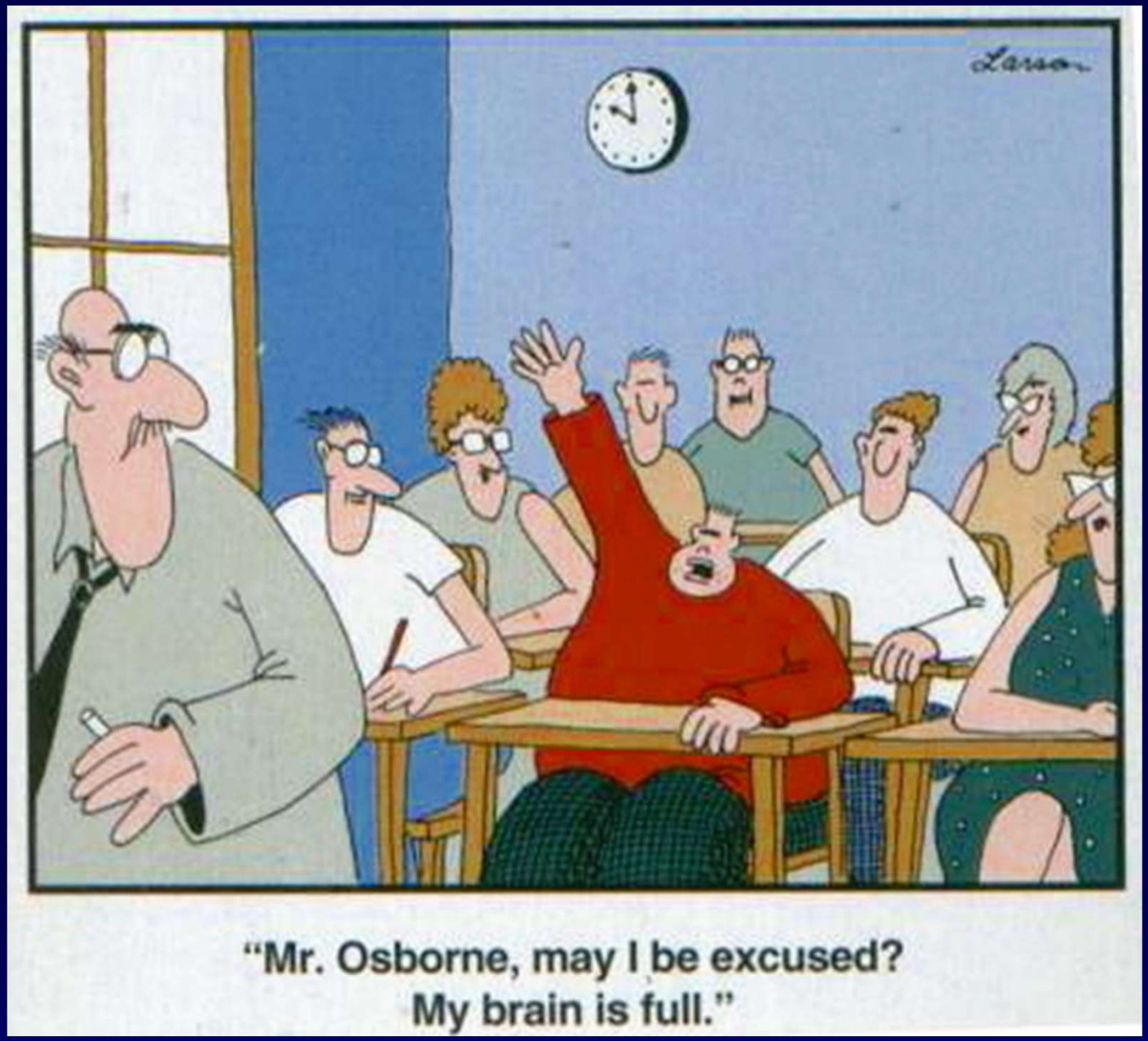
Acromioclavicular separations

Acromioclavicular separations



Acromioclavicular separations





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Case #3

- 18yo high school football player is tackled, landing on his right extended arm
- Immediate deep pain
- Unable to move shoulder
- Taken to training room for evaluation

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Case #3

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Case #3

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Case #3

- Diagnosis?

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Glenohumeral Dislocations

- Very common injury in younger age groups
- Males (9:1)
- FOOSH
- ABER position
- Majority of traumatic dislocations are anterior/anteroinferior
- Posterior associated with epileptic seizures and electrocution

Glenohumeral Instability

- Loosely divided between traumatic and atraumatic etiology.
- Traumatic usually unidirectional
- Atraumatic usually multidirectional
- TUBS
- AMBRI

Glenohumeral Instability

- TUBS
  - Traumatic
  - Unilateral
  - Bankart lesion
  - Surgical management

Glenohumeral Instability

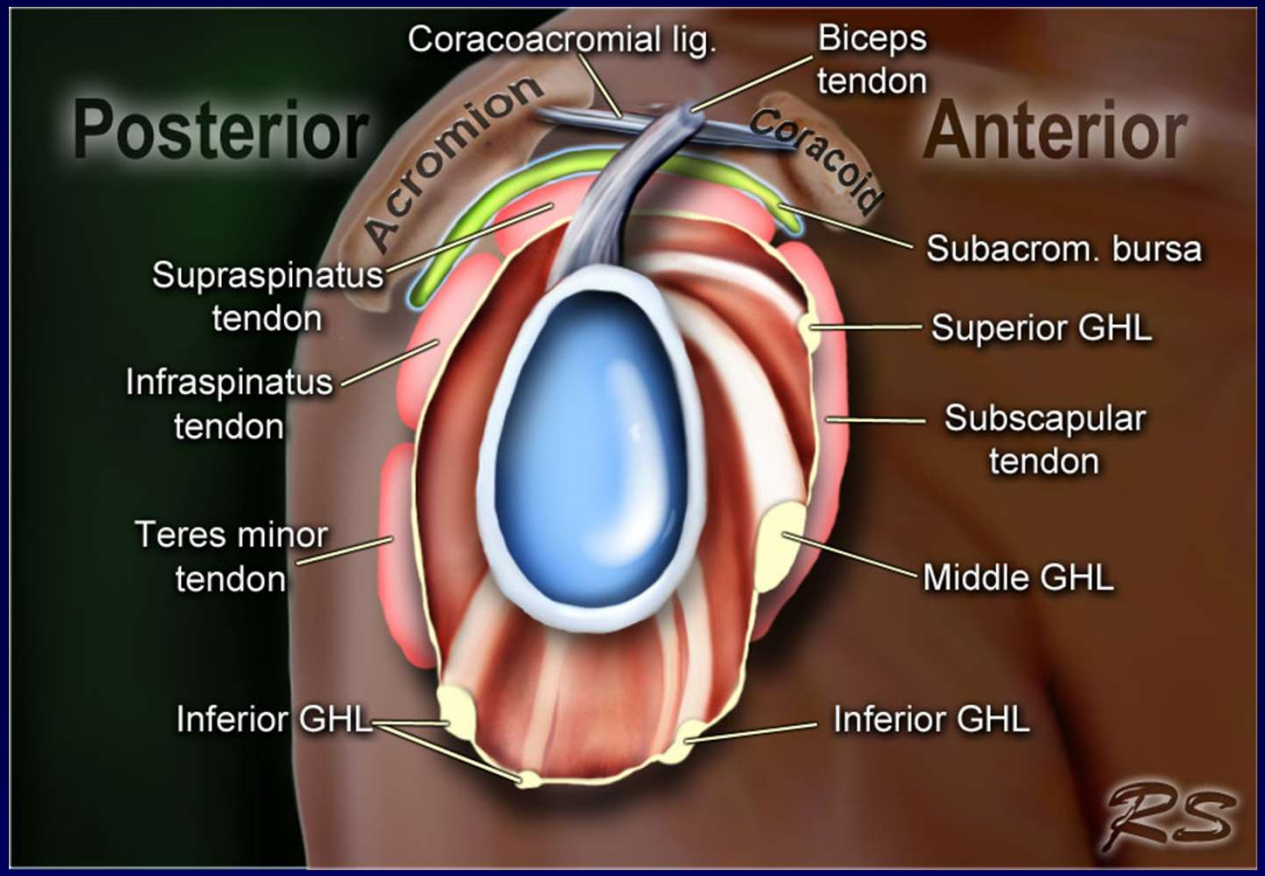
- AMBRI
  - Atraumatic
  - Multidirectional
  - Bilateral
  - Rehabilitation
  - Inferior capsular shift

Multidirectional Instability

- Usually atraumatic
- Multiple subluxation episodes
- Often never required reduction
- “Loose-jointed”
- Positive sulcus/apprehension signs
- Management is PT, then PT, and more PT
- Inferior capsular shift or arthroscopic plication

Glenohumeral Dislocations

- Anatomy review
  - Glenoid
  - Labrum
  - Capsule



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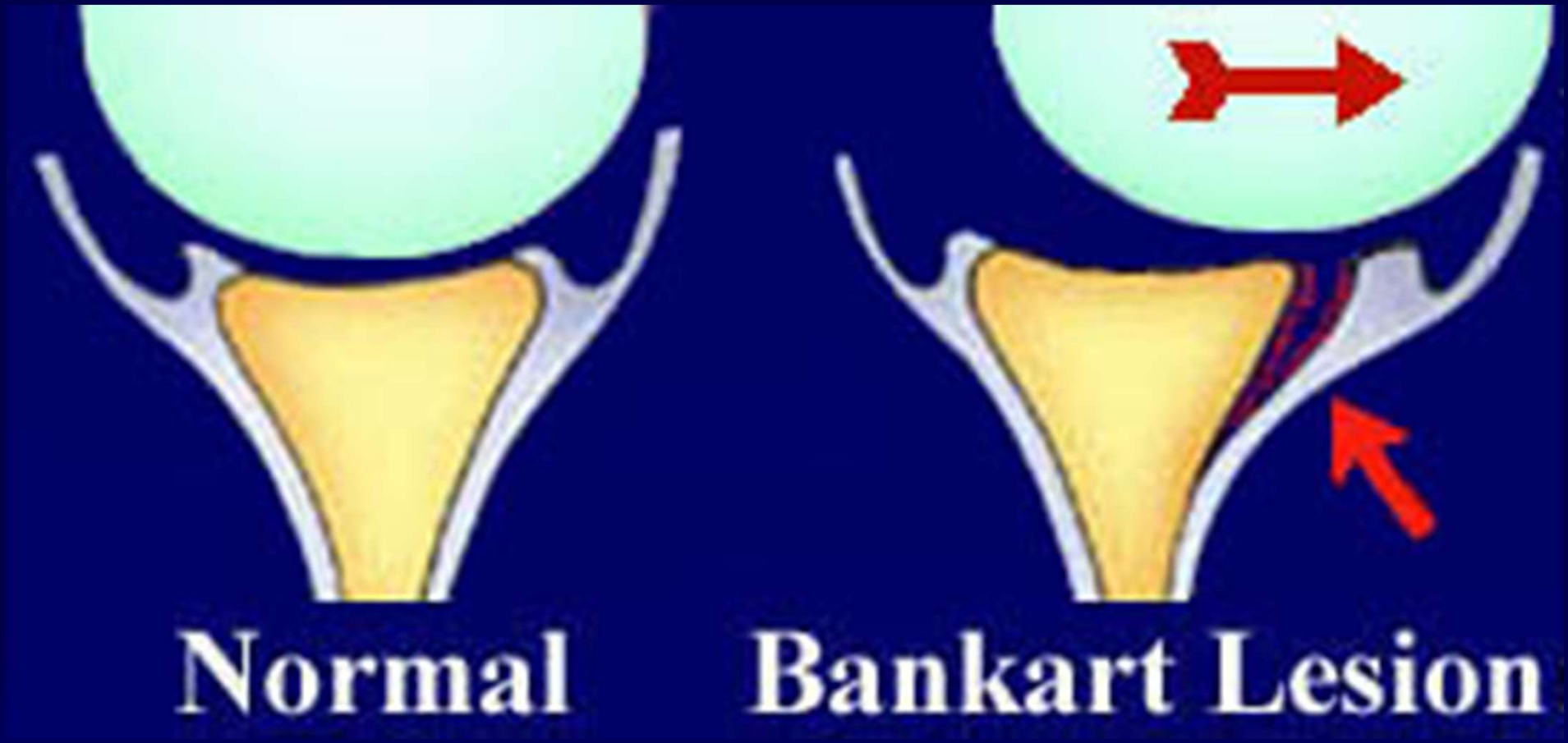
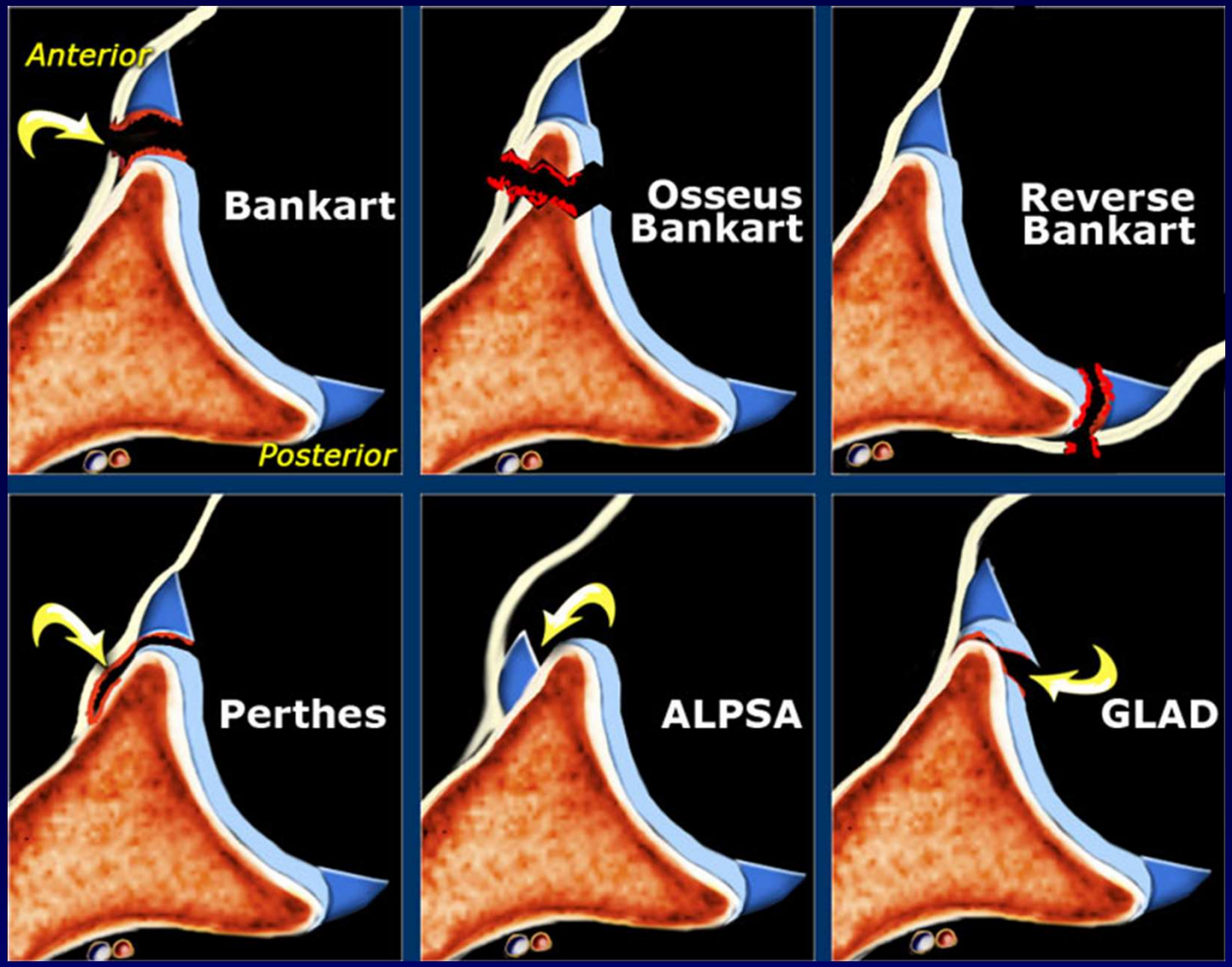
Glenohumeral Dislocations

- Bankart lesion is nearly an “essential” injury in traumatic glenohumeral dislocation
  - Capsulolabral injury
  - Bony Bankart
- Hill-Sachs lesion is a frequent concomitant injury to posterior humeral head

Glenohumeral Dislocations



Bankart and Friends



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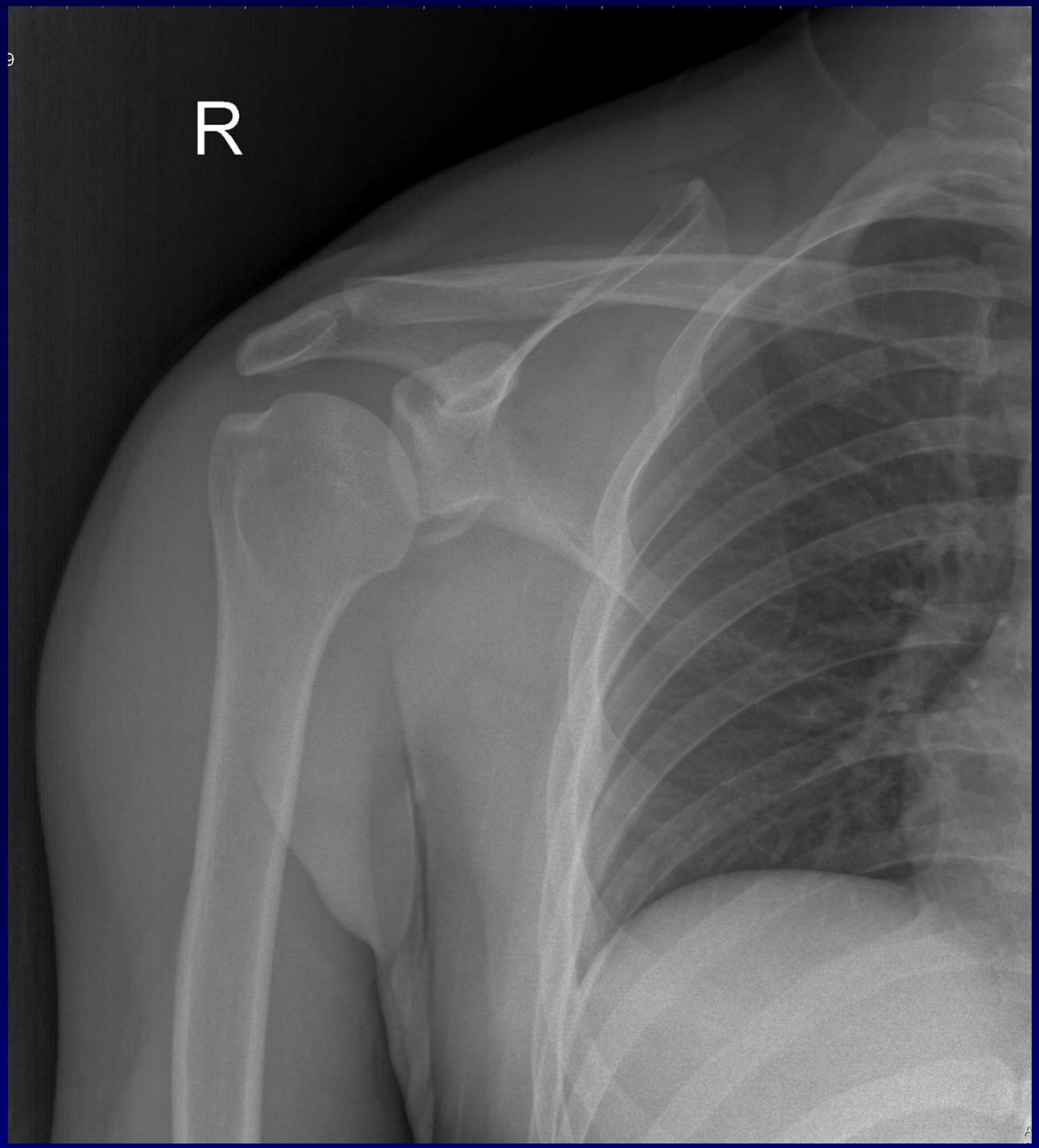
Bony Bankart – X-Rays



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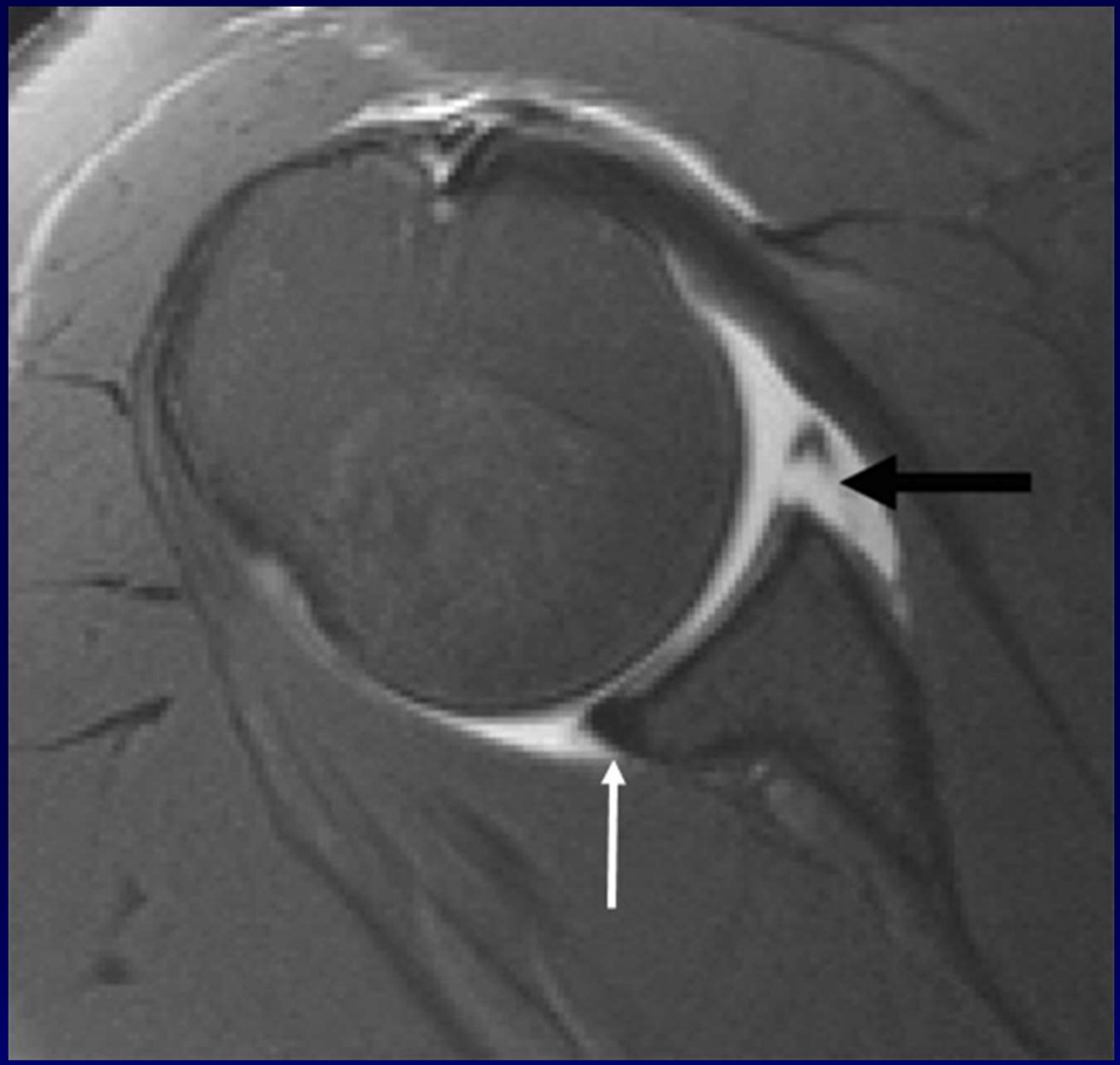
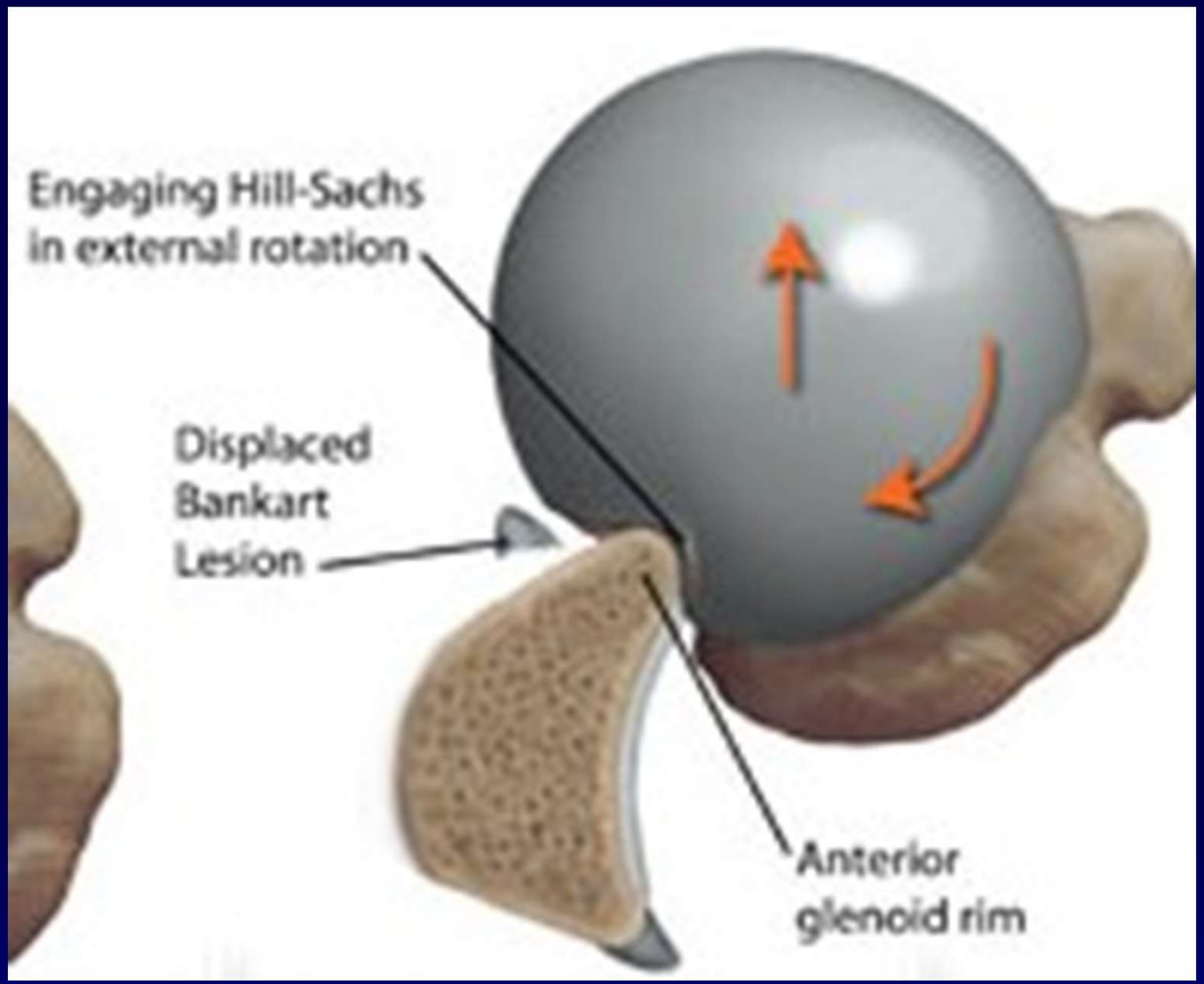
Bankart - MRI



Hill-Sachs Lesion



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Hill-Sachs Lesion

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Glenohumeral Dislocations

- Examination
  - Sulcus sign
  - Prominent acromion
  - Held in IR with limited AROM/PROM
- Imaging
  - Plain X-rays diagnostic (axillary view!)
  - MRI arthrogram shows Bankart
  - CT best for determining glenoid bone loss

Glenohumeral Dislocations

- Management
  - Closed reduction under anesthesia
  - Sling immobilization
  - Pain management
  - PT/Rehabilitation
  - Surgery?
  - Recurrent instability

Glenohumeral Dislocations

- Recurrent instability
  - Rates of re-dislocation higher in young Pts
  - 67% of first time dislocators will have a second
  - 90% of two-time dislocators will have a third

    Simonet and Cofield. Am J Sports Med, 1984.
- Some surgeons have recommended operative management of first time dislocators, especially young athletes

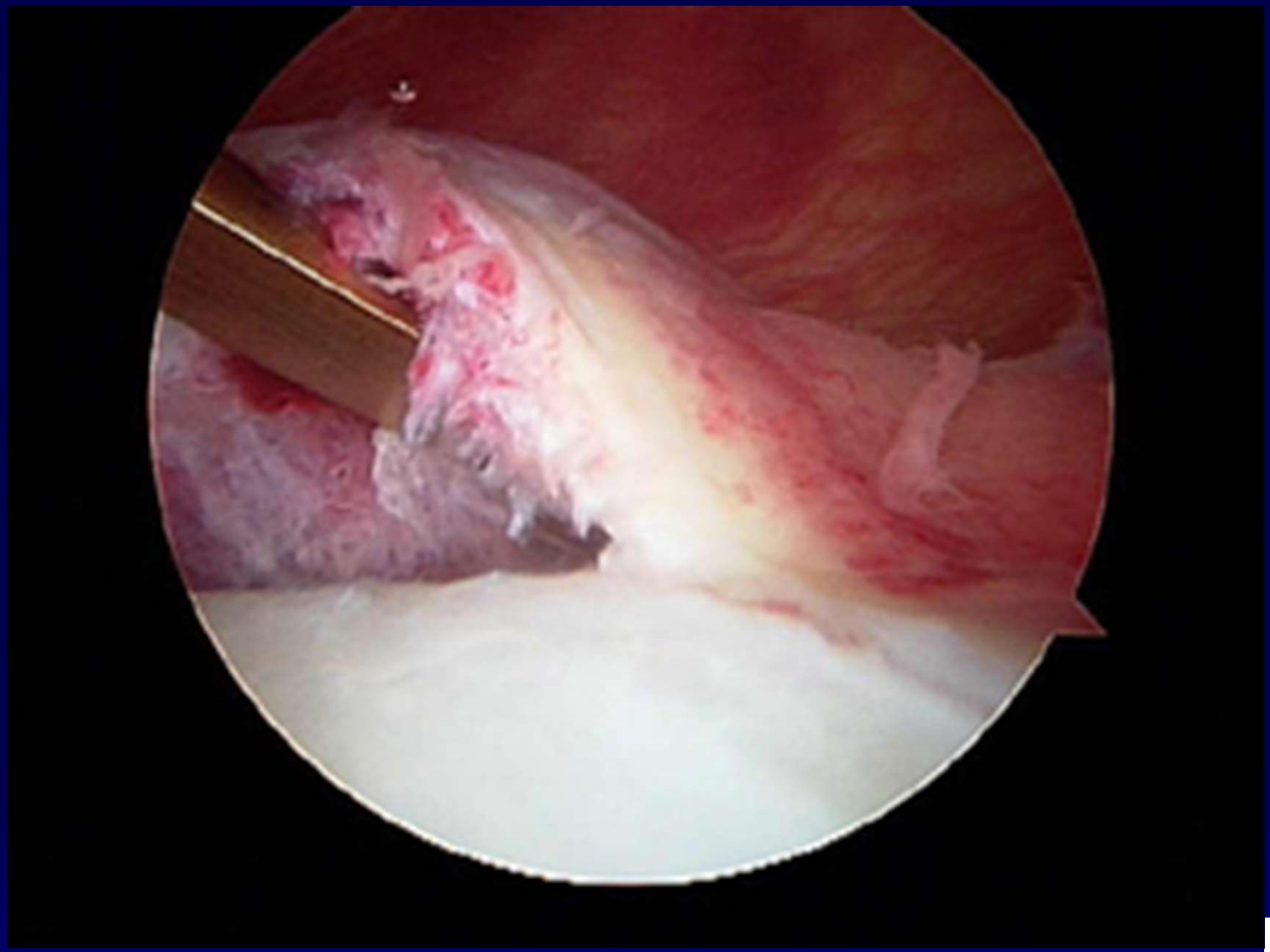
Recurrent Instability

- Age at first dislocation is most important factor in predicting recurrence
  - 0-20% in Pts older than 40 years
  - 40-60% in Pts 20-30 years old
  - 66-95% in Pts younger than 20 years old
  - Almost 100% in Pts with open growth plates

Simonet and Cofield. Am J Sports Med, 1984.

Nevaiser et al. J Shoulder Elbow Surg, 1995.

Bankart Lesion



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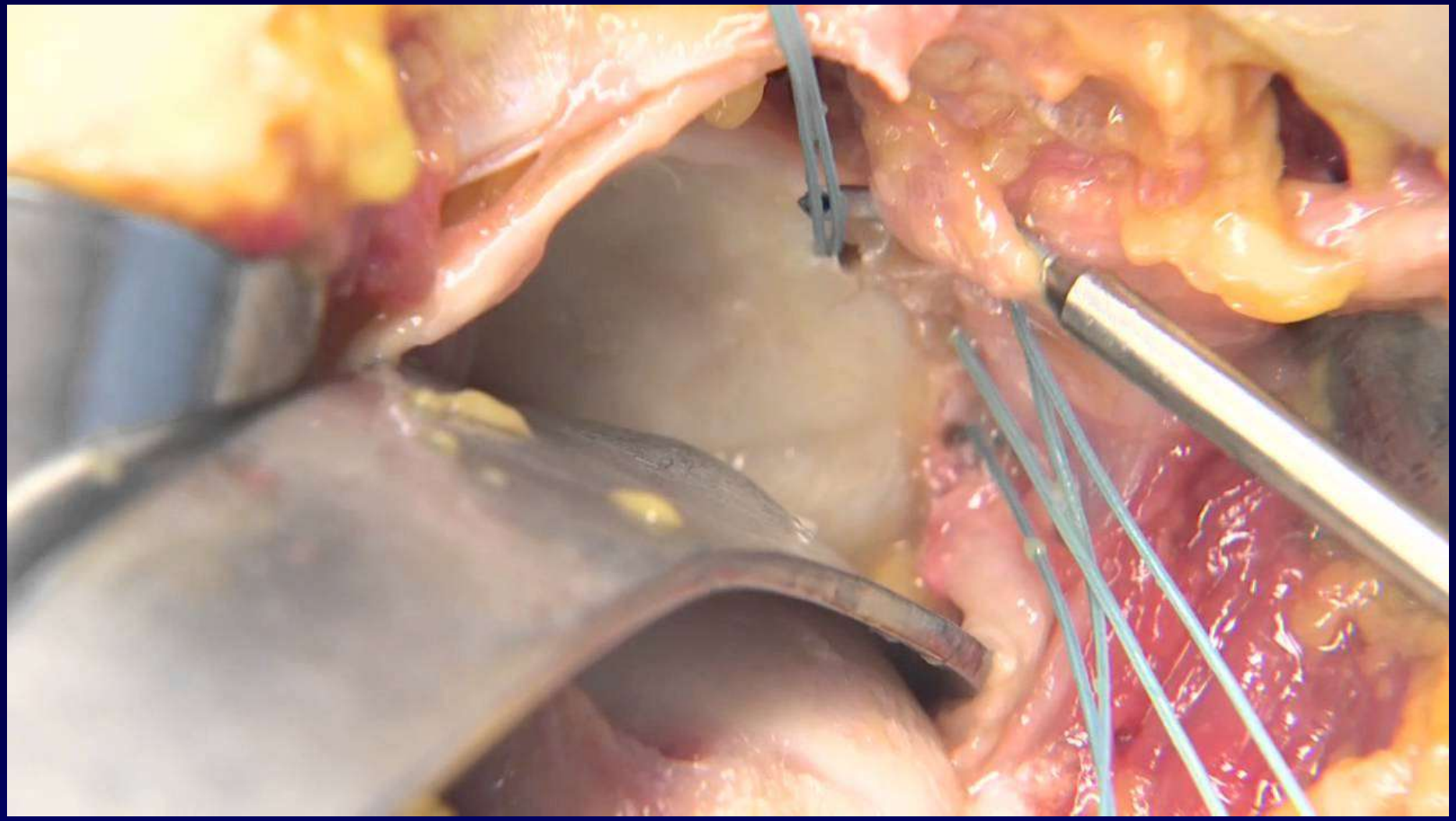
Treatment Options

- Conservative
- Surgical
  - Open Bankart repair/capsular shift
  - Arthroscopic Bankart repair

Open Bankart Repair

- Limited deltopectoral incision
- Labrum reattached to articular edge
  - Bone tunnels
  - Suture anchors
- Knots on outside of capsule
- Independent lateral capsular shift
- Overlapped capsular flaps

Open Bankart Repair



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Open Bankart Repair

- 161 Pts
- Bone defects
  - Glenoid 77%
  - Hill-Sachs 78%
- Only 5 recurrences
- 97% satisfied

Rowe. J Bone Joint Surg 1978

Open Bankart Repair

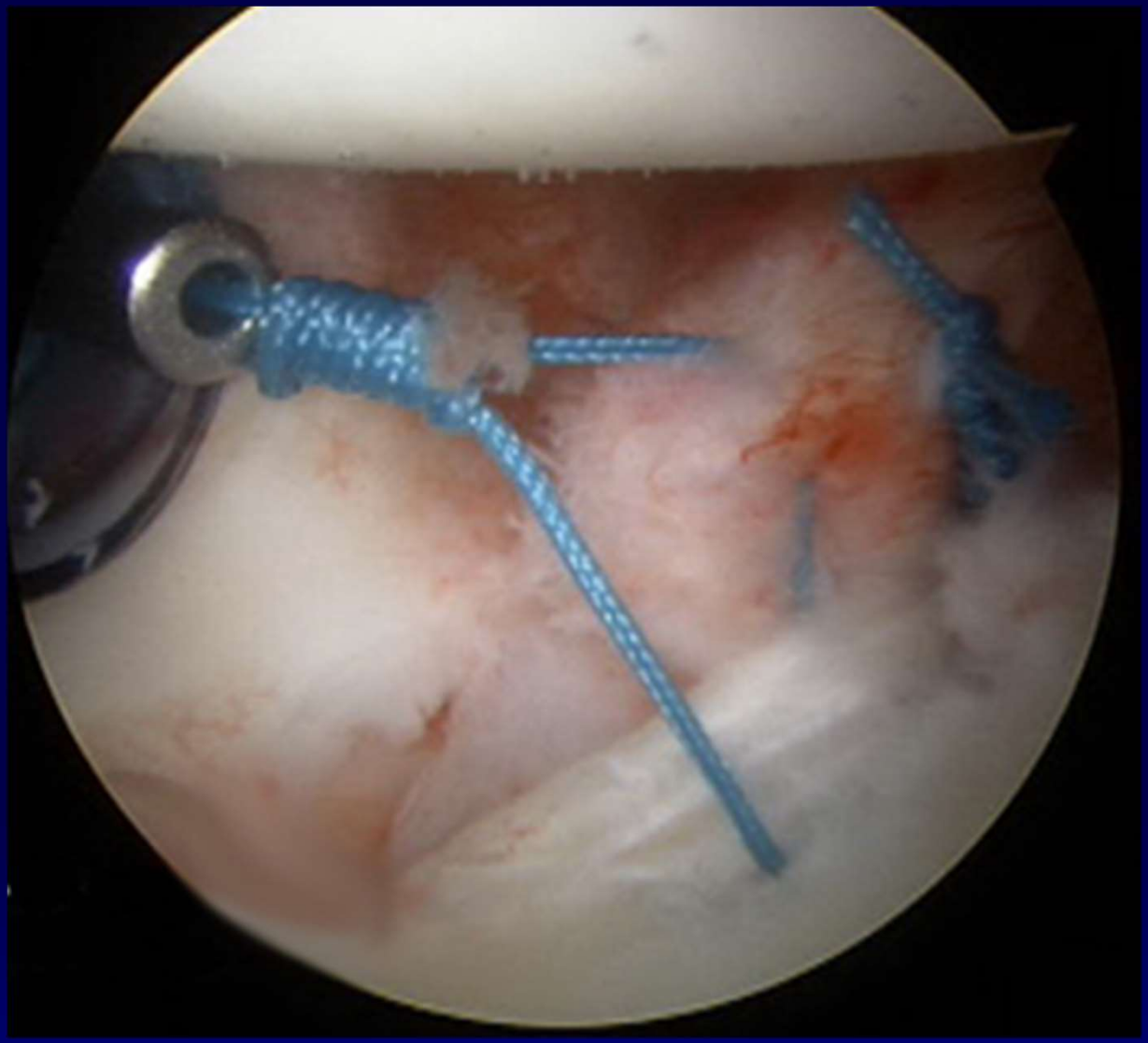
- 103 Pts
- 85% collision athletes
- Bone defects
  - Glenoid bone loss 14%
  - Hill-Sachs 84%
- 2 recurrences!

Pagnani. Am J Sports Med 2008

Arthroscopic Bankart Repair

- Less invasive, smaller incisions
- Shorter operative time
- Faster recovery
- Lower incidence of neurovascular injury
- More elegant
- Better in every way?!?

Arthroscopic Bankart Repair



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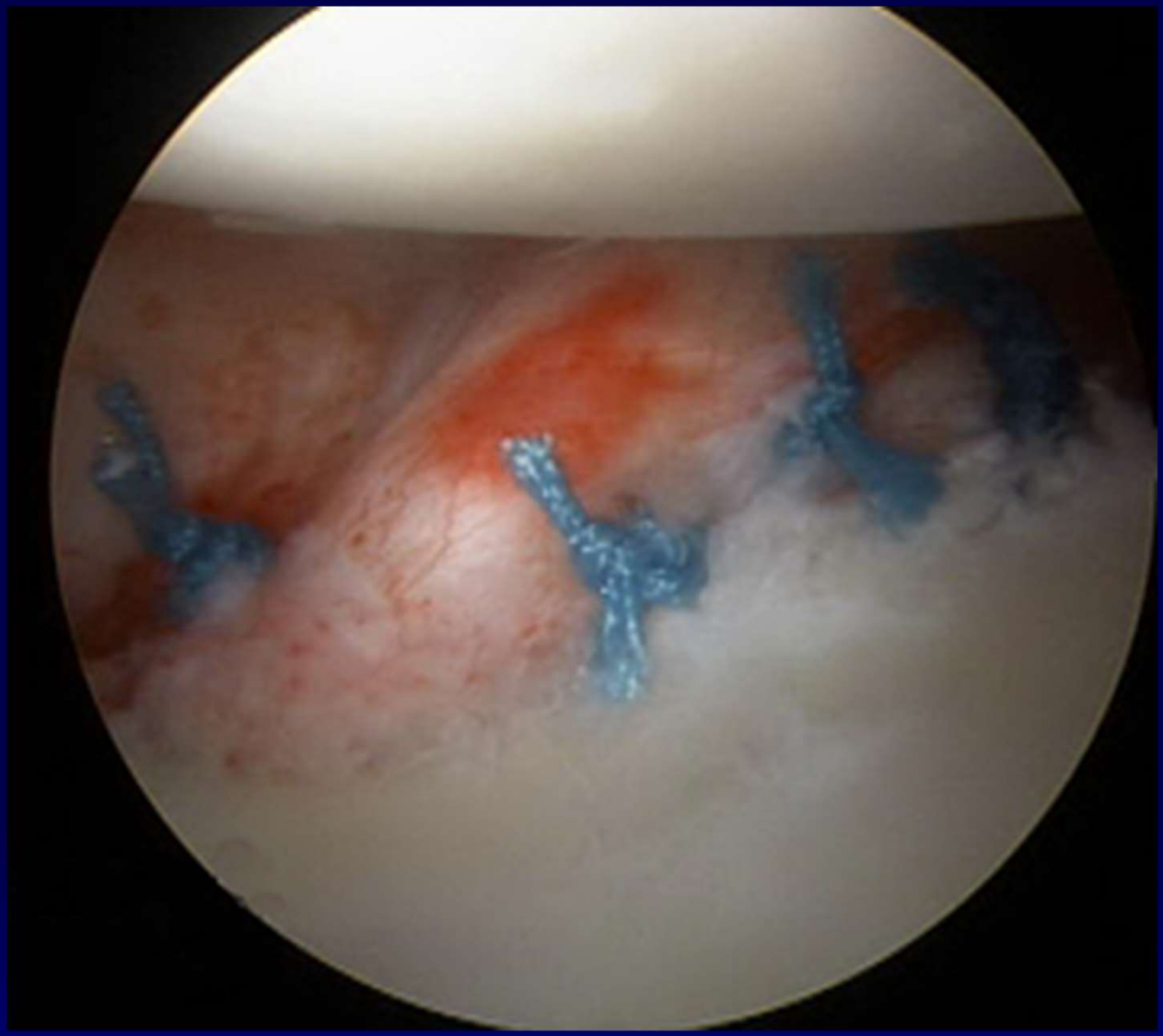
Arthroscopic Bankart Repair



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“Those who do not remember the past are condemned to repeat it”

--George Santayana

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Recurrent Instability

- 79 open repairs, 83 arthroscopic
- WOSI scores: No difference
- Recurrence rates:
  - Open 11%
  - Arthroscopic 23%

Mohtadi et al. J Bone Joint Surg, 2014

Recurrent Instability

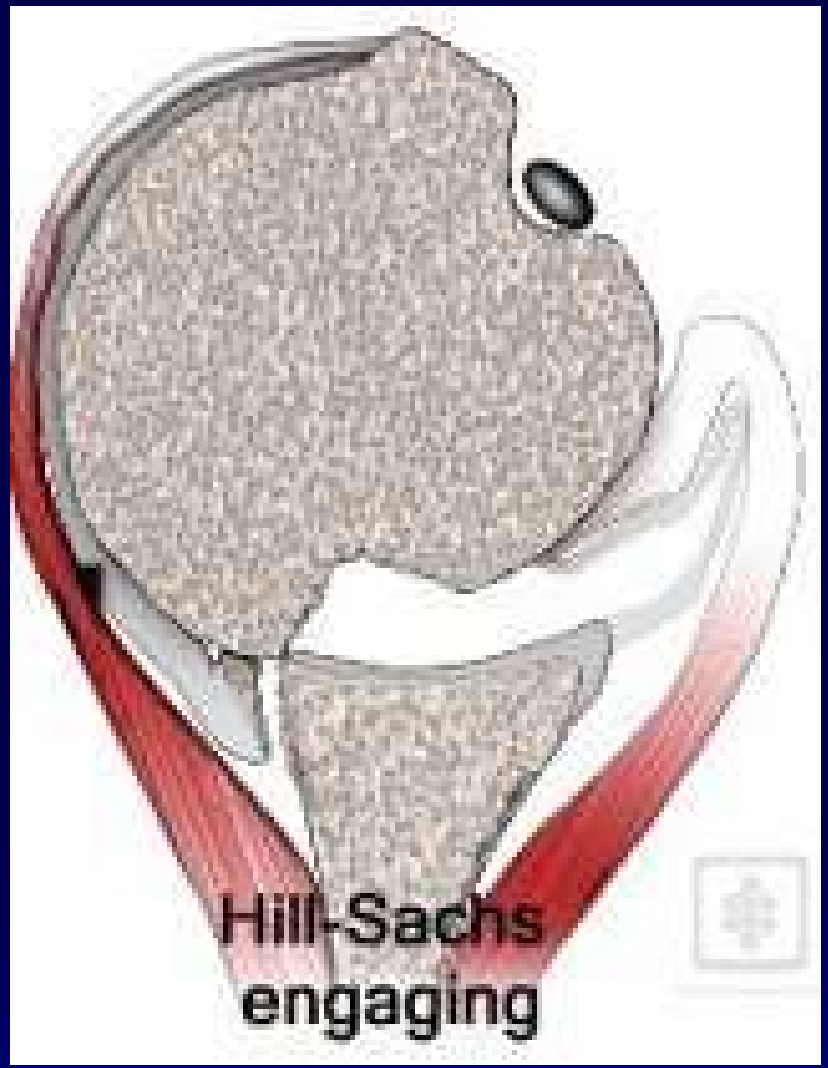
- Consider mechanism
- Beware of glenoid bone loss, especially in multiple time dislocators
- CT scan with 3D recons
- Most will require surgical management
- Bone augmentation
  - Latarjet
  - Bone graft

Bone Loss

- Humeral side
- Glenoid side
- Both (“Bipolar”)

- “On track” vs. “Off track” lesions

Itoi 2017



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Remplissage

- Insertion of infraspinatus tendon into Hill-Sachs lesion

  Wolf et al. J Shoulder Elbow Surg, 2014.

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Remplissage

- Can be done arthroscopically!
- Learning curve
- Adds +/- 10 min. to Bankart repair

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Remplissage

- 50 patients (Average 29 yo)
- “Off track” Hill-Sachs lesions
- 60 months average follow-up
- Redislocation rate 11%
- 95.5% return to sport
- Loss of ER 5.3 degrees

Garcia et al. Am J Sports Med, 2016.

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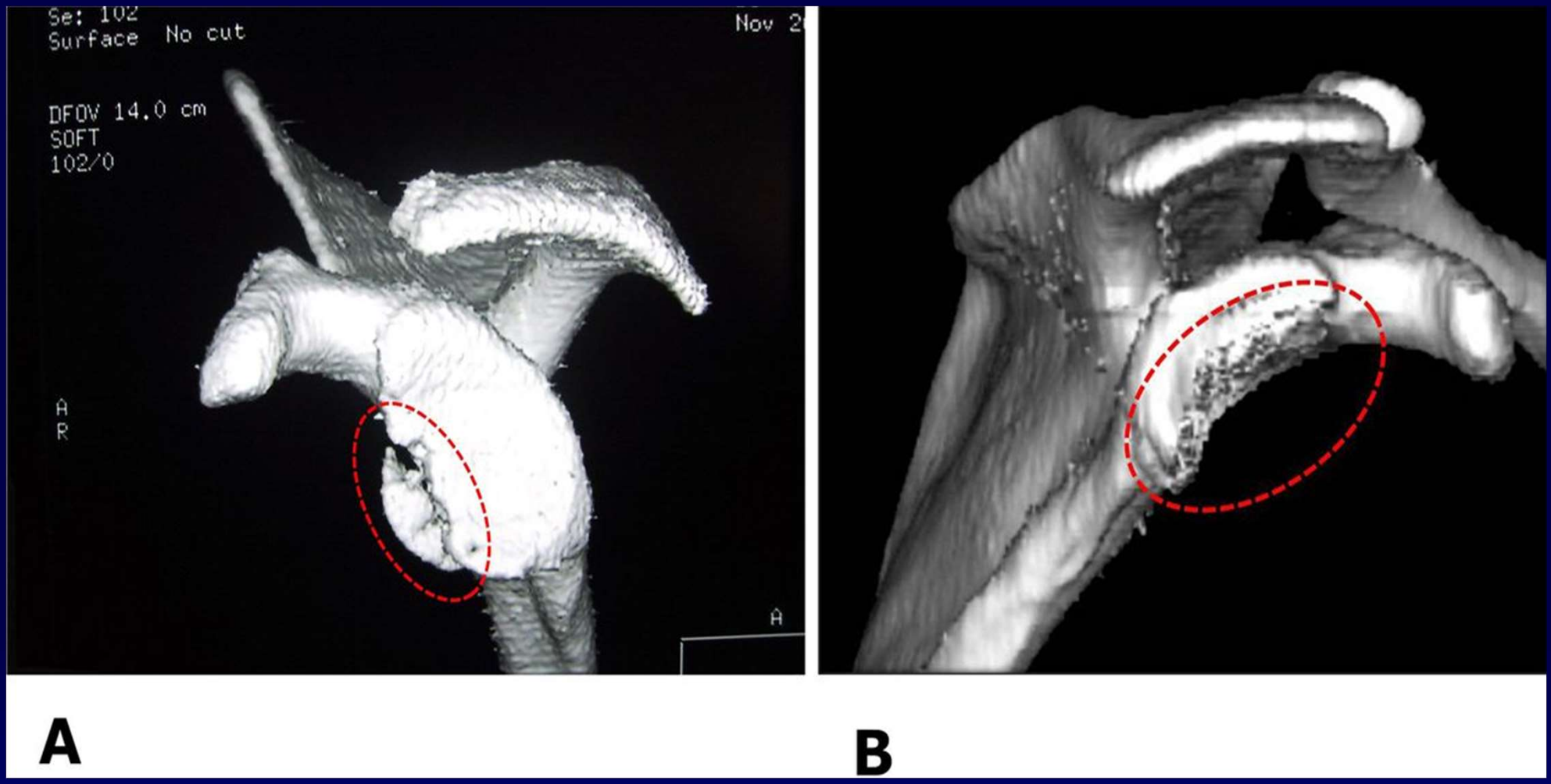
Glenoid Bone Loss



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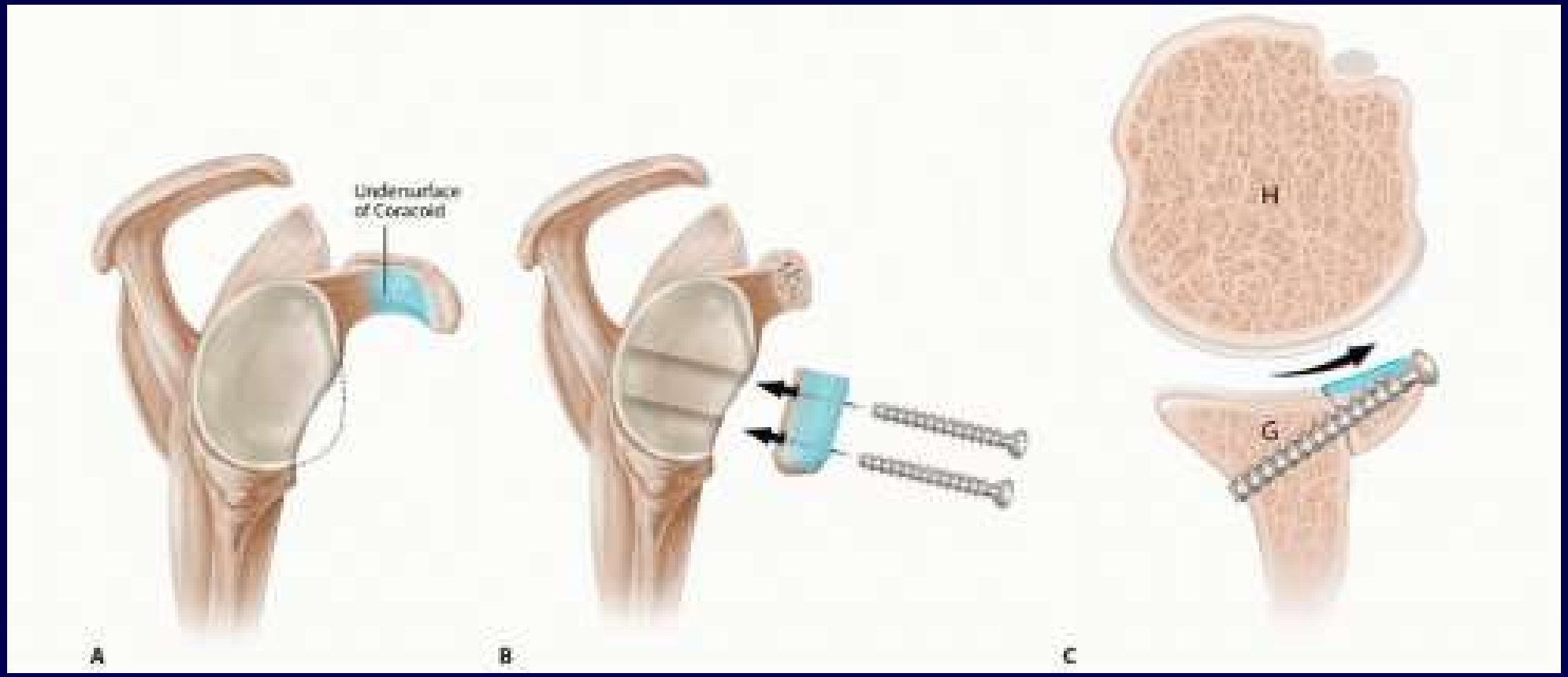
Latarjet Procedure

- Described in 1954
- Modified to be performed through subscapularis split
- “Triple blocking effect”
  - Increased bony arc
  - Sling effect of subscapularis
  - Capsular tightening
- Some surgeons performing arthroscopic

Latarjet Procedure



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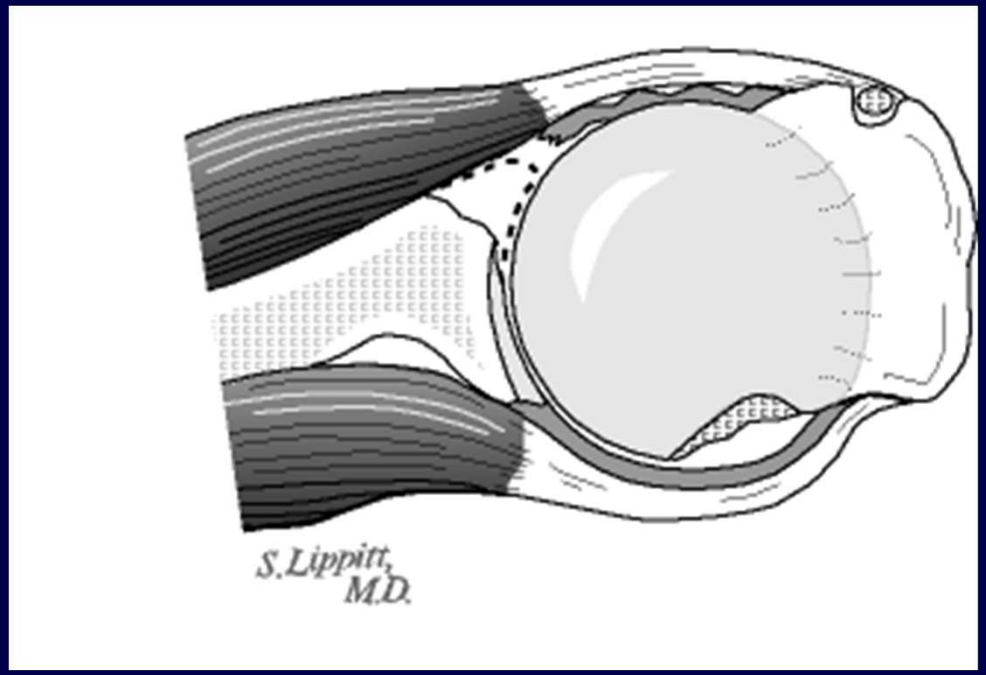
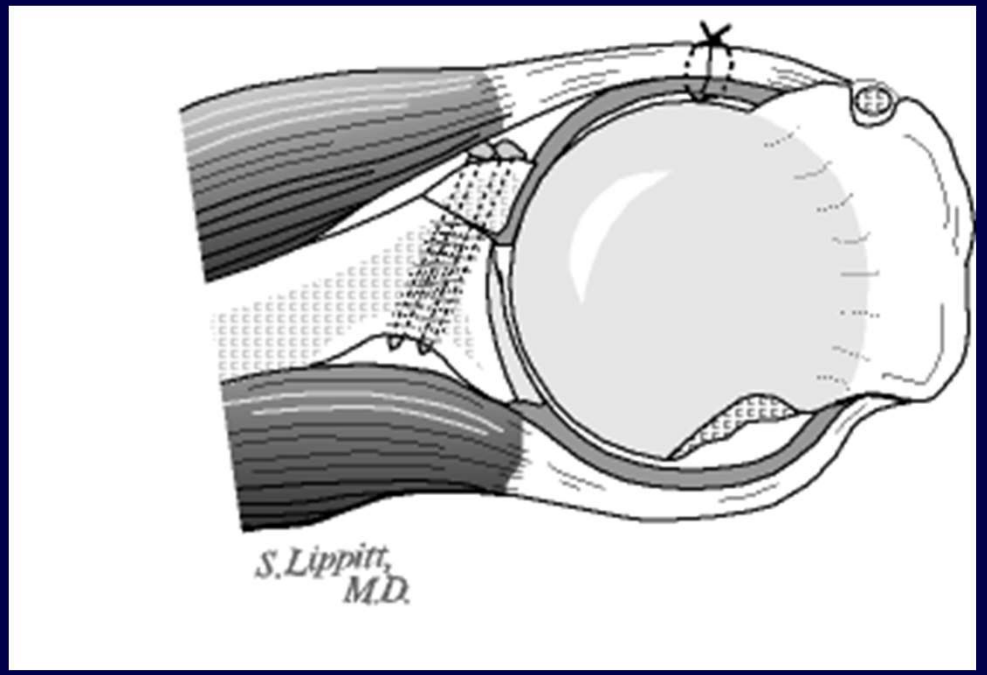
Bone Grafting Anterior Glenoid





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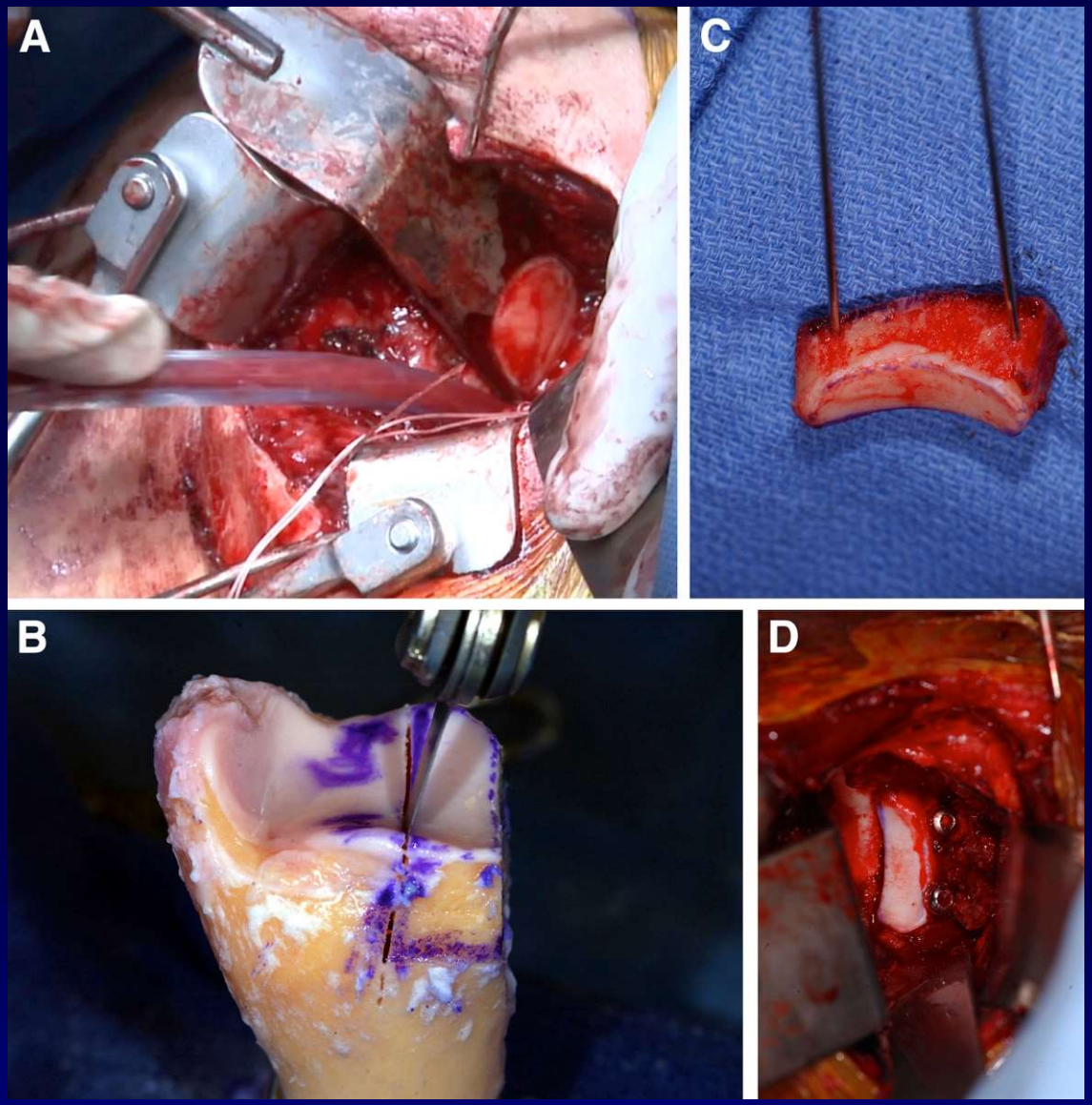
Distal Tibial Allograft

- Easy to prepare
- No morbidity from coracoid harvest
- Less pain/easier recovery
- Comparable results to Latarjet
- Fewer complications?

Provencher et al. Arthroscopy 2009

Distal Tibia Allograft



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Take Home Points

- Recognize common shoulder injuries
- Formulate differential diagnoses
- Recommend initial treatment plans:
  - Immobilization
  - Pain Management
  - Imaging
  - Definitive treatment
  - Rehabilitation

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Introduction

- Shoulder impingement
- Rotator cuff disease
- Rotator cuff arthropathy
- SLAP lesions
- Adhesive capsulitis
- Glenohumeral arthritis

“Life may not begin at 40, but it certainly doesn’t have to end there”

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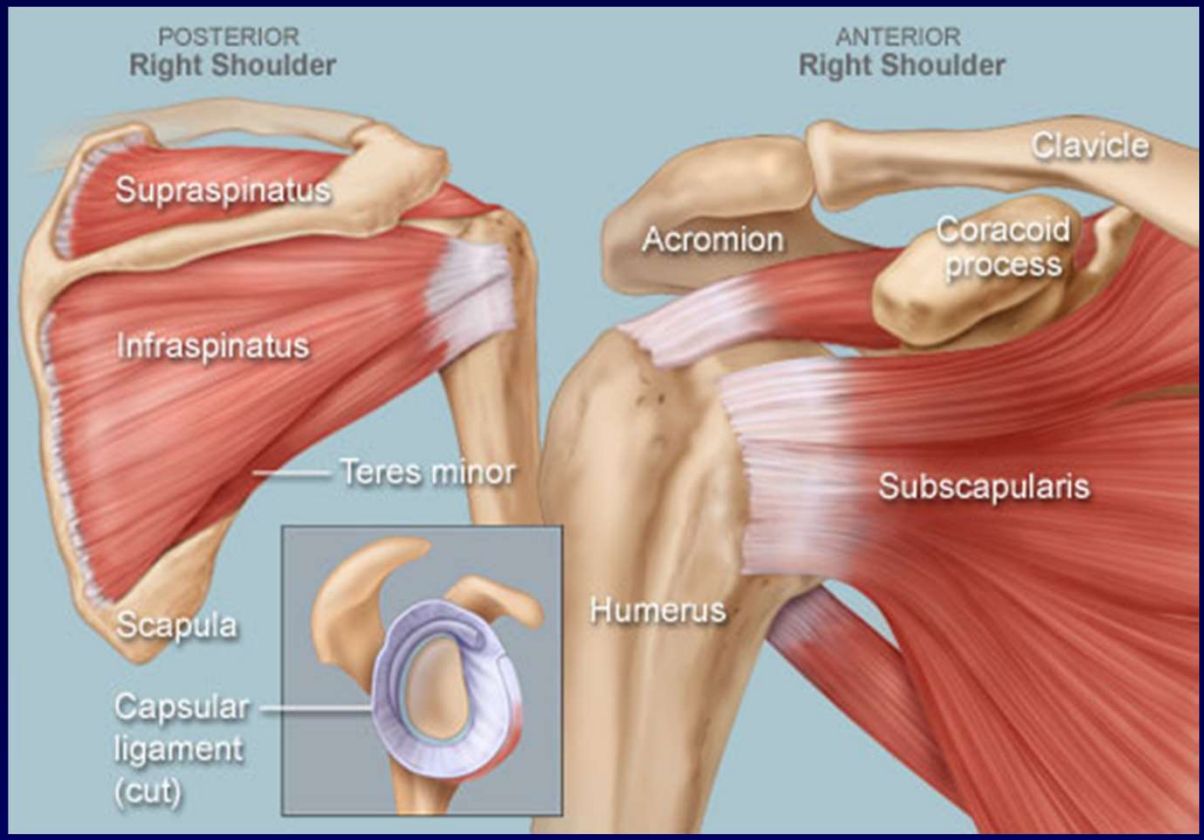
Rotator Cuff

- Four muscles/tendons covering scapula
  - Supraspinatus
  - Infraspinatus
  - Subscapularis
  - Teres minor



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Case #1

- 58yo RHD male avid tennis player presents with a 3 month h/o right shoulder pain
- Localized deep and lateral
- Increased with overhead serves
- Partially relieved by rest and NSAIDs

Case #1

- Exam reveals painful arc of motion in forward elevation and abduction
- No rotator cuff atrophy
- TTP over lateral subacromial bursa
- Positive Neer and Hawkins signs
- Mild weakness in abduction and ER

Case #1

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Case #1

- Diagnosis?

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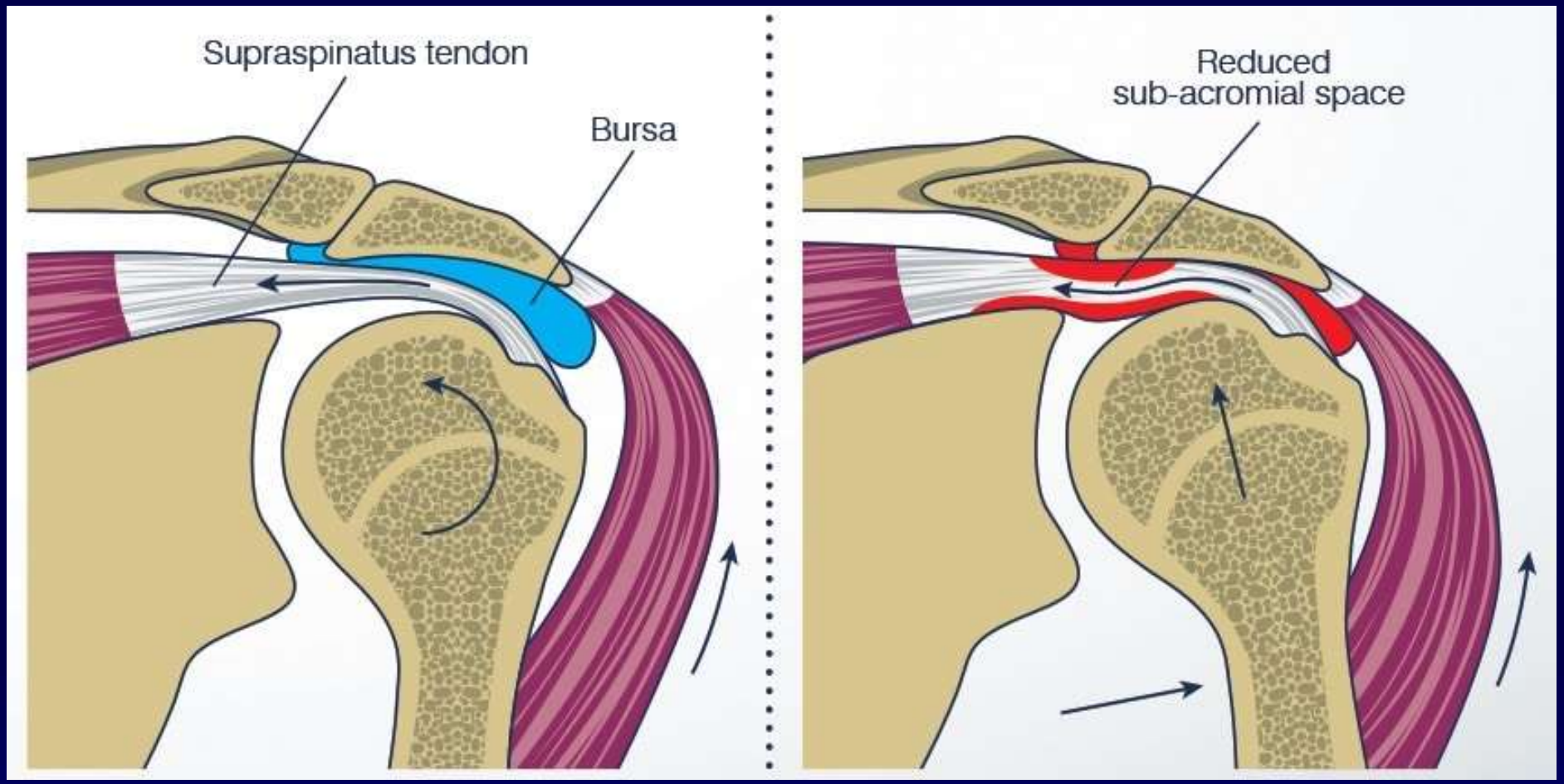
Impingement Syndrome

- Most common overuse problem in the shoulder in the older overhead athlete
- Compression of subacromial bursa and/or rotator cuff tendons between humeral head and undersurface of the acromion
- Subacromial bursitis
- Rotator cuff tendinitis

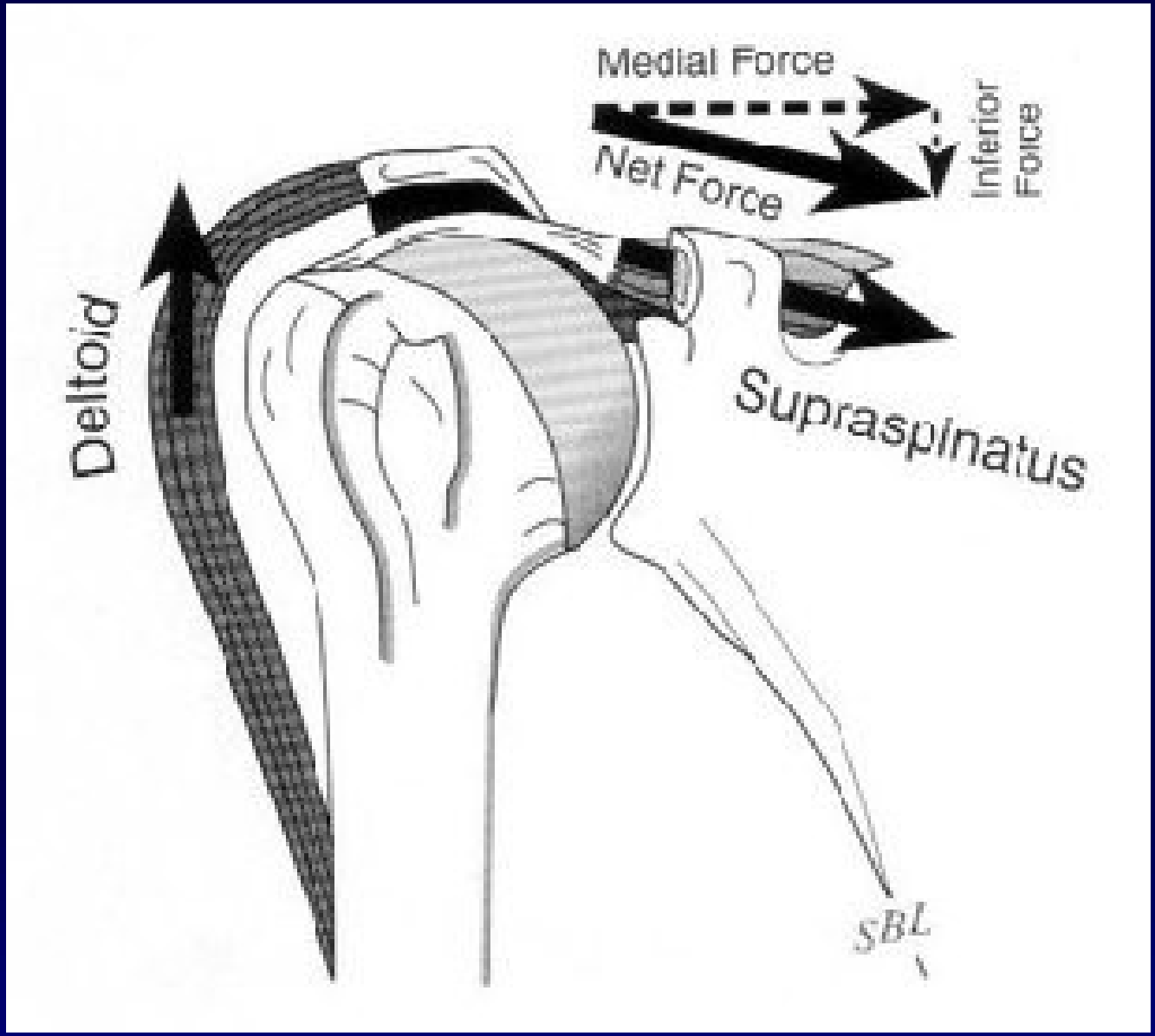
Impingement Syndrome



Impingement Syndrome

- Treatment
  - Rest from aggravating factors
  - NSAIDs
  - Consider cortisone Injection
  - Physical therapy for RC strengthening
- Surgical decompression
  - Partial bursectomy
  - Acromioplasty

Shoulder Force Couple



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Subacromial Decompression

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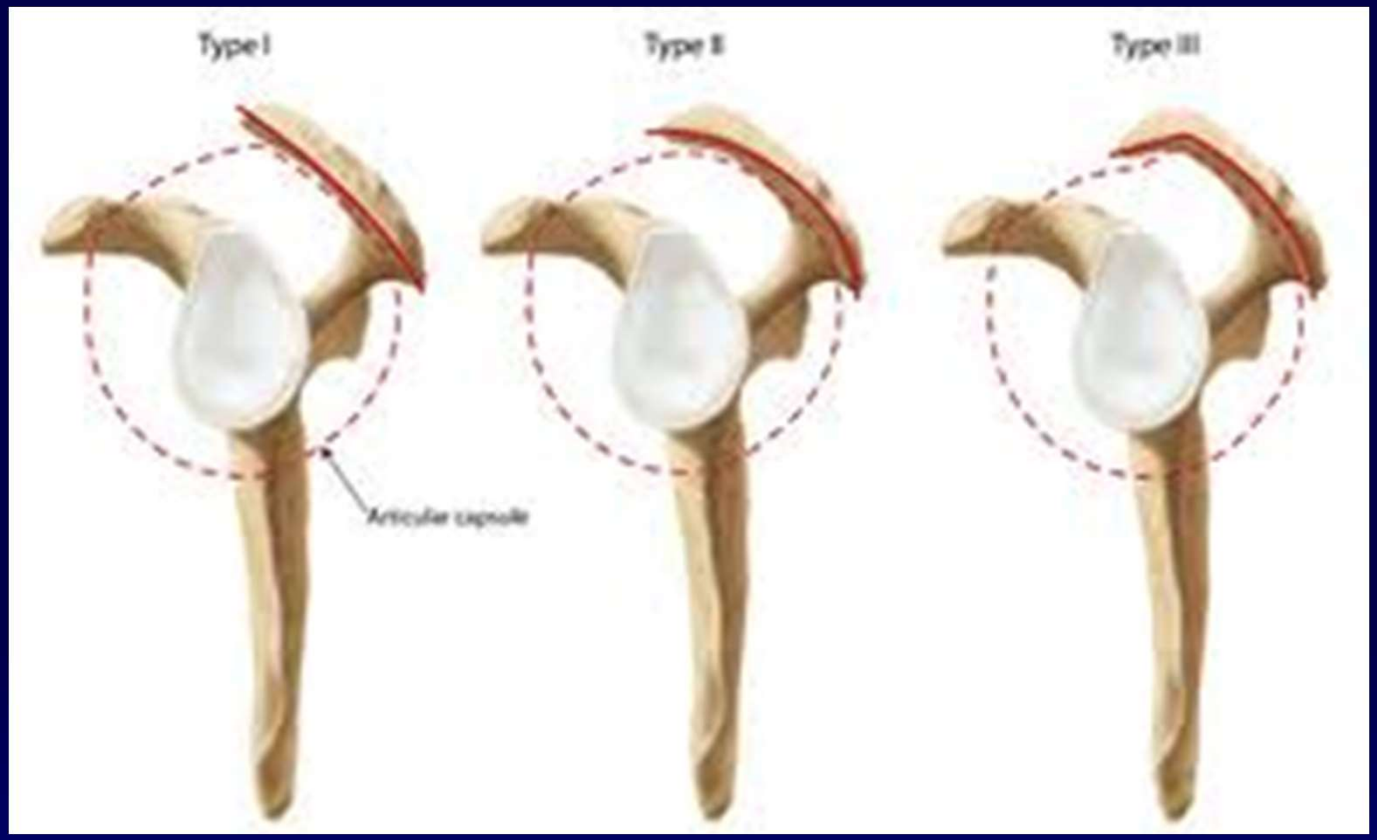
Impingement Syndrome

- Increased risk of rotator cuff disease



Bigliani et al. Orthop Trans 1986

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Rotator Cuff Tears

- Most often chronic, degenerative tears or acute-on-chronic presentations
- Initial symptom may be pain only
- Many have few other symptoms
- Ultimately results in weakness as tear worsens and RC muscle atrophy occurs

Rotator Cuff Tears

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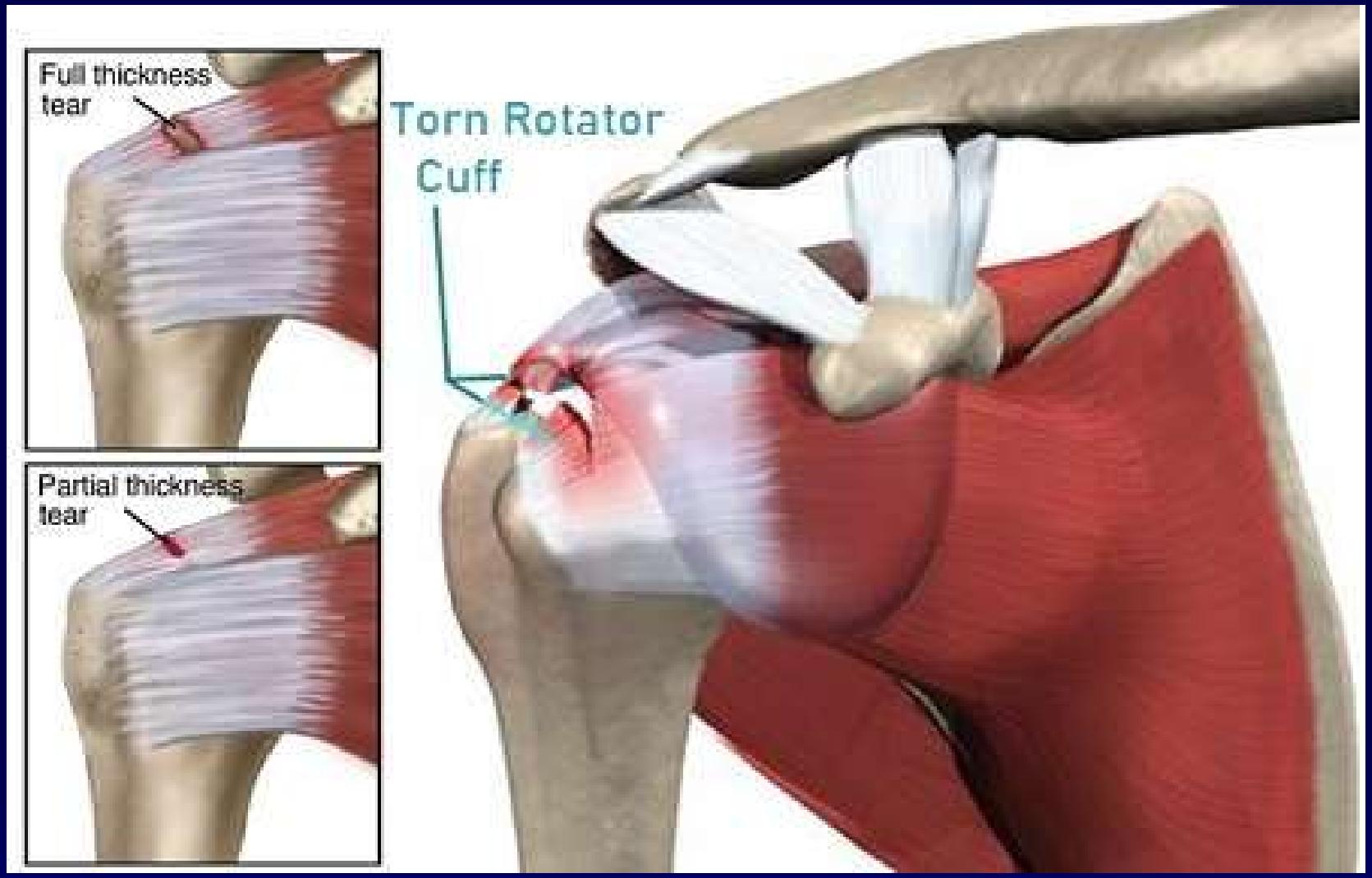
Rotator Cuff Tears



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Rotator Cuff - Exam

- Painful ROM, especially ABER
- Positive Neer and Hawkins signs
- Muscle atrophy
- Weakness in ABER
- Drop arm sign
- ER lag
- Hornblower's sign

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Rotator Cuff - MRI

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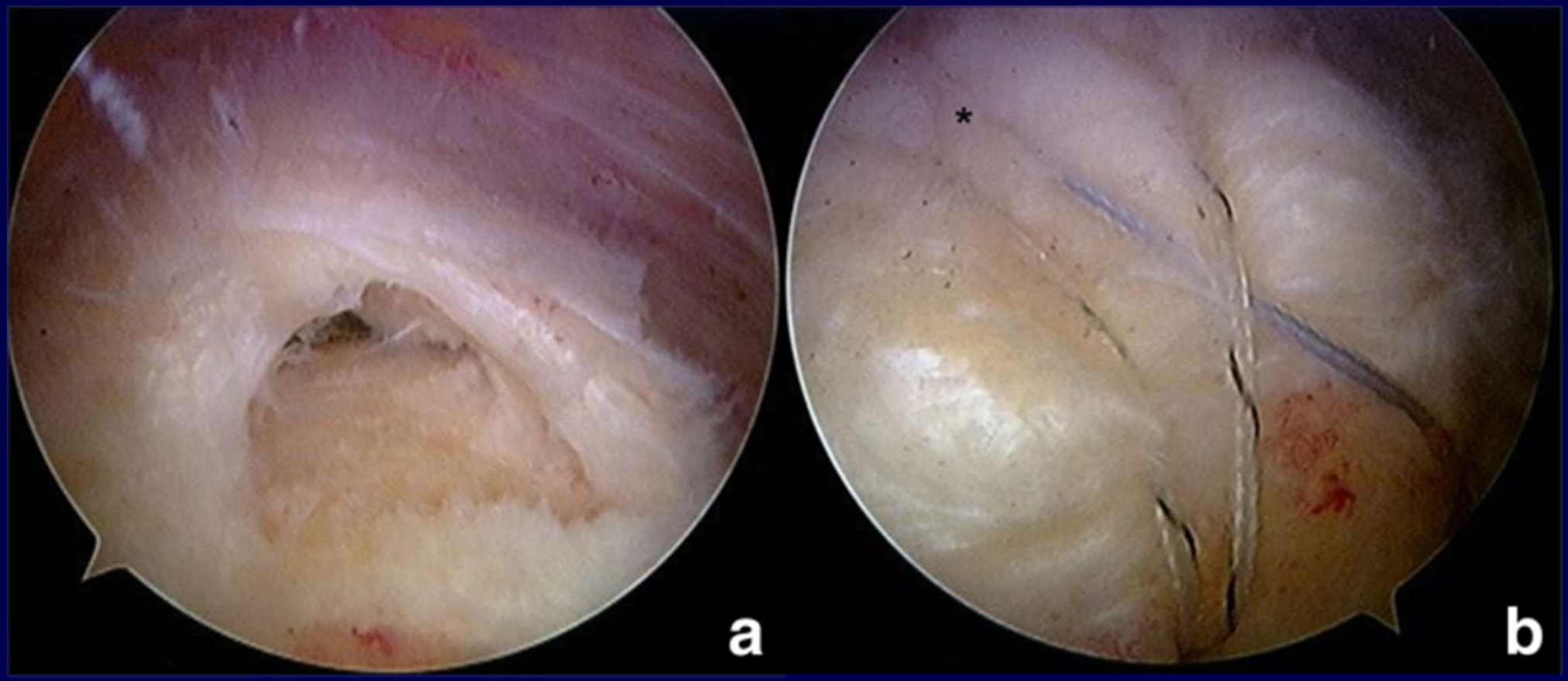
Rotator Cuff Tears

- Initial treatment may be the same as that for subacromial impingement
- Many tears slowly progress and worsen
- Arthoscopic or mini-open rotator cuff repair is often the treatment of choice
- Advanced RC disease often results in secondary glenohumeral DJD
- Rotator cuff arthropathy

Rotator Cuff Repair



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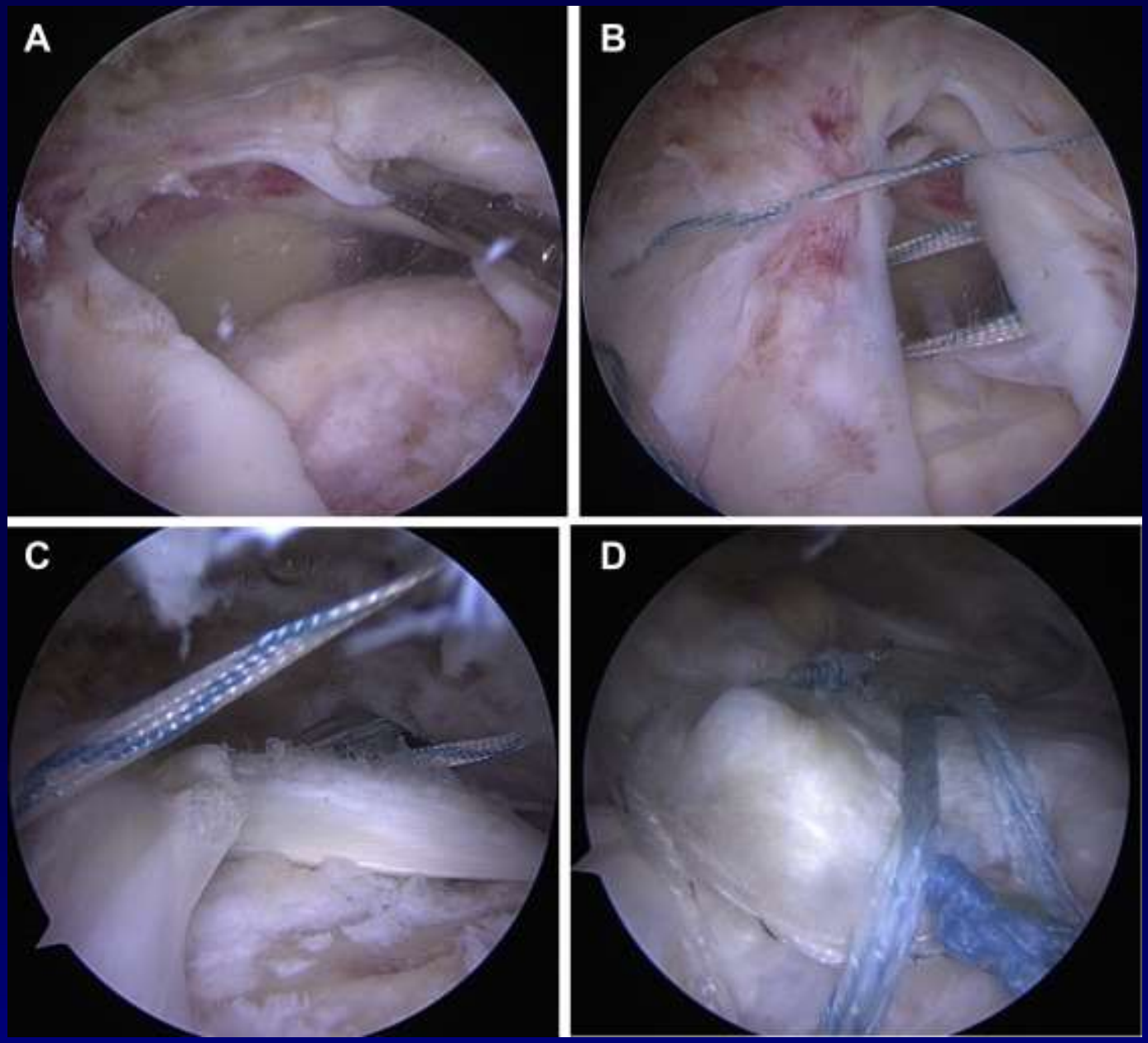
Rotator Cuff Repair



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Rotator Cuff Tears

"Hey Doc, if I don't get my rotator cuff tear fixed, will it get bigger or cause me more pain in the future?"

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RCT Progression

- Does every patient with a full thickness RCT need a repair?
- Do rotator cuff tears get bigger over time?
- What factors suggest tears will worsen?
  - 47% total over 2 years (≥2mm)
  - Full thickness
  - Medium tears
  - Smokers, Males, Hand dominance, Trauma

Yamamoto et al. Am J Sports Med, 2017.

Biologics

- Growth factors (Platelet-rich plasma)
- Interpositional grafts
- Scaffolds
- Patches

Platelet-Rich Plasma

- Peripheral blood drawn from patient, centrifuged, plasma buffy coat collected
- Re-injected at site of injury
- Growth factors present in supraphysiologic concentrations
- Some studies have shown improved healing rates
- Others show no SSD vs. saline injections

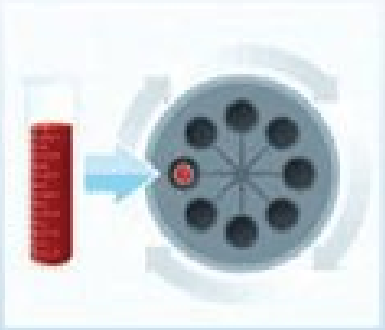
Platelet-Rich Plasma

STEP 1

Collecting Blood

A small amount of blood (30-60ml) is drawn from the patient's arm.

STEP 2



Separating the Platelets

The blood goes for a "spin" in a centrifuge separating the platelets from the rest of the blood.

STEP 3

Platelet-Rich Plasma

The patient's own platelet-rich plasma is now extracted from the test tube.

STEP 4

Return of PRP to the Patient

The plasma is injected into the injured area or inflammed tissue.

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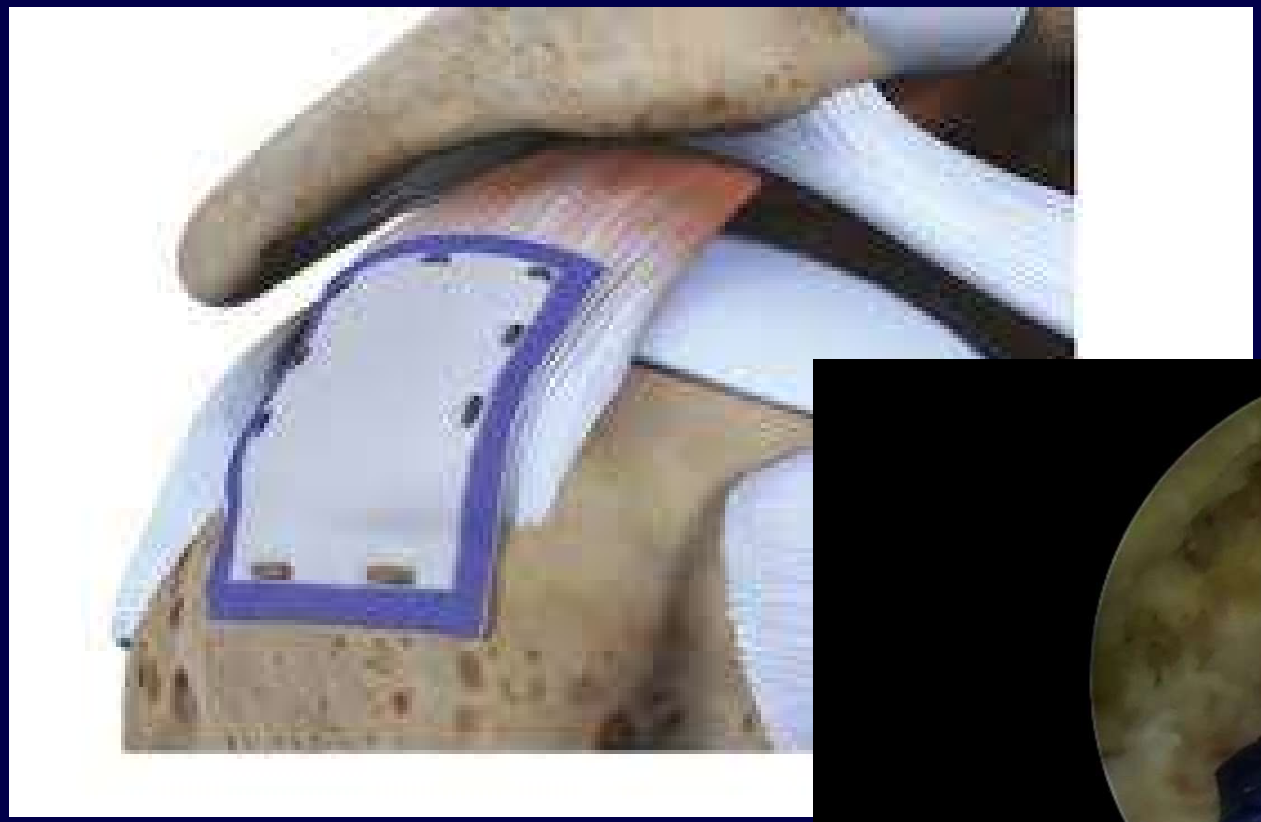
Bovine Collagen Grafts

- 33 Pts with chronic, degenerative PTRCTs
- ASAD with no traditional RCR
- Implant placed on bursal surface of SS
- Clinical outcomes at 3 months, 1 and 2 yrs
- ASES/CMS scores improved at 2 years
- MRI evidence of tissue fill-in in 100% of intermediate and 95% of high grade tears

Schlegel et al. JSES 30:8, 2021

Biologics



Case #2

- 78yo RHD retired male presents with a 6 month h/o right shoulder pain
- Associated weakness
- Interfering with ADLs
- Not sleeping well

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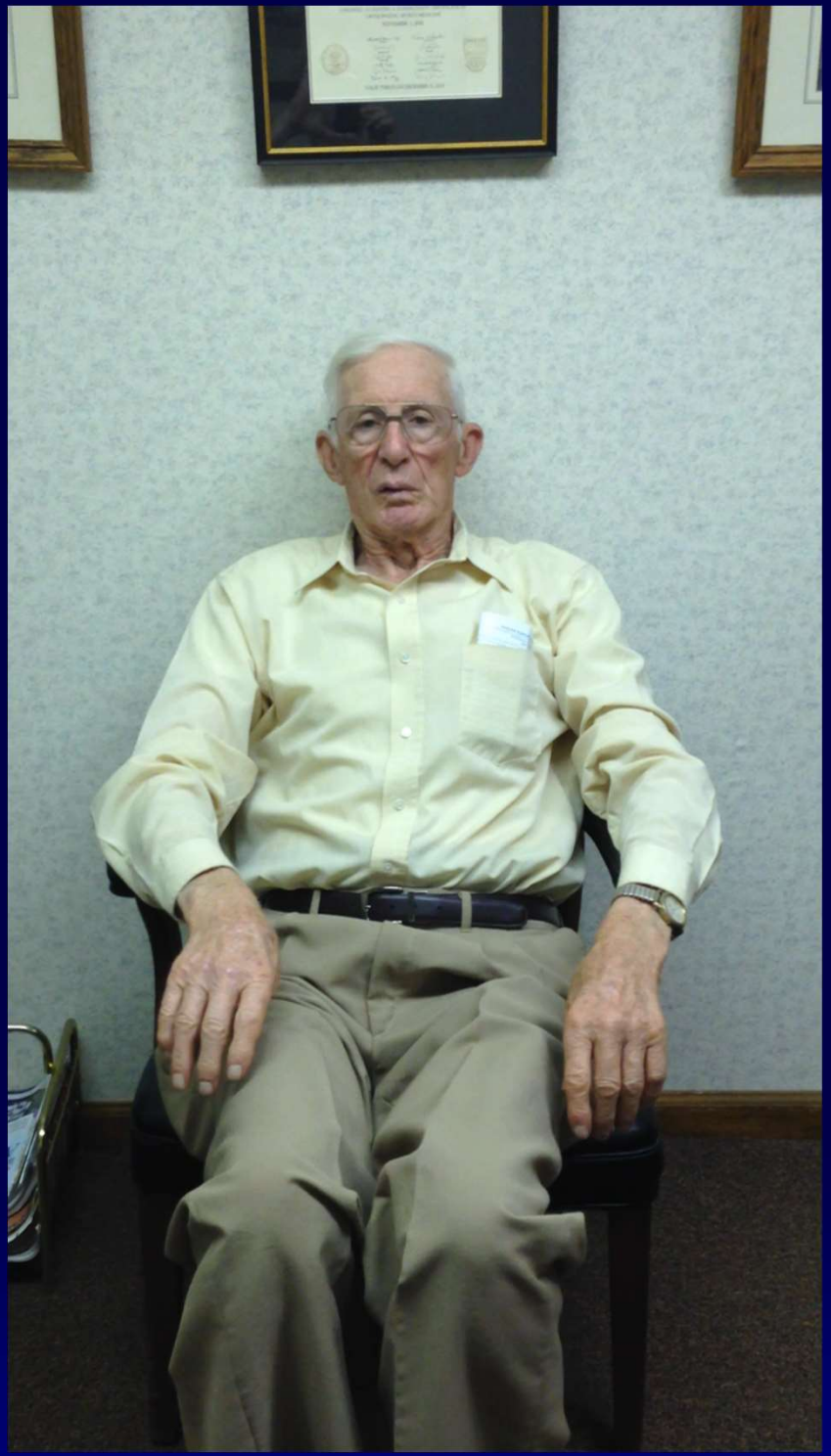

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Diagnosis?

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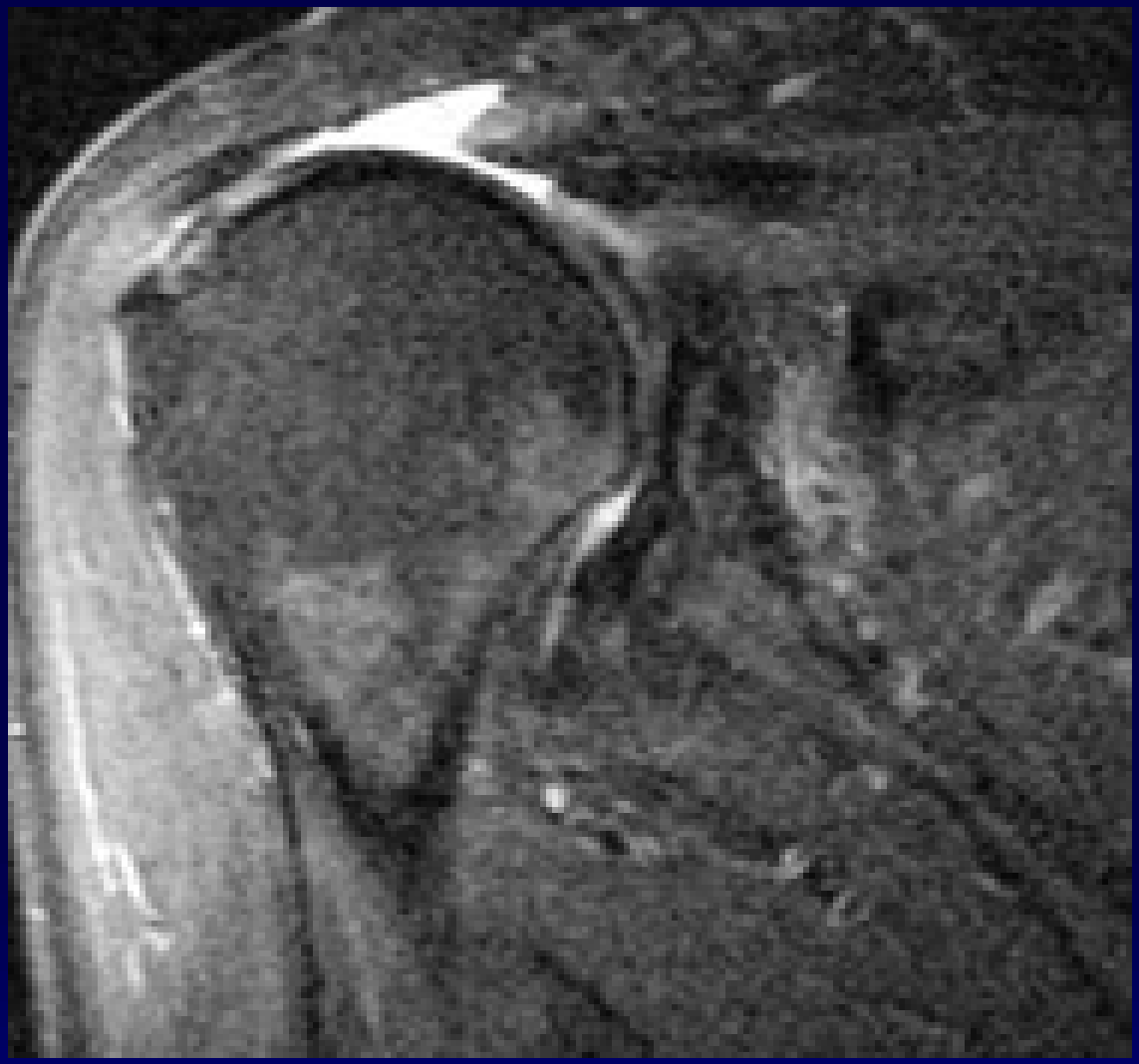
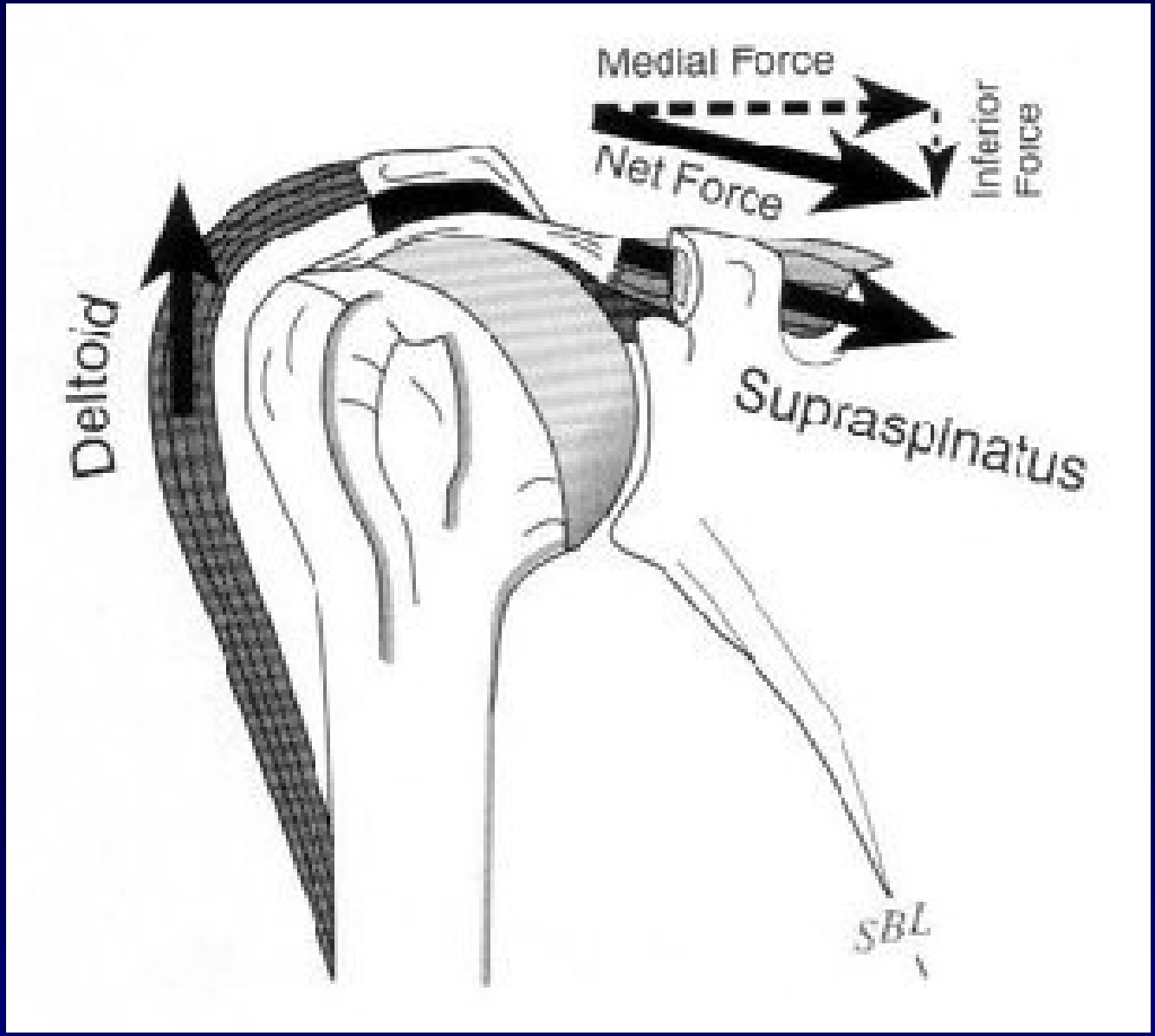
Rotator Cuff Arthropathy



Rotator Cuff Arthropathy

- Growing problem
- Failed RC repair
- Neglected RC tear
- Loss of depressing force of cuff
- Superior migration of humeral head
- Deltoid shortens, becomes weak
- Pseudoparalysis

Shoulder Force Couple



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Rotator Cuff Arthropathy

- Conservative treatment
  - PT
  - Pain management
  - Cortisone injections
  - Activity modification
- Surgical Management
  - Reverse TSA
  - SCR
  - Biceps tenotomy!

Boileau et al. J Bone Joint Surg, 2007.

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Superior Capsular Reconstruction

- Described by Mihata with fascia lata
- Recent use of acellular dermal allograft
- Arthroscopic procedure
- Restores tether/fulcrum to prevent superior migration of humeral head
- Limited experience
- May reverse pseudoparalysis over time!

Burkhart et al. Arthroscopy, 2019.

Superior Capsular Reconstruction

- 10 Pts with complete SS/IS tears
- Tears > 5cm
- AFE <45 degrees
- Full PFE
- F/U at 1 year
- Avg AFE 159 degrees!
- Improved pain, AER, ASES scores

Burkhart et al. Arthroscopy 2019

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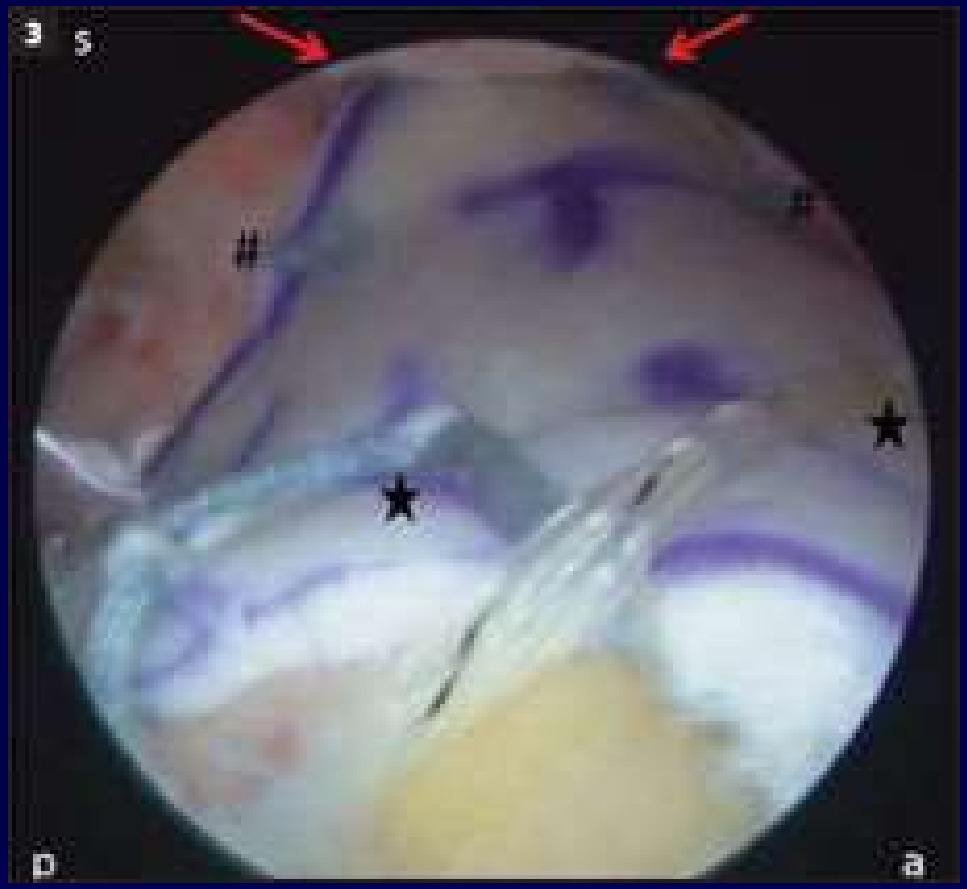
Superior Capsular Reconstruction



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LIMITATIONS

UNTIL YOU SPREAD YOUR WINGS,
YOU'LL HAVE NO IDEA HOW FAR YOU CAN WALK.

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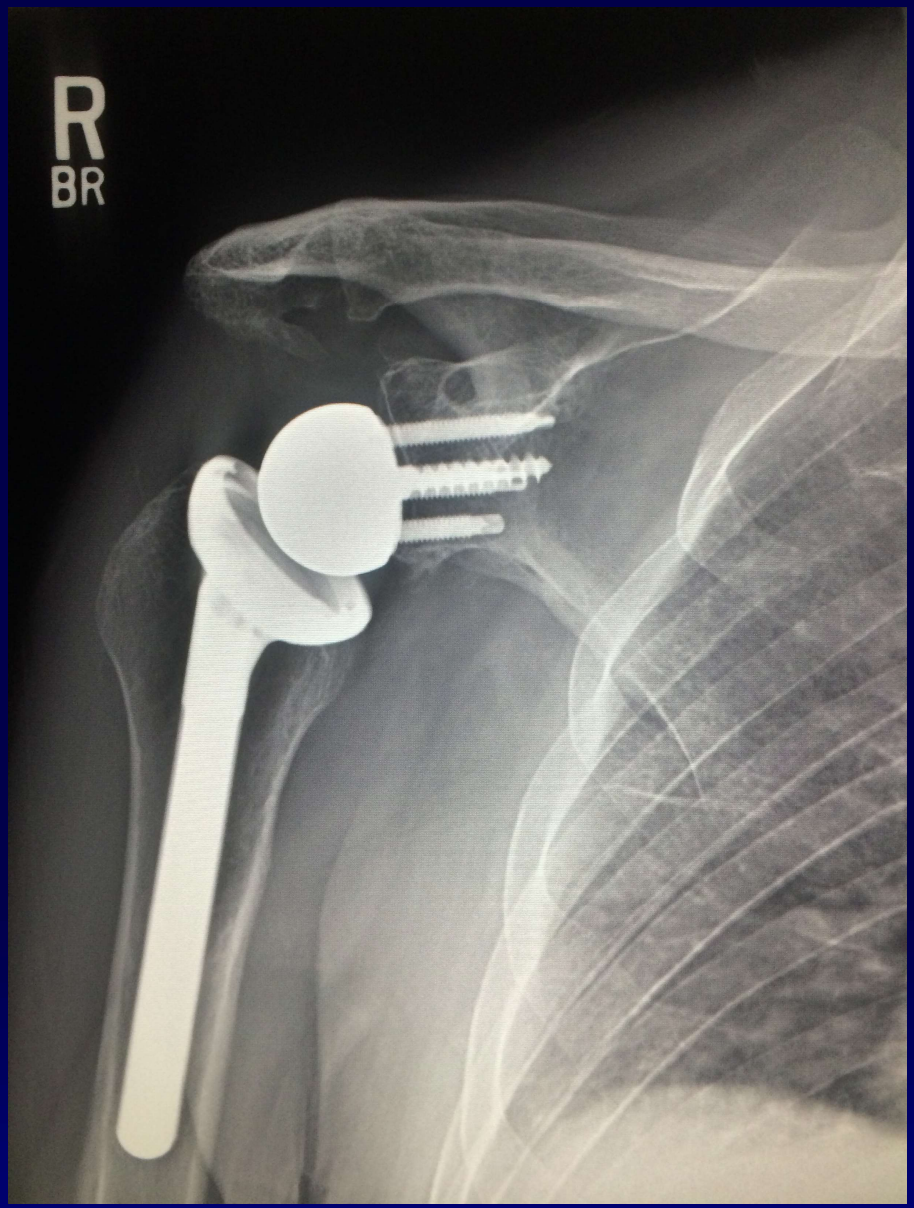
Reverse Shoulder Arthroplasty



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Case #3

- 62yo LHD female golfer presents with 1 year h/o left shoulder pain
- Localized deep and radiates down the front of her upper arm
- Aggravated by driving golf balls
- Pain with lifting objects in front

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Case #3

- Exam reveals a positive O'Brien's test and positive biceps load test
- No significant weakness
- Plain x-rays normal
- Any other studies?

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Case #3

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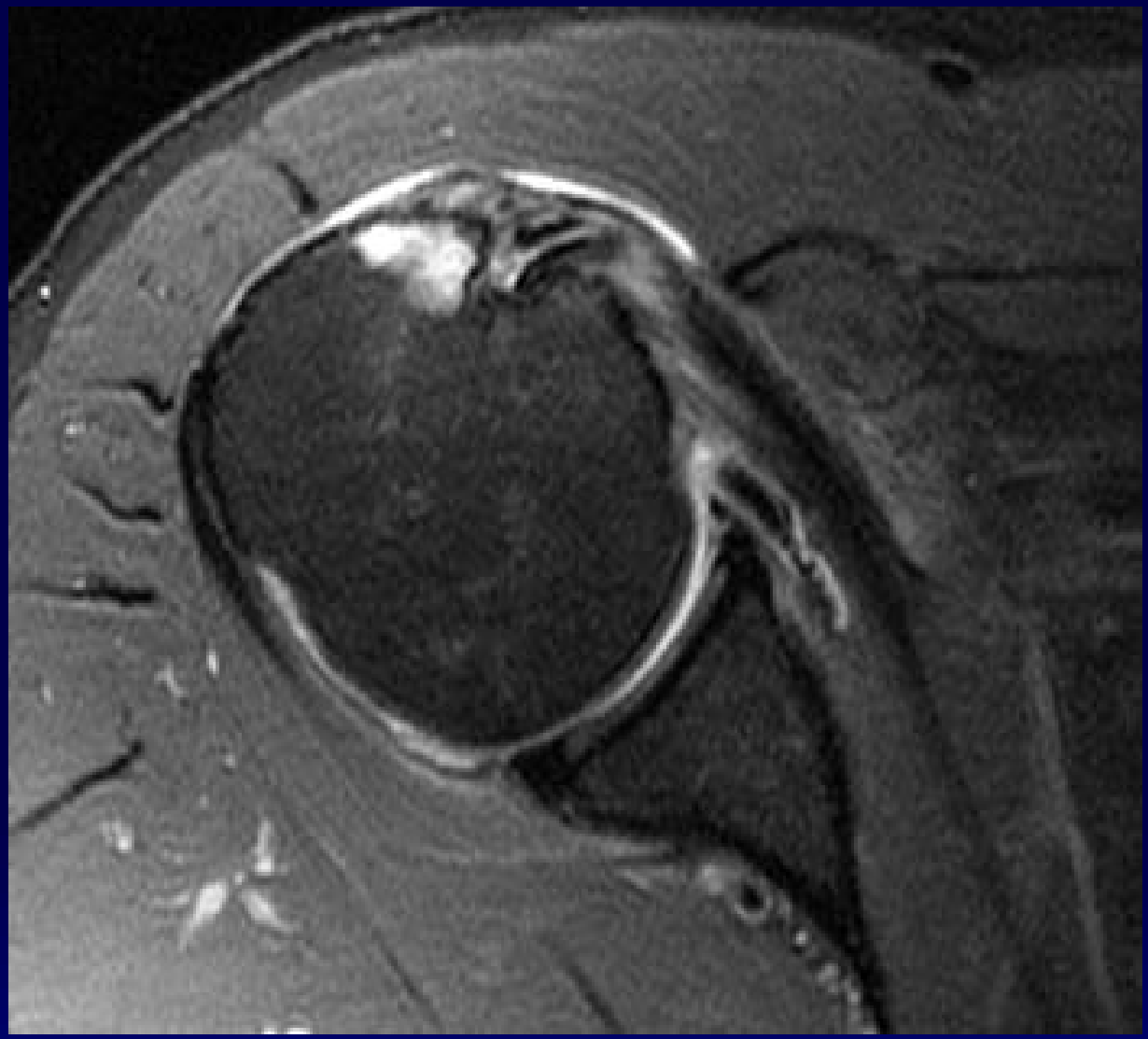
Case #3



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Case #3

- Diagnosis?

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SLAP Lesion/Biceps Tendinitis

- Commonly associated in Pts>40
- Treatment options
  - SLAP repair
  - Biceps tenodesis
  - Biceps tenotomy

SLAP Lesion/Biceps Tendinitis

- SLAP Repair
  - Can achieve good results
  - Higher complications-Stiffness!!!
  - Lower healing rates
  - Pain from associated biceps pathology
  - Cumulative evidence supports labral debridement and/or biceps tenotomy

Abbot et al. Am J Sports Med 2009

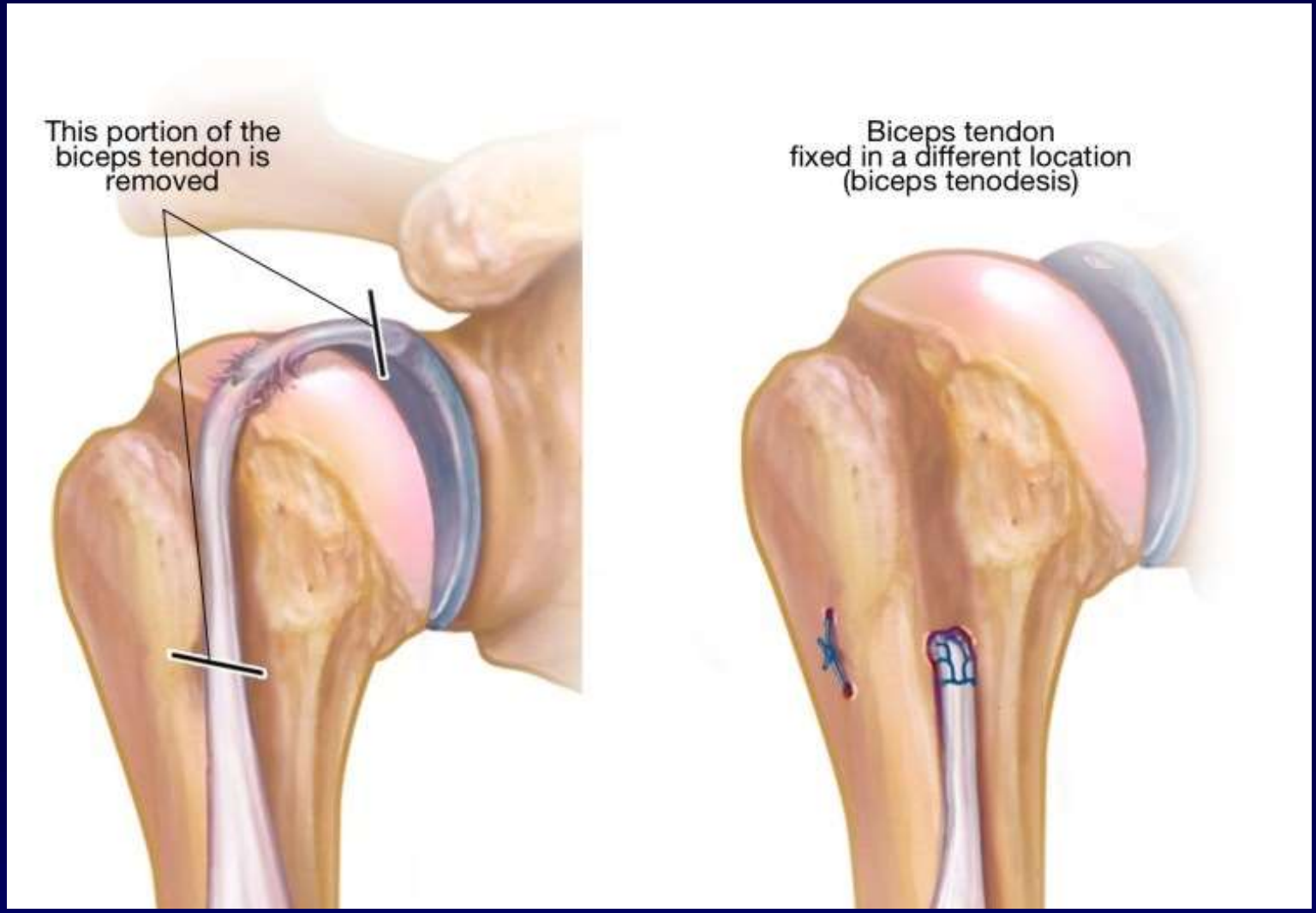
Erickson et al. Am J Sports Med 2015

SLAP Lesion/Biceps Tendinitis

- Biceps Tenodesis
  - Detach long head of biceps from glenoid
  - Debride SLAP lesion
  - Reattach LHB to humerus
    - In bicipital groove
    - Subpectoral humerus

Gottschalk et al. Am J Sports Med 2014

Biceps Tenodesis



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Biceps Tenodesis

- Time consuming
- Additional incision
- Additional implant
- Complications
- Is it really necessary?

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Biceps Tenotomy

- Faster
- No extra costs
- Minimal weakness
  - 20% supination loss
  - 8-20% flexion loss
- Popeye deformity
- “Biceps Killers”

Boileau et al. J Bone Joint Surg 2007

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Case #4

- 65yo RHD retired female presents with 6 month h/o right shoulder pain
- Gradual worsening after a fall on right side
- Associated stiffness
- Pain at end of day not as bad as prior
- Difficulty dressing herself

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Case #4

- Physical Exam
  - AROM: FE 100, ER 30, AER 45, AIR 30
  - PROM nearly the same
  - Positive O'Briens
  - No instability
  - Motor exam normal

Case #4

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Case #4

- Any other studies?
- Diagnosis?

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Adhesive Capsulitis

- Common cause of pain and stiffness
- Posttraumatic
- Diabetic
- Stroke Pts
- Idiopathic
- Pain, stiffness, resolution phases
- Self limiting

Adhesive Capsulitis

- Conservative Management
  - Physical Therapy
  - NSAIDs vs. steroids
  - Cortisone injection
- Operative Management
  - Manipulation under anesthesia
  - Arthroscopic capsular release

Case #5

- 65yo RHD retired male presents with 6 month h/o right shoulder pain
- Localized deep and has associated stiffness as well as grinding sensation
- Pain at end of day
- Difficulty sleeping

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Case #5

- Physical Exam
  - AROM: FE 140, ER 30, AER 60, AIR 45
  - Moderate crepitance
  - Slight cogwheeling
  - No instability
  - Motor exam normal

Case #5

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Conservative Management

- NSAIDs
- Physical therapy
- Cortisone injections
- Activity modification

Case #6

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A chance to cut is a chance to cure.
The only way to heal is…

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A chance to cut is a chance to cure.
The only way to heal is…
Surgical steel!

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Surgical Options

- Arthroscopic debridement
- Meniscal Allograft
- Hemiarthroplasty
- “Ream and Run”
- Total Shoulder Arthroplasty

Arthroscopy

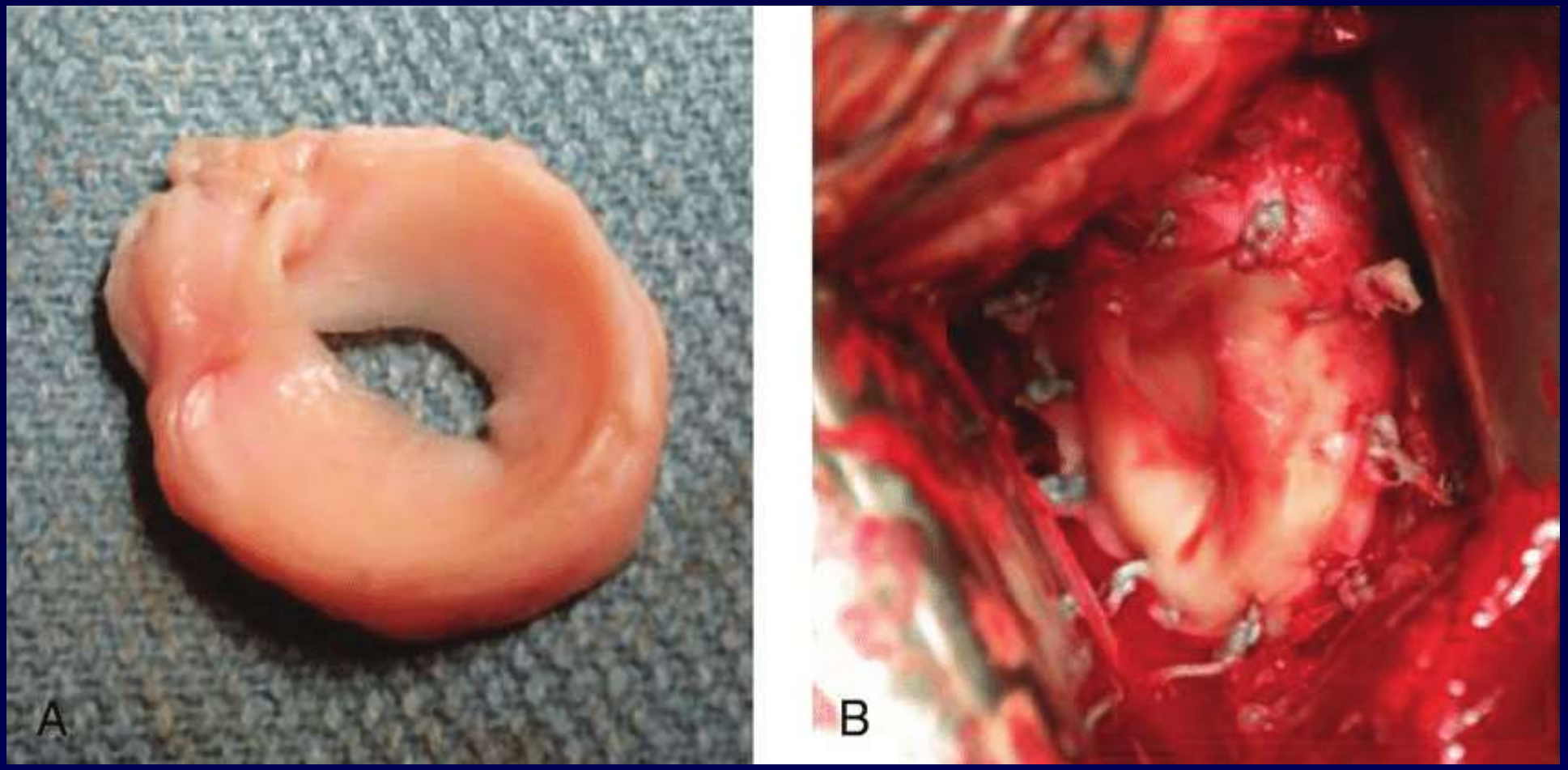
- Limited role in advanced DJD
- Loose body removal
- Debridement of osteophytes
- Short term relief
- Recurrent pain

Meniscal Allograft

- Technically challenging
- Less invasive than arthroplasty
- Partial pain relief
- Does not address humeral side unless combined with hemiarthroplasty

Ball et al. Tech Shoulder Elbow Surg, 2001.

Meniscal Allograft



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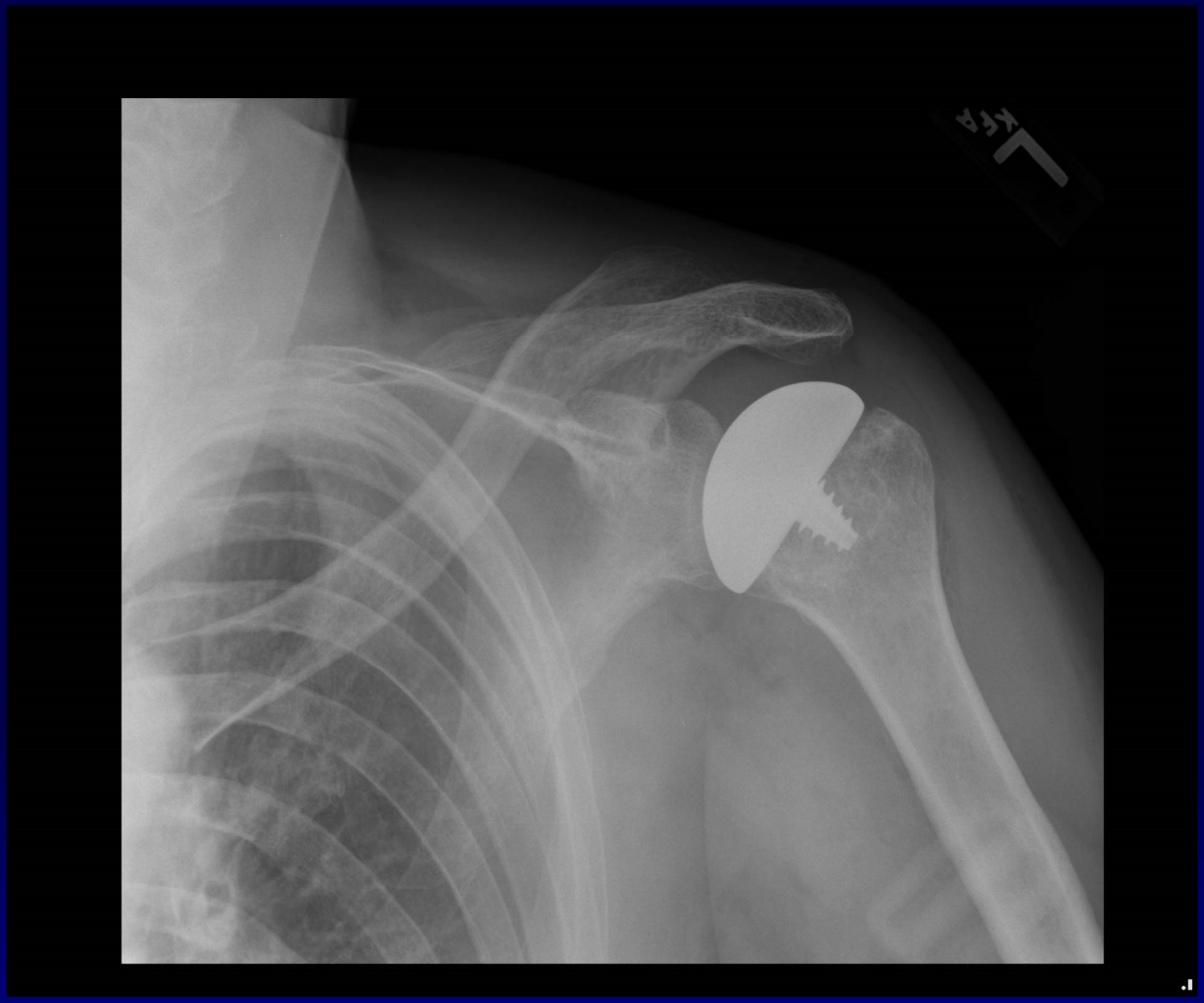
Hemiarthroplasty

- Resurface humeral side
- Easier, less invasive than TSA
- Lower complication rate
- Doesn't address glenoid side
- Higher reoperation rate vs. TSA

Aldinger et al. Int Orthop, 2010.

Hemiarthroplasty



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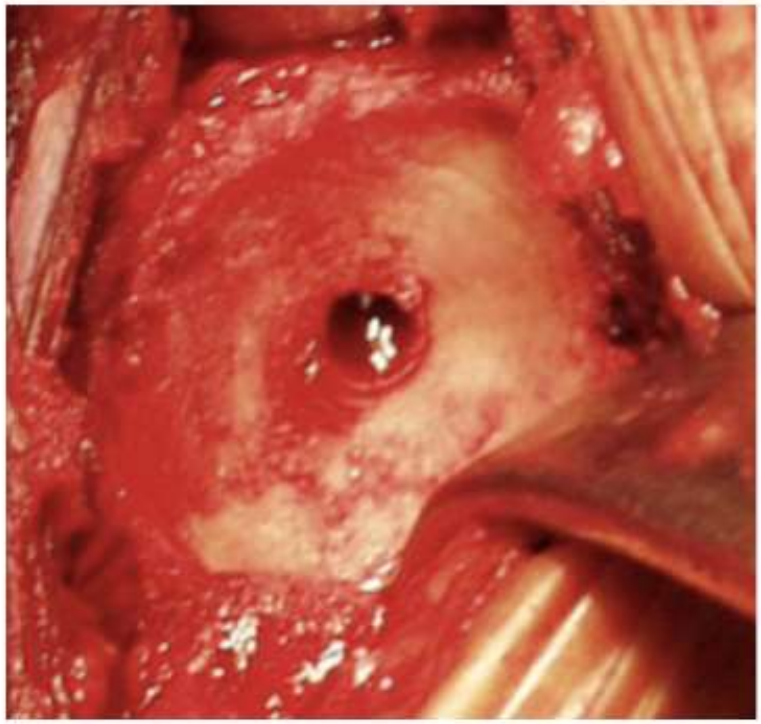
Ream and Run

- Hemiarthroplasty
- Ream glenoid to remove cartilage, spurs
- Creates smooth concavity
- Option for higher demand Pts

Matsen et al. Int Orthop, 2019

Ream and Run



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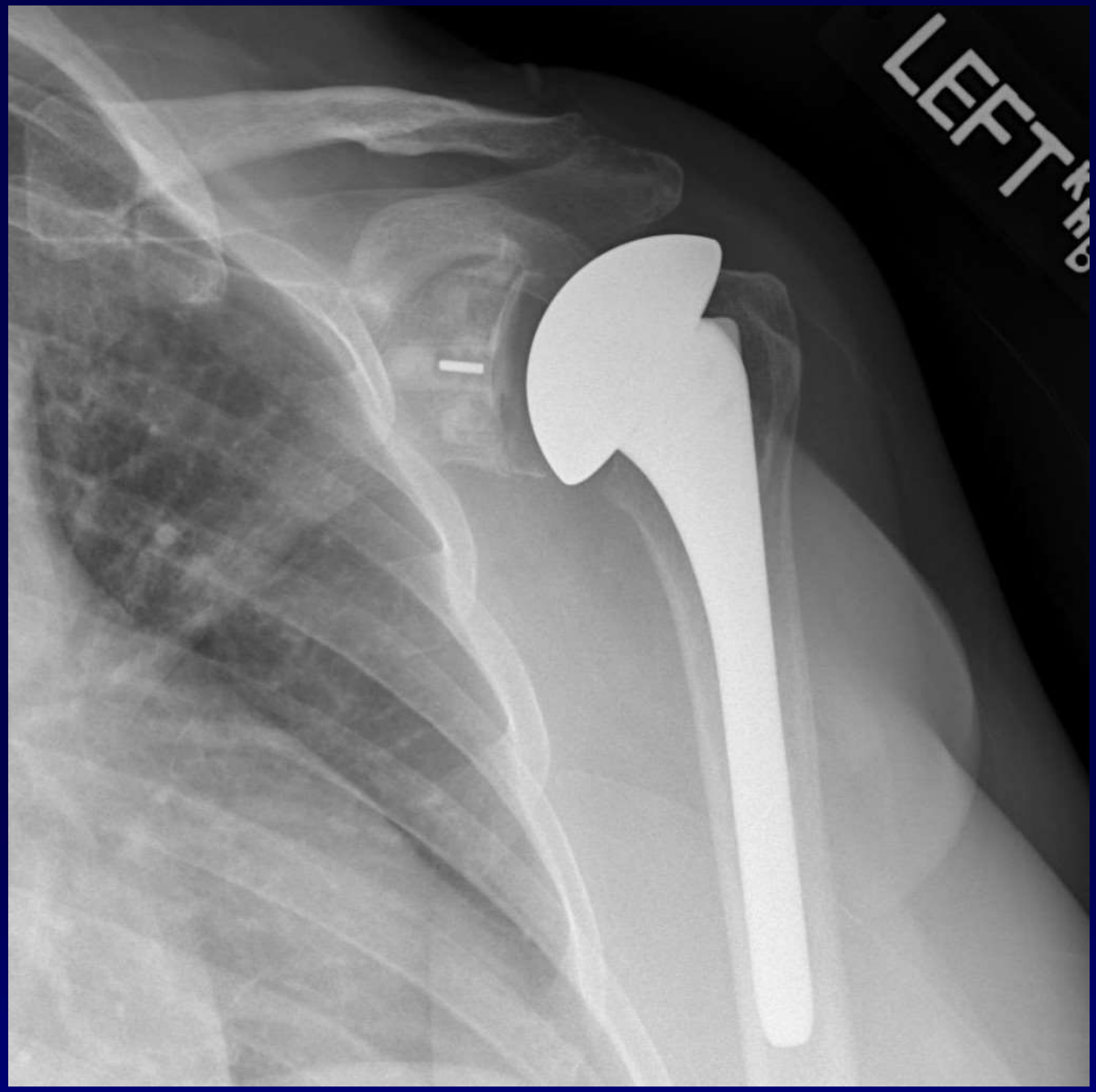
Total Shoulder Arthroplasty

- Remains gold standard for advanced DJD
- Best pain relief
- Glenoid loosening concerns

Total Shoulder Arthroplasty



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Take Home Points

- Recognize common shoulder injuries
- Formulate differential diagnoses
- Recommend initial treatment plans:
  - Immobilization
  - Pain Management
  - Imaging
  - Definitive treatment
  - Rehabilitation

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Questions?

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