



# **Best Practices in Shoulder Treatment**

**Chairperson: Suzanne Miller, MD**

**Tuesday, March 29<sup>th</sup>, 2022**

**8:05-8:55am**



# **The Evolution of the Reverse Shoulder Arthroplasty**

**Andrew Jawa, MD**

**Boston Sports and Shoulder  
Center**

**New England Baptist Hospital**

# Conflicts of Interest

## Research

- DJO Global

## Consultant/Speaker Bureau

- DJO Global
- Depuy-Synthes

## Designer

- Ignite Orthopedics
- Depuy-Synthes

## Royalties

- Depuy-Synthes
- Ignite Orthopaedics
- Oberd

## Ownership/Equity

- Boston Outpatient Surgical Suites
- Ignite Orthopedics

## Editorial Board

- Journal of Shoulder and Elbow Surgery

# Goals of the Talk

1. What are We Treating?
2. How Does the Modern Reverse Work?
3. How Did we Get Here?
4. Where are We Going?





# What are We Treating?

**2022**

**Work Related Injuries  
Workshop**

# **“Cuff Tear Arthropathy”**

Neer, et al. *JBJS* 1983

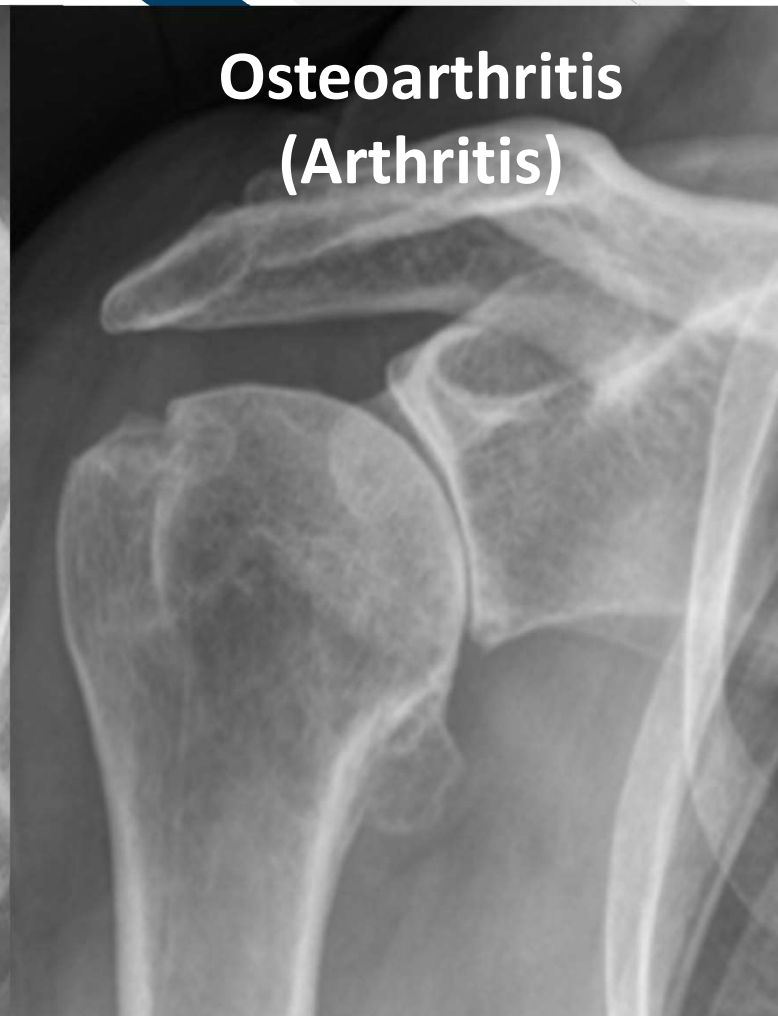


## **Rotator Cuff Tears Leading to Arthritis**



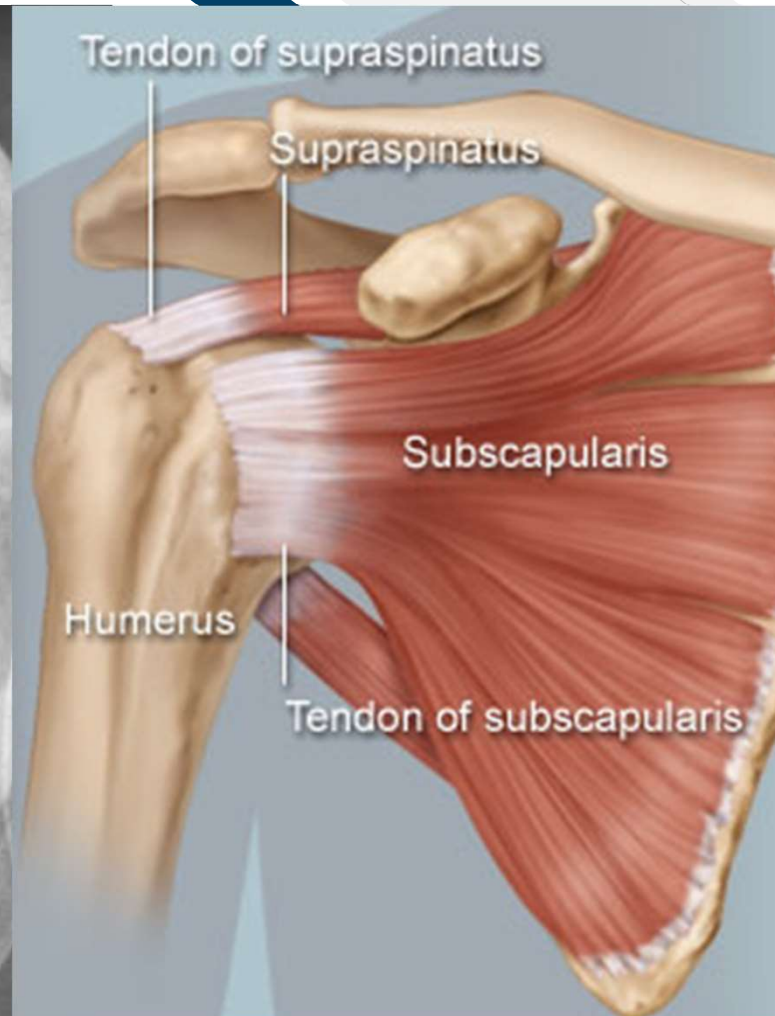
**2022**

**Work Related Injuries  
Workshop**

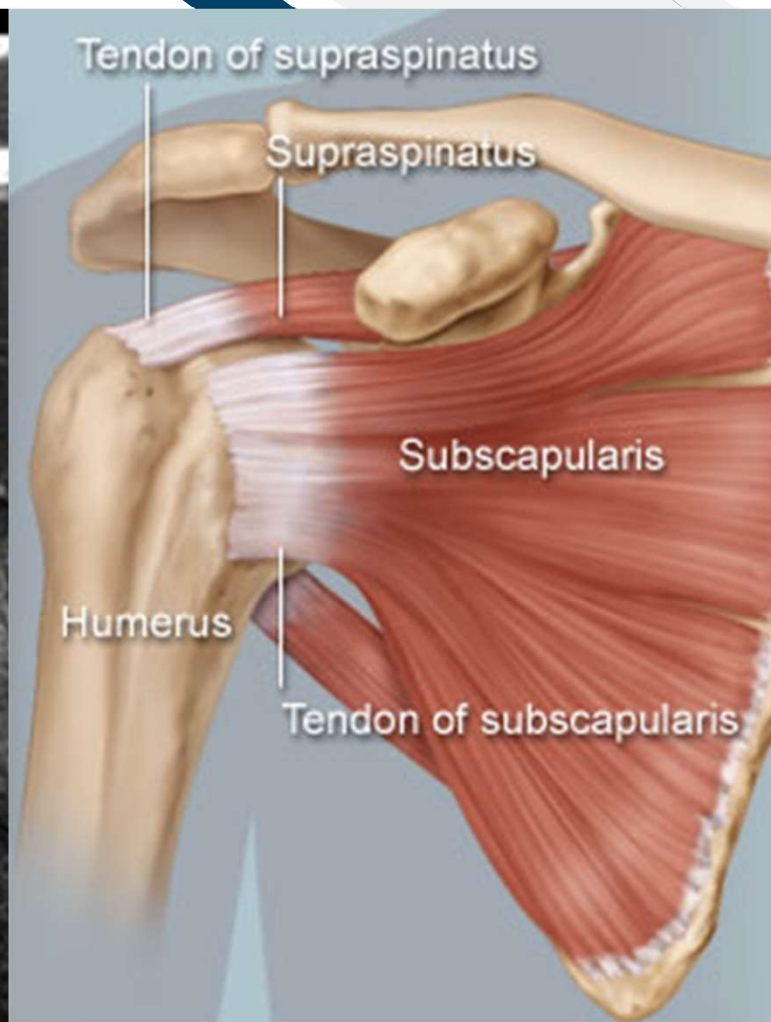


**2022**

x Related Injuries  
Workshop



## Normal Cuff



**2022**

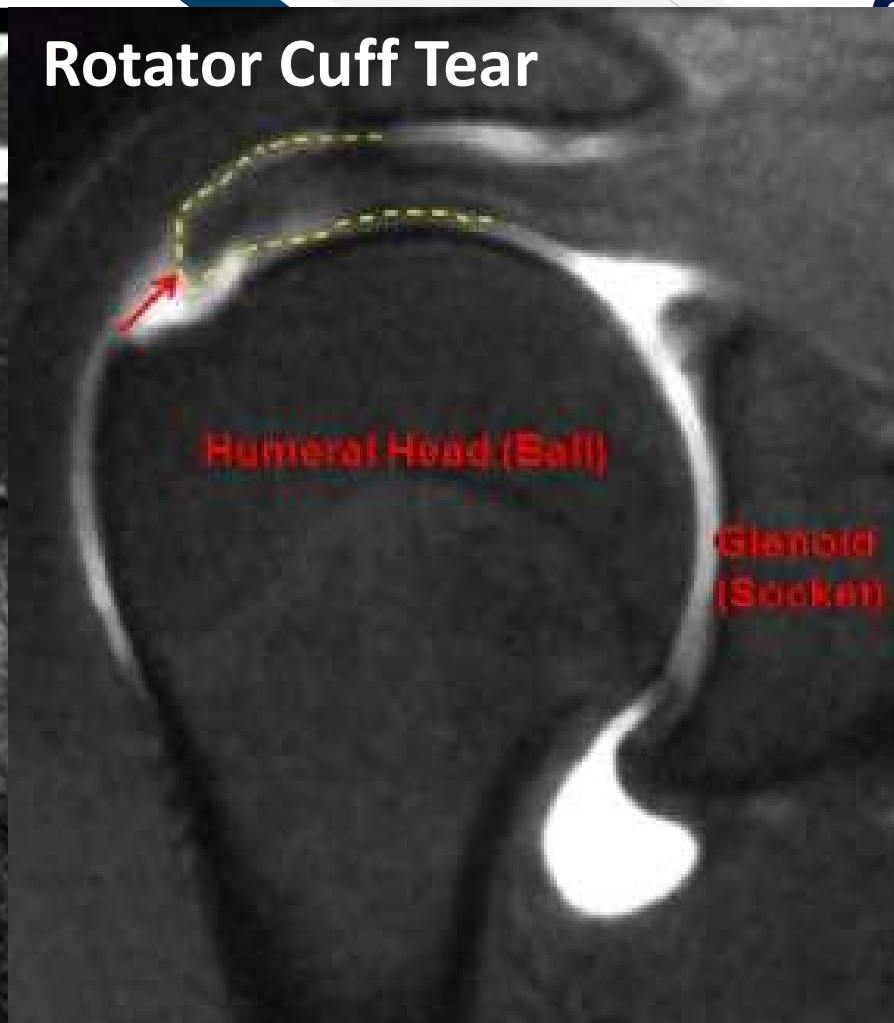
Work Related Injuries  
Workshop



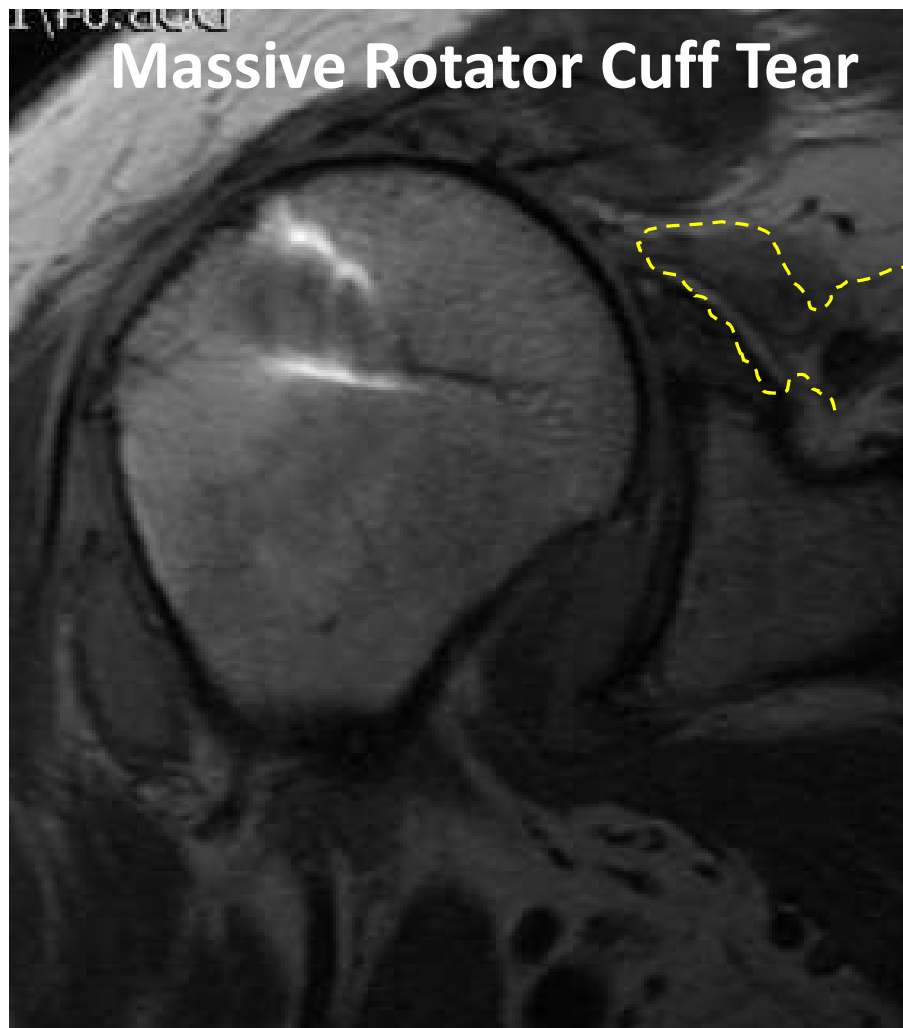
**Normal Cuff**



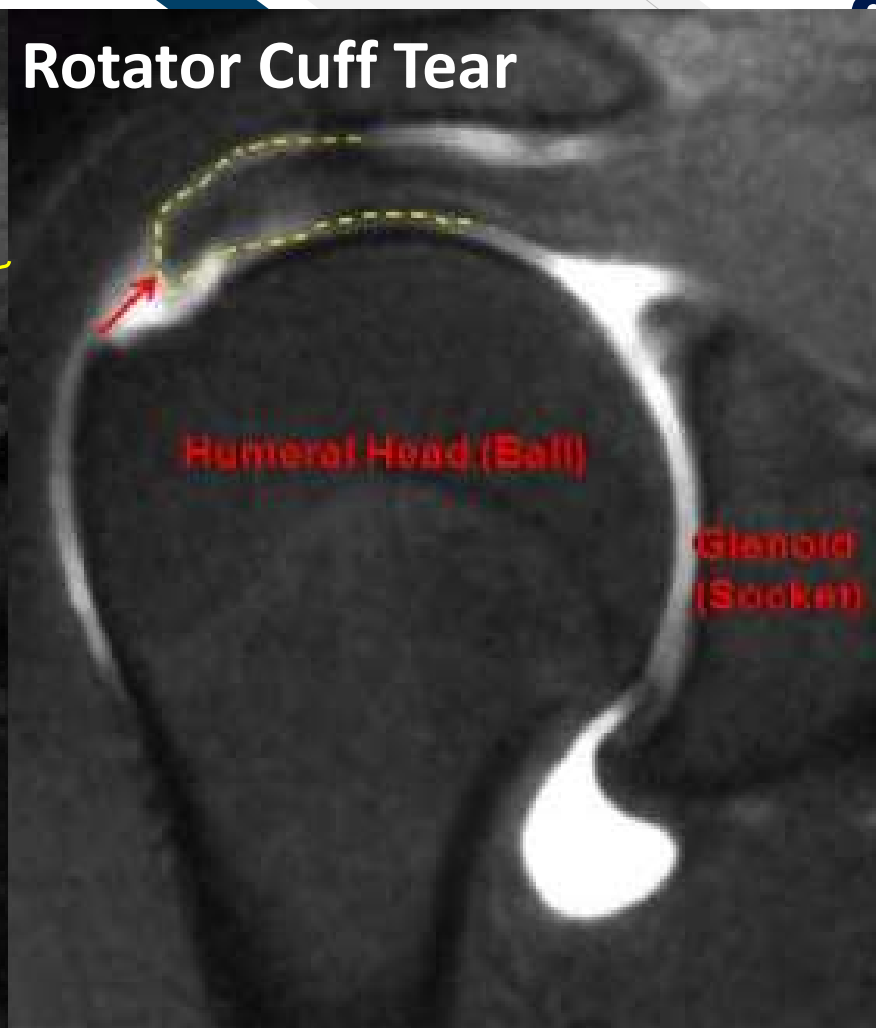
**Rotator Cuff Tear**



**Massive Rotator Cuff Tear**

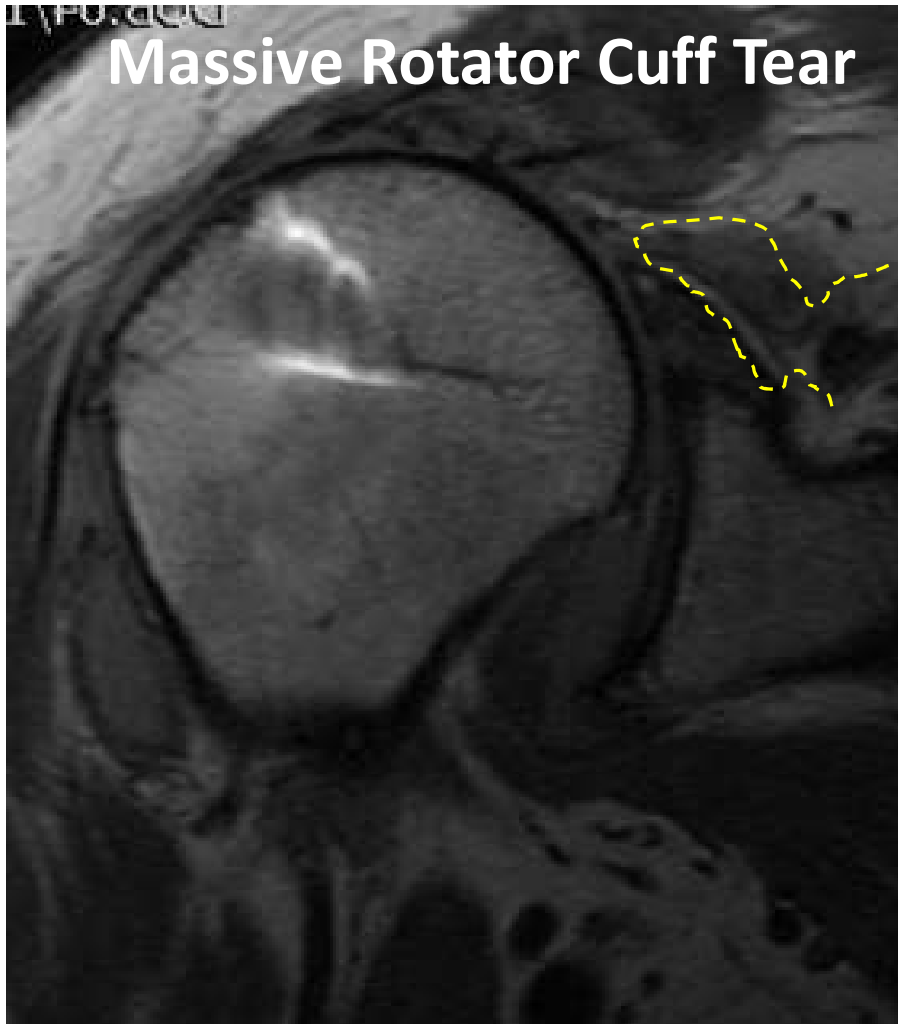


**Rotator Cuff Tear**





## Massive Rotator Cuff Tear



## Cuff Tear Arthropathy



R

Normal



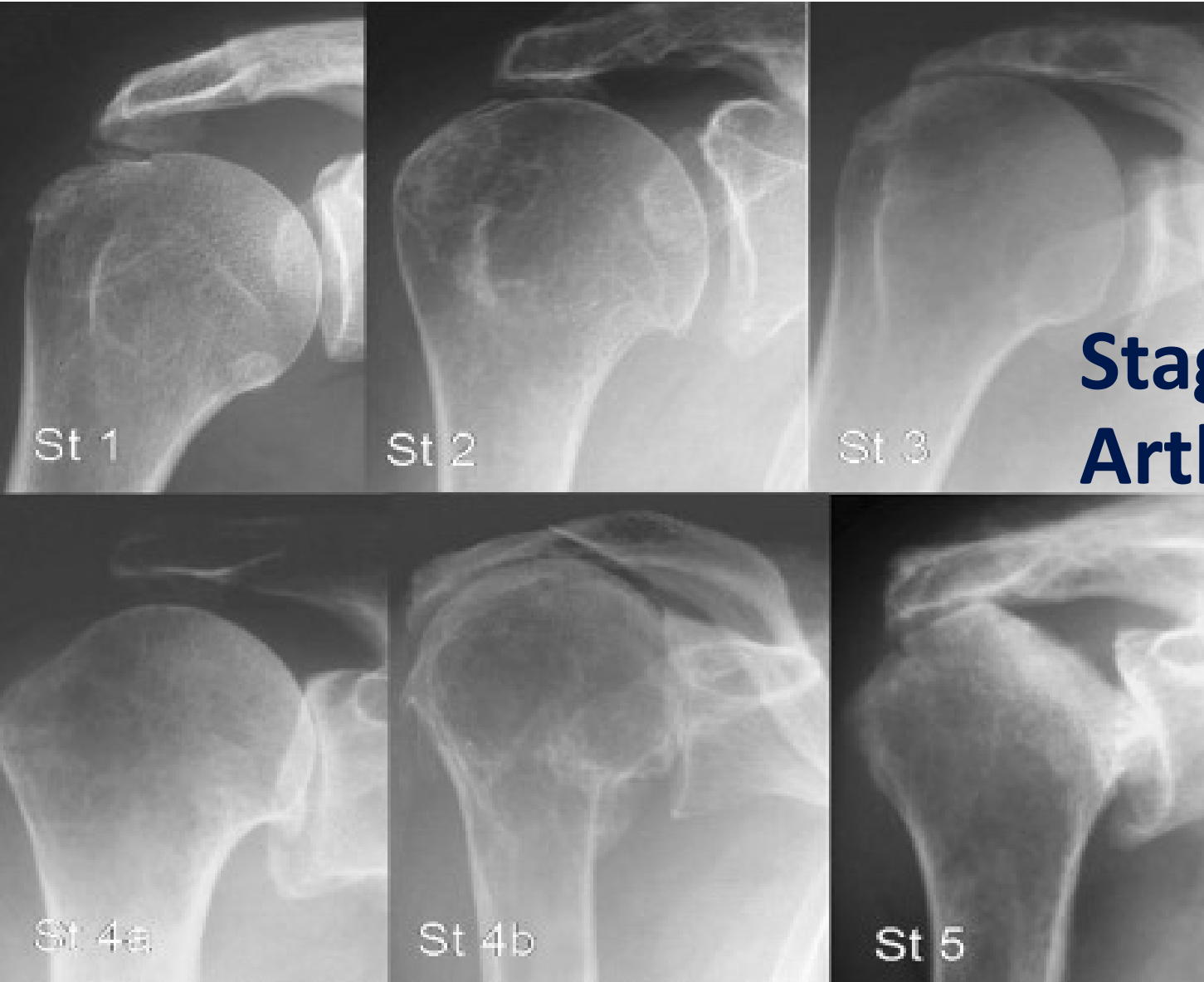
Cuff Tear Arthropathy  
(CTA)



**2022**

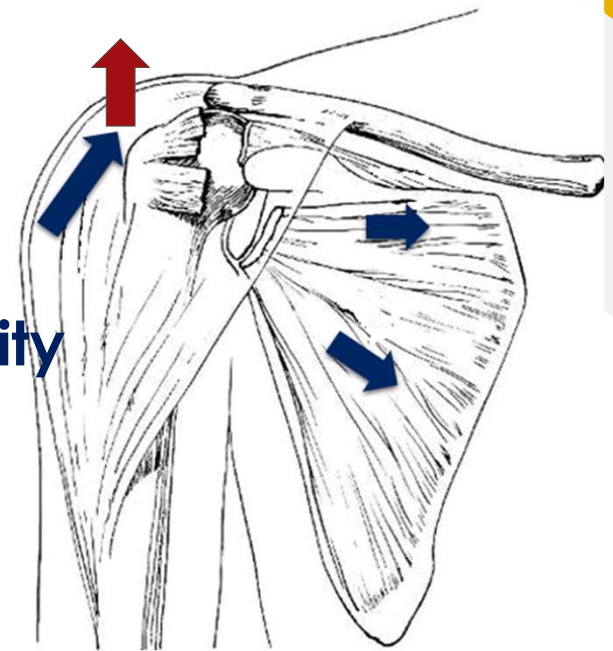
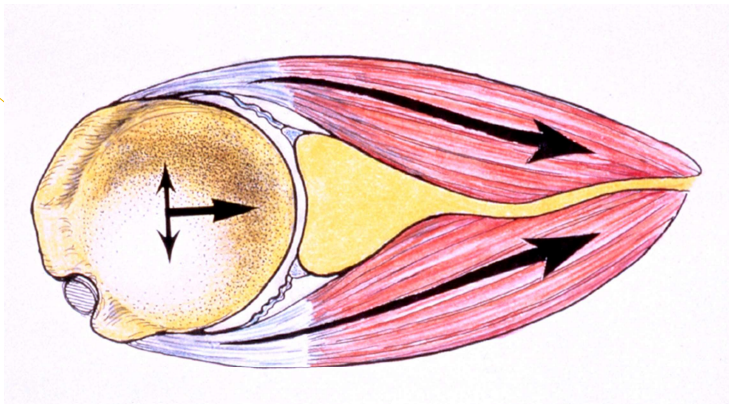
**Work Related Injuries  
Workshop**

# Stages of Cuff Tear Arthropathy



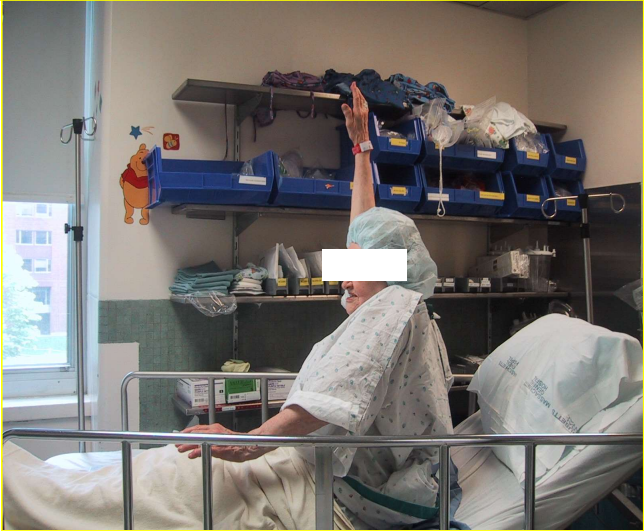
# Pathomechanics of Cuff Tear Arthropathy

1. Rotator Cuff Tearing
2. Humerus Migrates
3. Arthritis Changes
4. Loss of Fixed Fulcrum/Compression Concavity



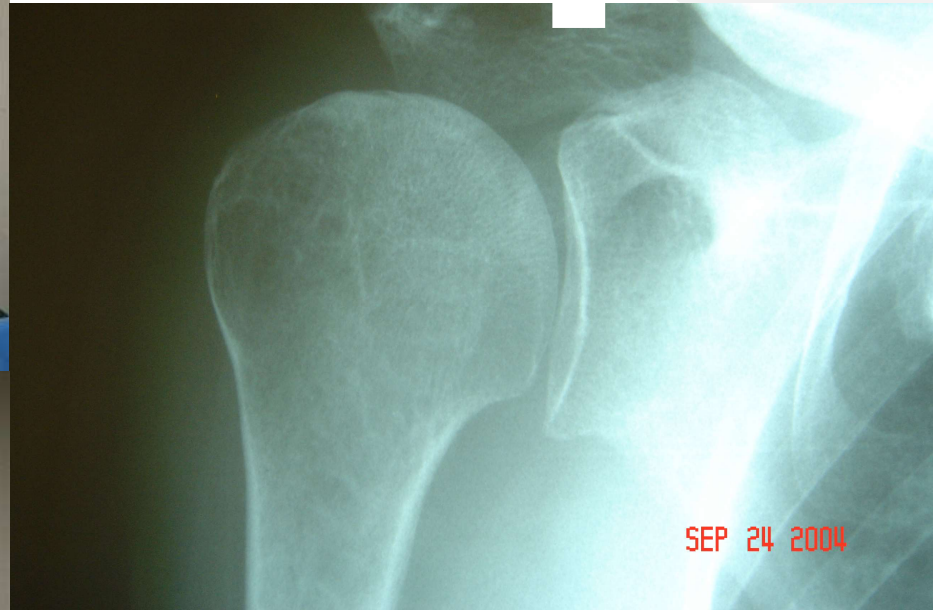
Neer, et al. JBJS 1983



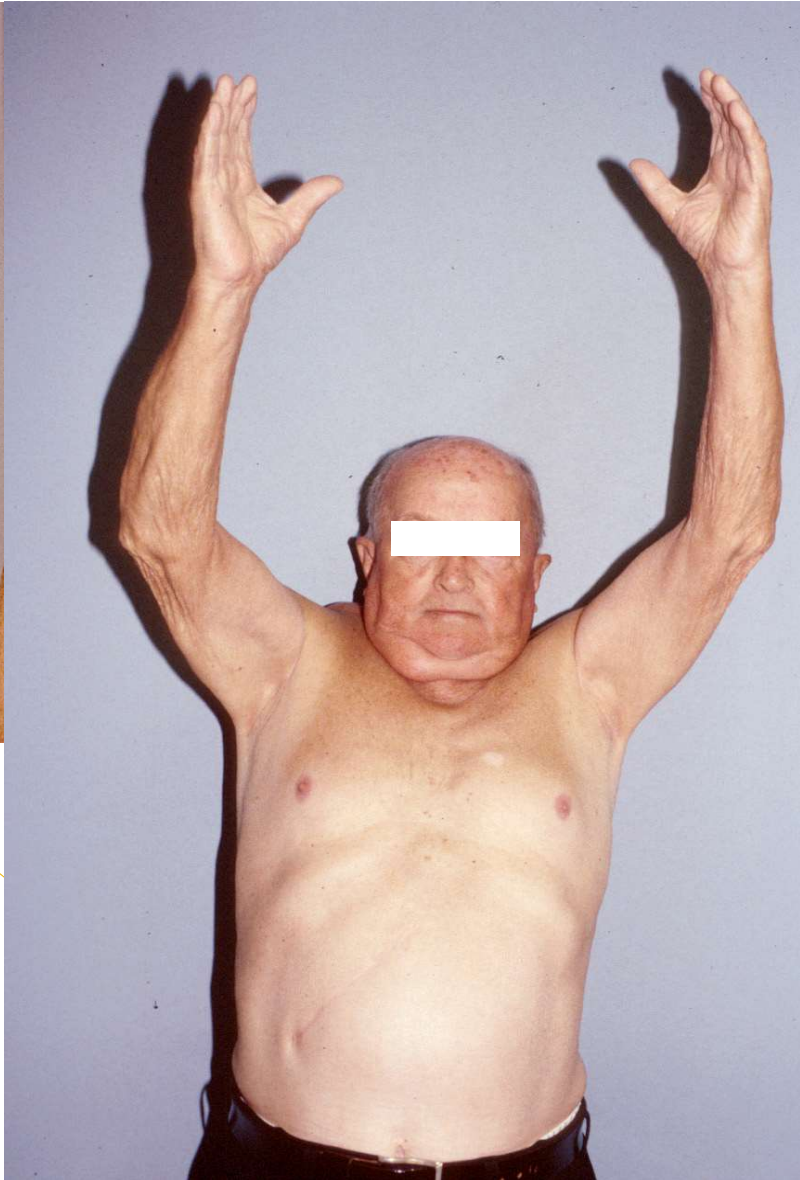


**2022**

**Work Related Injuries  
Workshop**









# How Do Replacements Solve These Problems?



**Osteoarthritis  
(Arthritis)**



**Anatomic  
(TSA)**

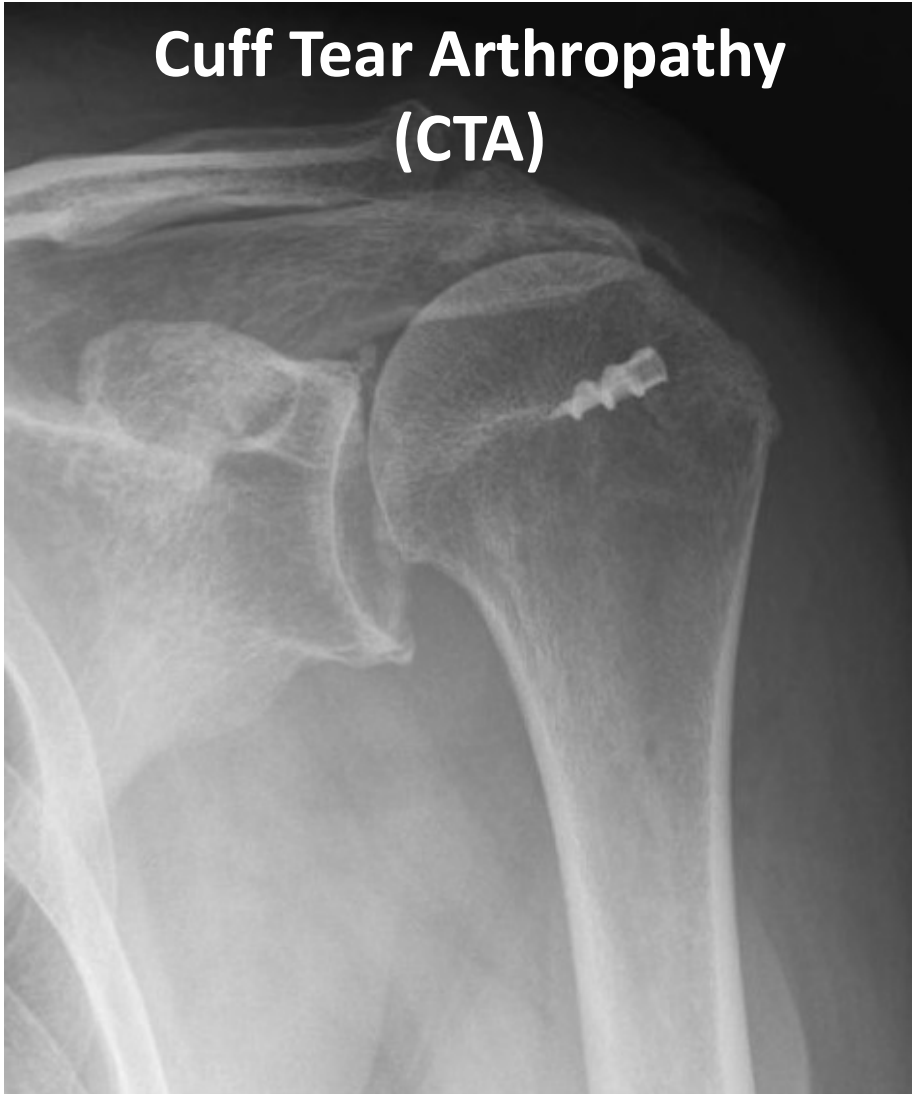


**2022**

**Work Related Injuries  
Workshop**



**Cuff Tear Arthropathy  
(CTA)**



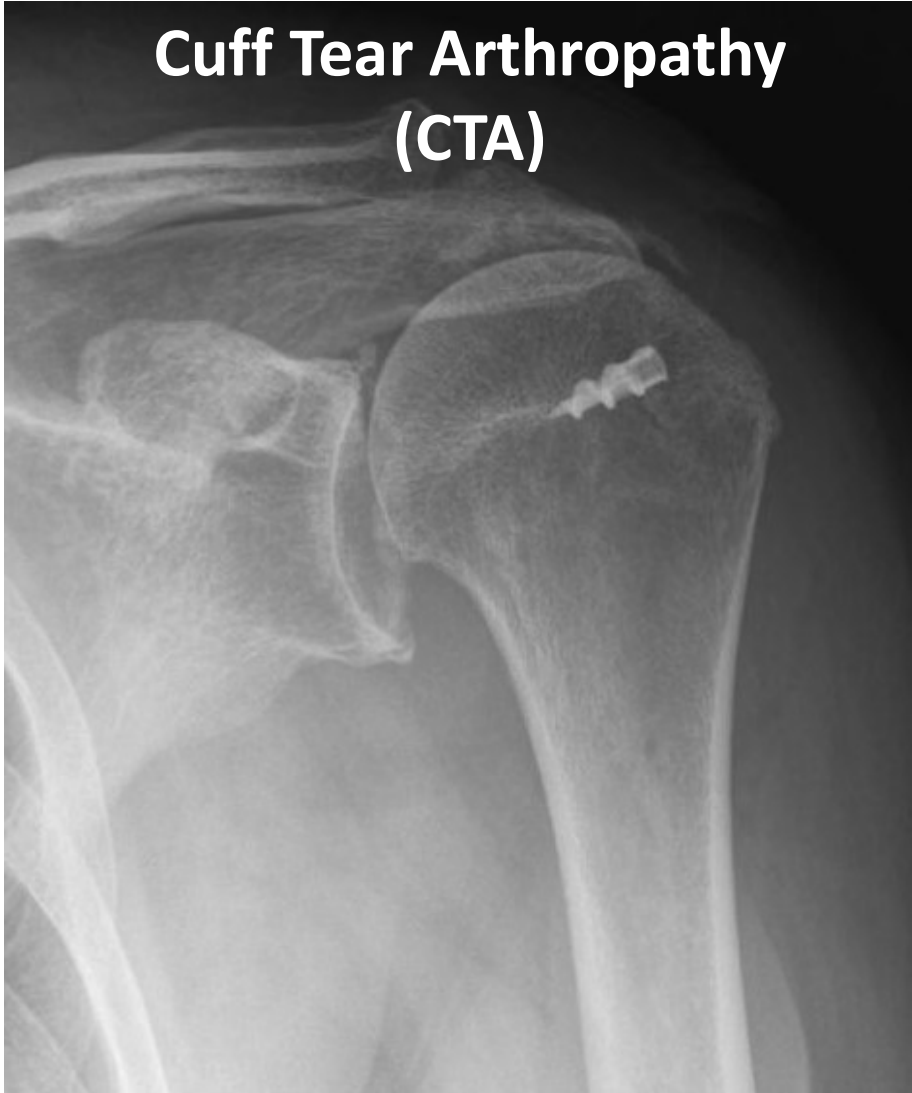
**Anatomic  
(TSA)**



**2022**

**Work Related Injuries  
Workshop**

**Cuff Tear Arthropathy  
(CTA)**



**Reverse  
(RSA)**



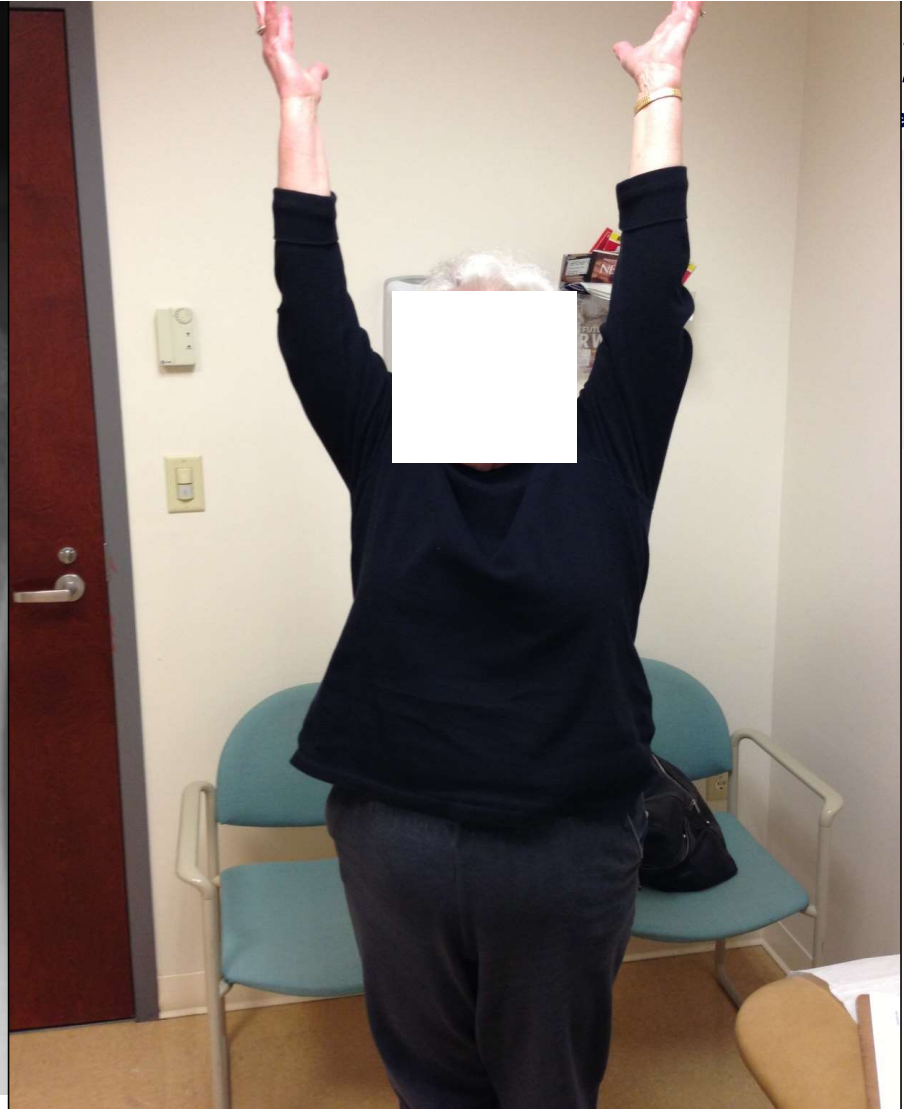
**2022**

**Work Related Injuries  
Workshop**



**2022**  
**Work Related Injuries**  
**Workshop**



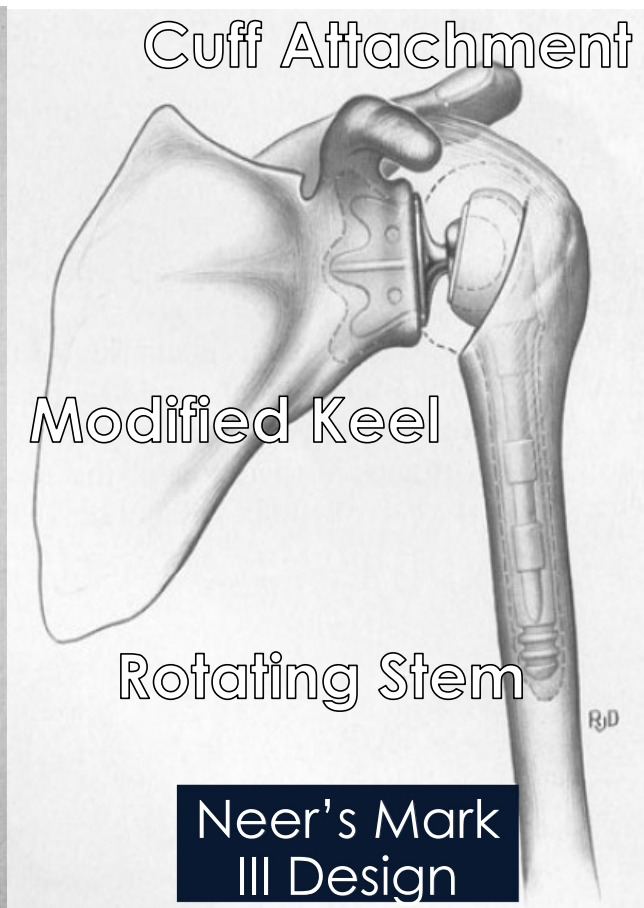
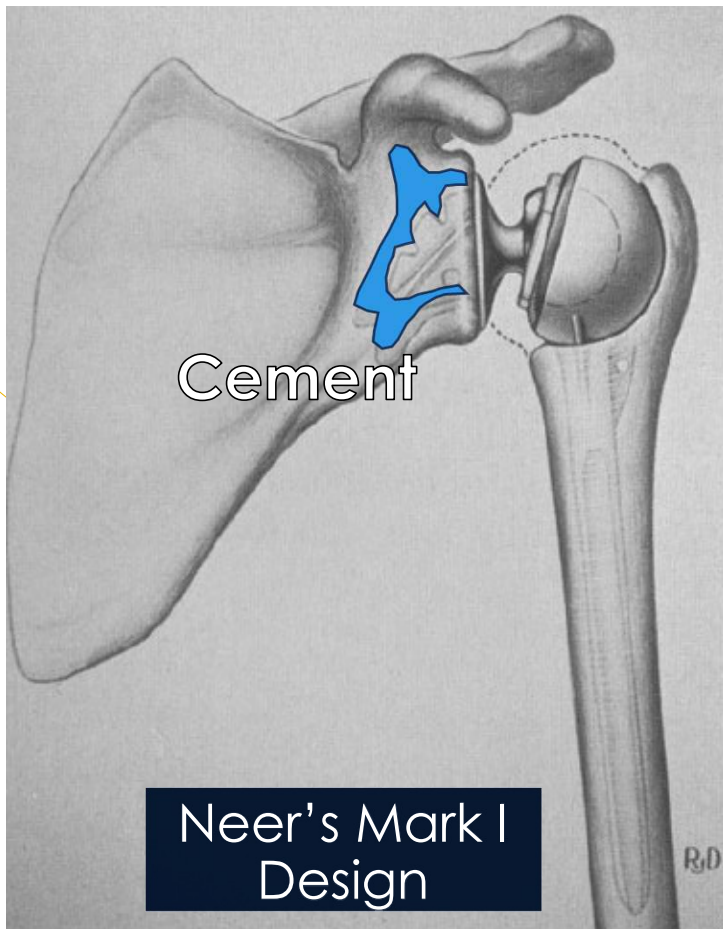




# How Did We Get Here?

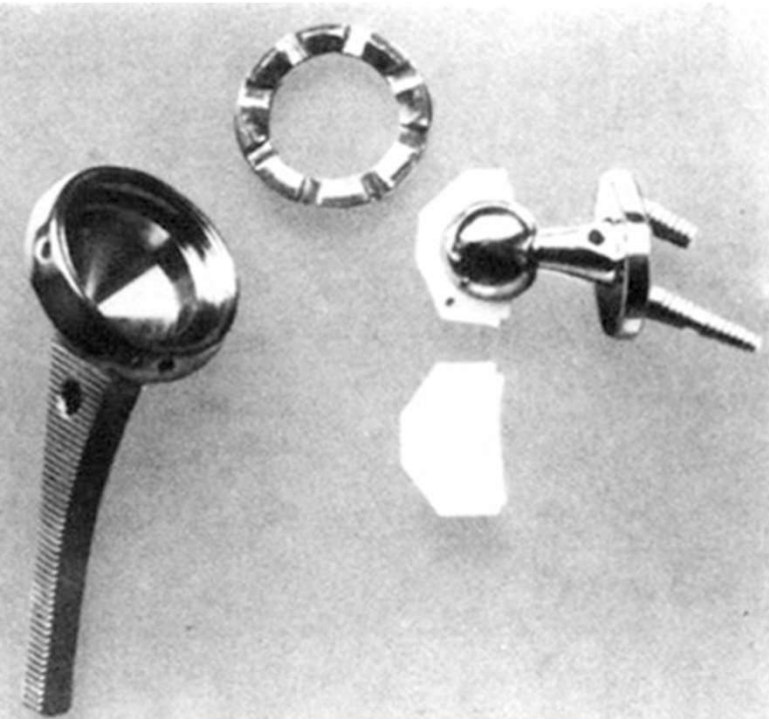
# 1970s: Origins of Reverse Shoulder

- Loosening
- Dislocations
- Abandoned by Neer





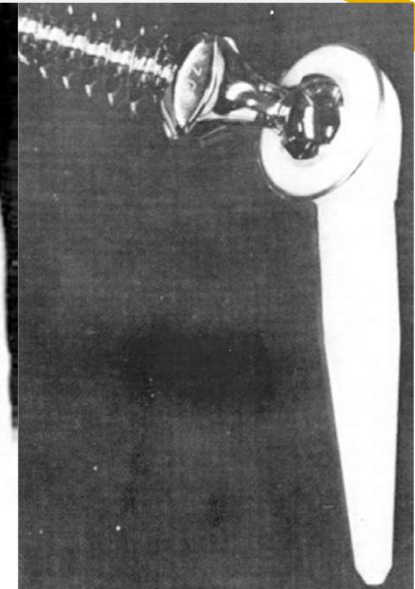
# Origins of Reverse Shoulder



Leeds/Reeves

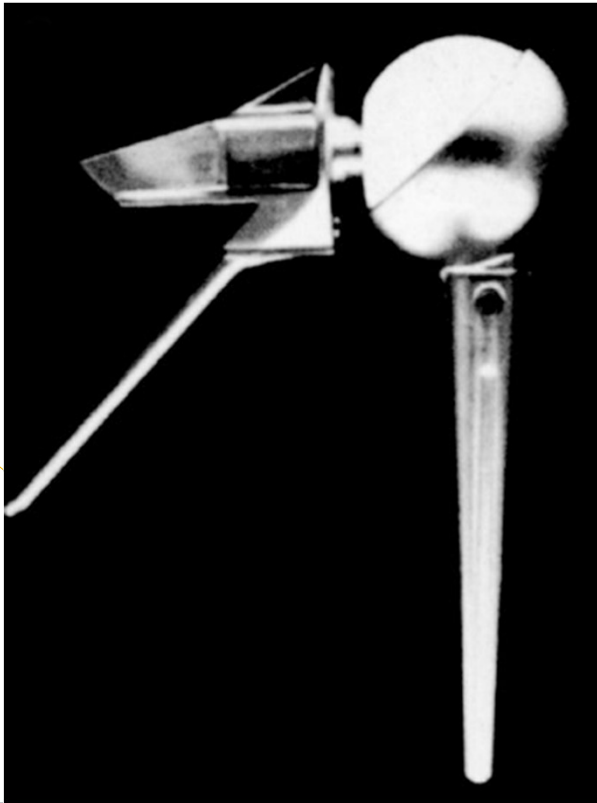


Kolbel and  
Friedebold '72

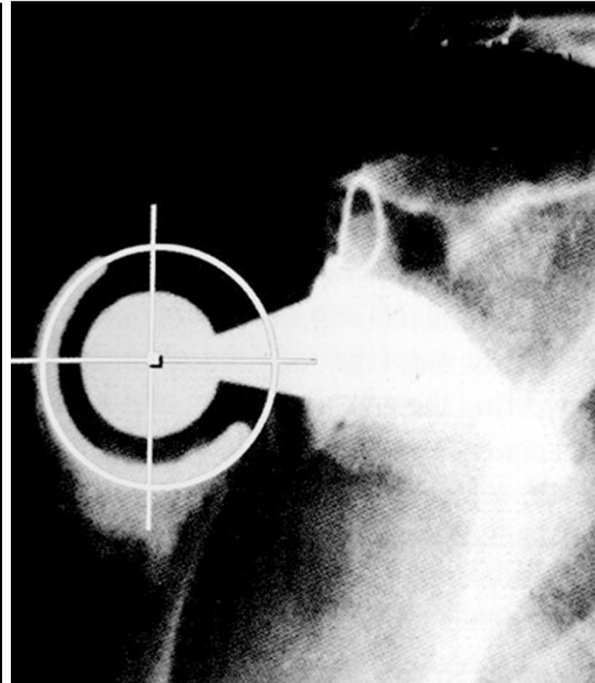


Kessell '73

# 1970s: Origins of Reverse Shoulder



Jefferson Prosthesis of  
Fenlin



The Liverpool  
Prosthesis

- All Showed Some Early Success
- All Loosened

Copyright 1982 by The Journal of Bone and Joint Surgery, Incorporated

## Recent Experience in Total Shoulder Replacement\*

BY CHARLES S. NEER, II, M.D.<sup>†</sup>, KEITH C. WATSON, M.D.<sup>‡</sup>, AND  
F. JOANN STANTON<sup>†</sup>, NEW YORK, N.Y.

*From the New York Orthopaedic Hospital, Columbia-Presbyterian Medical Center, New York City*

**2022**

**Work Related Injuries  
Workshop**

# "Limited goal rehabilitation"

- **Modify Pain**
- **Limited Function**



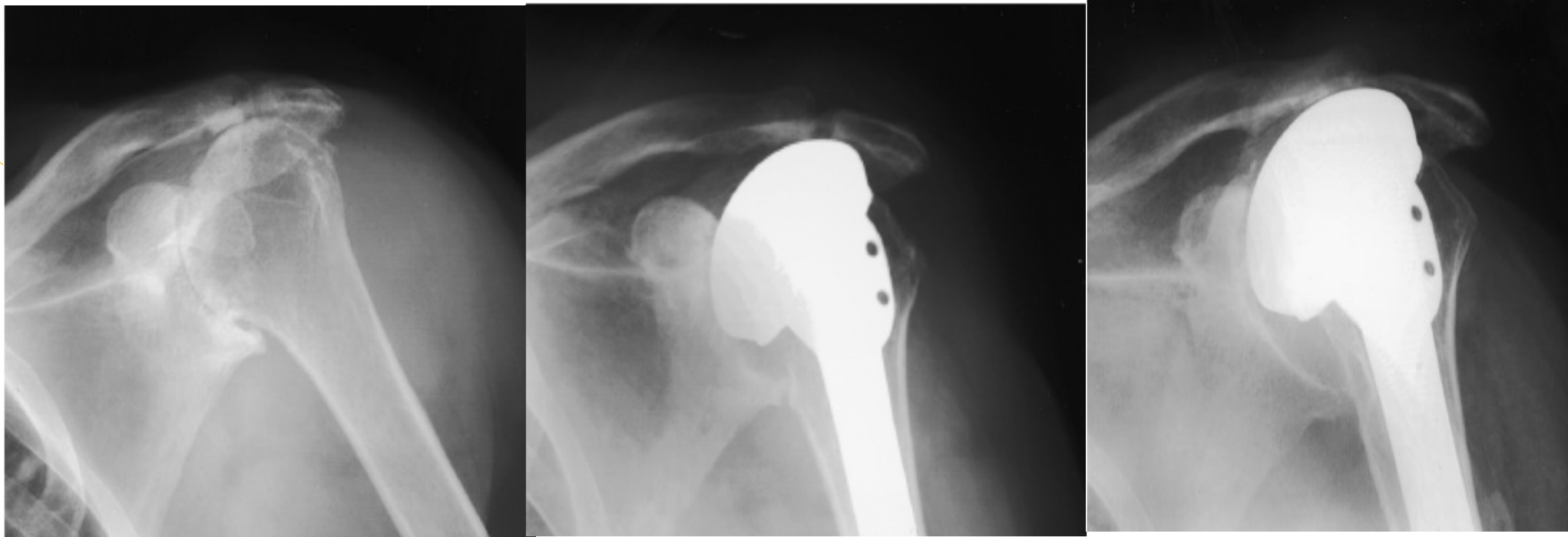
# SHOULDER HEMIARTHROPLASTY FOR GLENOHUMERAL ARTHRITIS ASSOCIATED WITH SEVERE ROTATOR CUFF DEFICIENCY

BY JOAQUIN SANCHEZ-SOTELO, MD, PhD, ROBERT H. COFIELD, MD, AND CHARLES M. ROWLAND, MS

*Investigation performed at the Mayo Clinic and Mayo Foundation, Rochester, Minnesota*

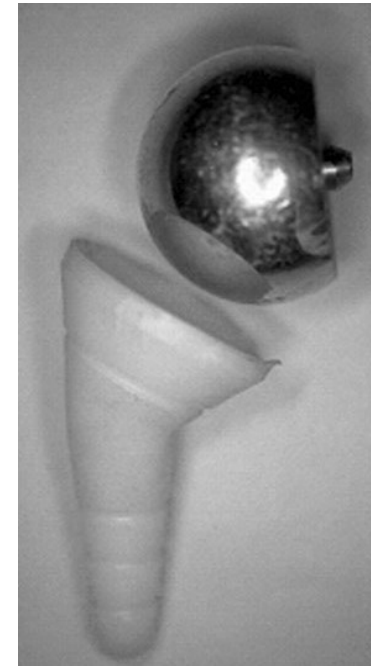
**2022**

**Work Related Injuries  
Workshop**



# 1985: Meanwhile in France...

- “Trompette” prosthesis
- 1987: Preliminary Report
  - Achieved improved ROM
  - Later, observed some loosening
- Made some design changes...

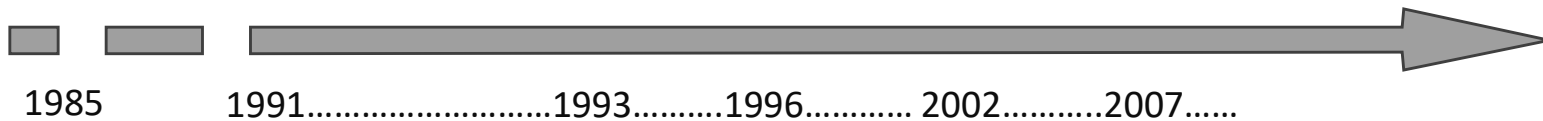


Paul Grammont

**2022**

**Work Related Injuries  
Workshop**

# Delta



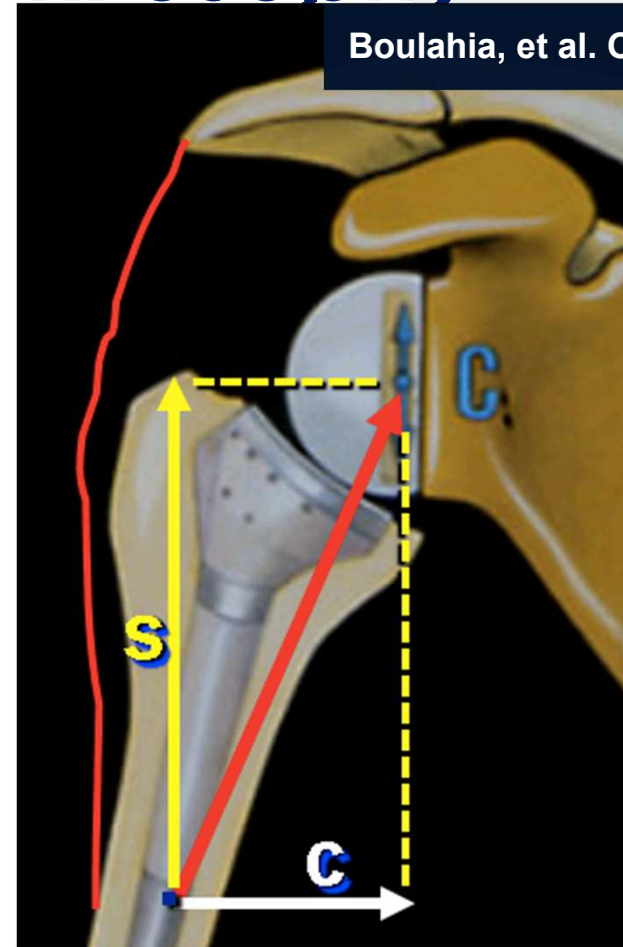
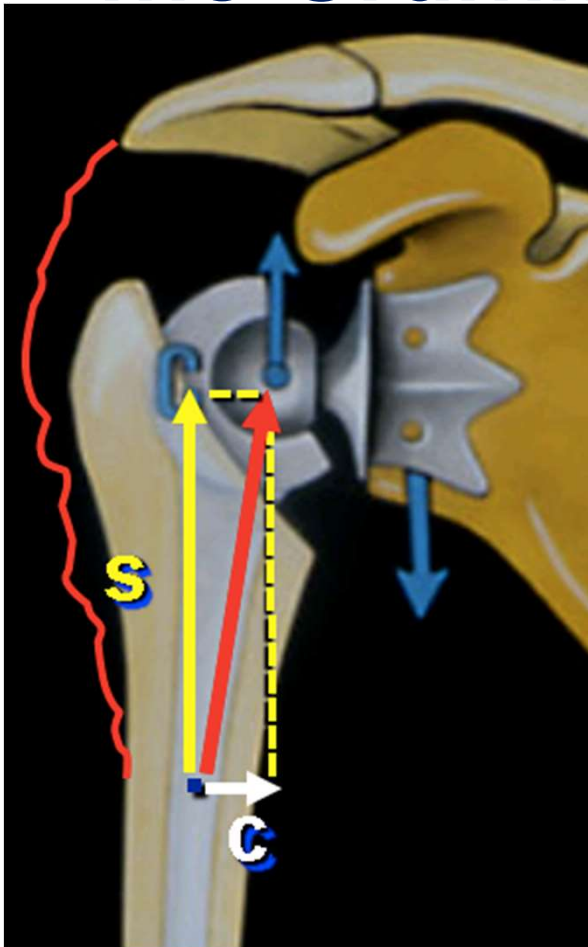


2022

Work Related Injuries  
Workshop

# The Grammont Philosophy

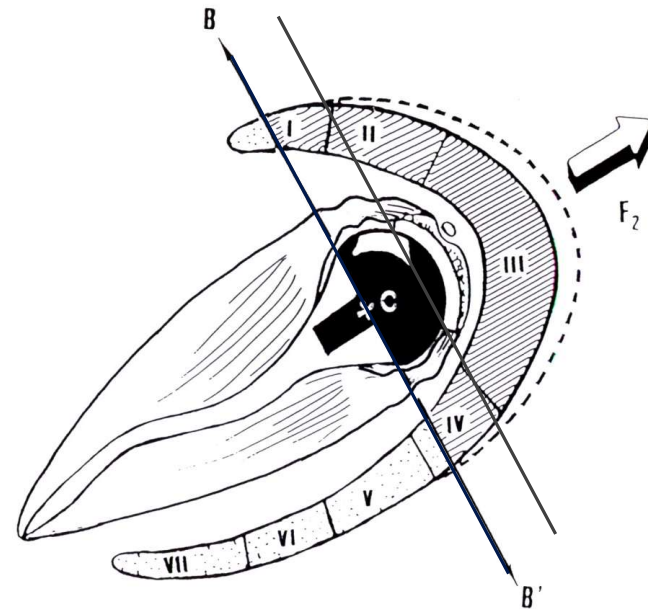
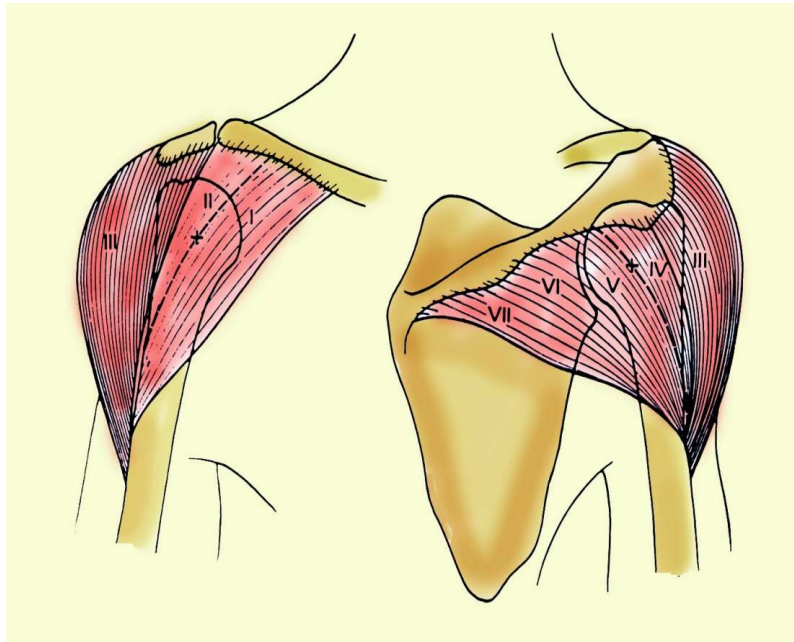
Boulaiah, et al. Orthopedics 2002



**2022**

**Work Related Injuries  
Workshop**

# Muscular Strength







# Where Are Going?

# REVERSE TOTAL SHOULDER ARTHROPLASTY

SURVIVORSHIP ANALYSIS OF EIGHTY REPLACEMENTS  
FOLLOWED FOR FIVE TO TEN YEARS

BY JACQUES GUERY, MD, LUC FAVARD MD, FRANÇOIS SIRVEAUX, MD,  
DIDIER OUDET, MD, DANIEL MOLE, MD, AND GILLES WALCH, MD

*Investigation performed at Centre Hospitalier Régional Universitaire de Tours-Université François Rabelais, Tours, France*



**Conclusions:** Our findings indicate that the reverse total prosthesis should be reserved for the treatment of very disabling shoulder arthropathy with a massive rotator cuff rupture, and it should be used exclusively in patients over seventy years old with low functional demands.



**2022**

**Work Related Injuries  
Workshop**

# The Early Implants



**Tournier Aequalis  
(2004)**



**Zimmer TM  
(2005)**



**Exactech Equinox  
(2007)**



**DePuy Delta  
(2003)**



**Encore Reverse  
(2005)**



**Zimmer Anatomical  
(2006)**



**S&N Promos  
(2008)**

**2022**

**Work Related Injuries  
Workshop**

# Reverse Shoulder Prosthesis Timeline

**DePuy Delta  
Xtend  
(2009)**



**Stryker ReUnion  
(2013)**



**Duocentric  
(2014)**



**DJO AltiVate  
(2015)**



**Biomet  
Comprehensive  
Reverse Shoulder  
(2008)**



**Lima SMR  
(2011)**



**Tornier Ascend  
(2011)**



**Arthrex Universe  
(2013)**

**Integra Titan  
(2016)**



**2022**

Work Related Injuries  
Workshop

# Reverse Shoulder Prosthesis Timeline

Link Embrace  
2021



Depuy  
Inhance  
2021



Medacta  
Eccentric  
2021

Catalyst  
R1  
(2021)



Shoulder  
Innovations  
Inset Reverse  
(2021)



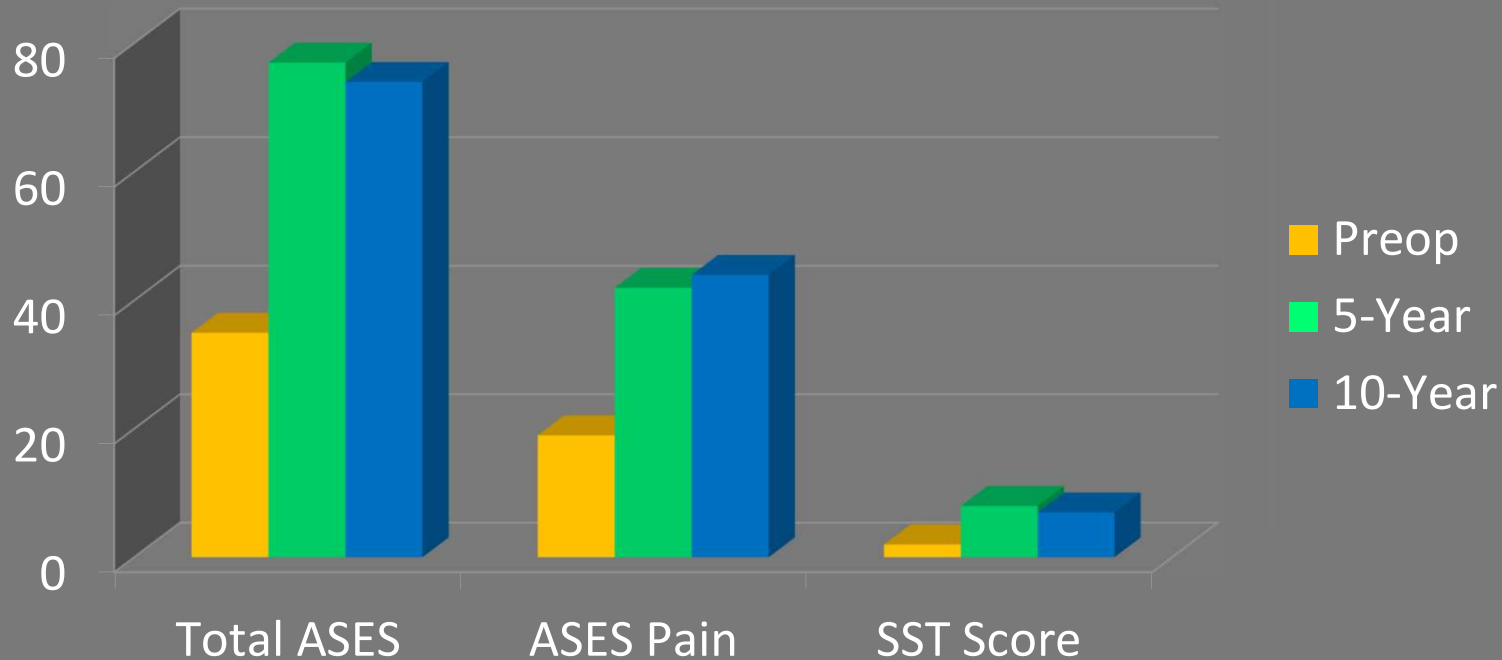
Arthrosurface  
Ovomotion  
2021



2022

Work Related Injuries  
Workshop

## Scores



- Maintained Scores

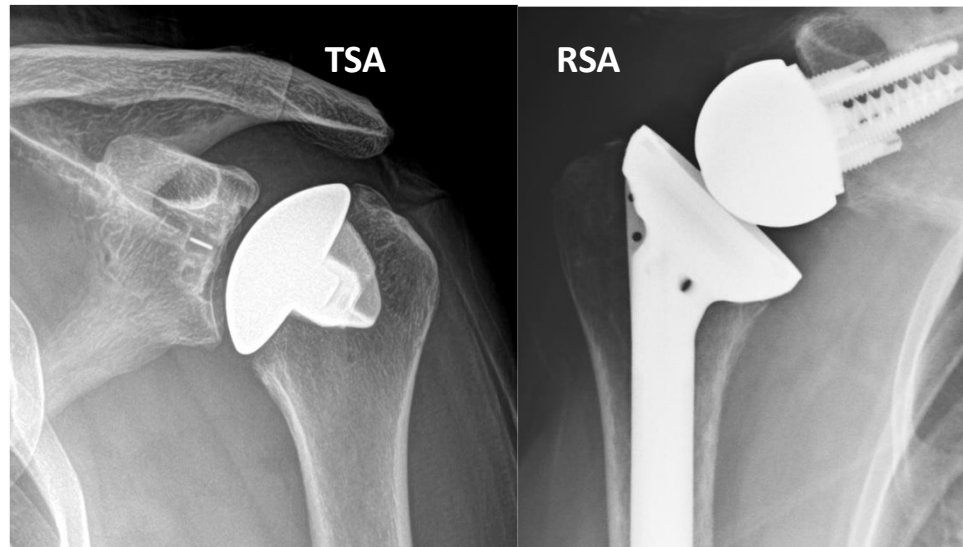
Cuff et al. *JBJS* 2017



## Comparison of complication types and rates associated with anatomic and reverse total shoulder arthroplasty

Stephen A. Parada, MD<sup>a,\*</sup>, Pierre-Henri Flurin, MD<sup>b</sup>, Thomas W. Wright, MD<sup>c</sup>,  
Joseph D. Zuckerman, MD<sup>d</sup>, Josie A. Elwell, PhD<sup>e</sup>, Christopher P. Roche, MSE, MBA<sup>e</sup>,  
Richard J. Friedman, MD, FRCSC<sup>f</sup>

Complications/Revisions      10.7%/5.6%      8.9%/2.5%



# Outcomes/Complications Differ by Diagnosis

- 
- 76.8
  - 3.2%
  - >

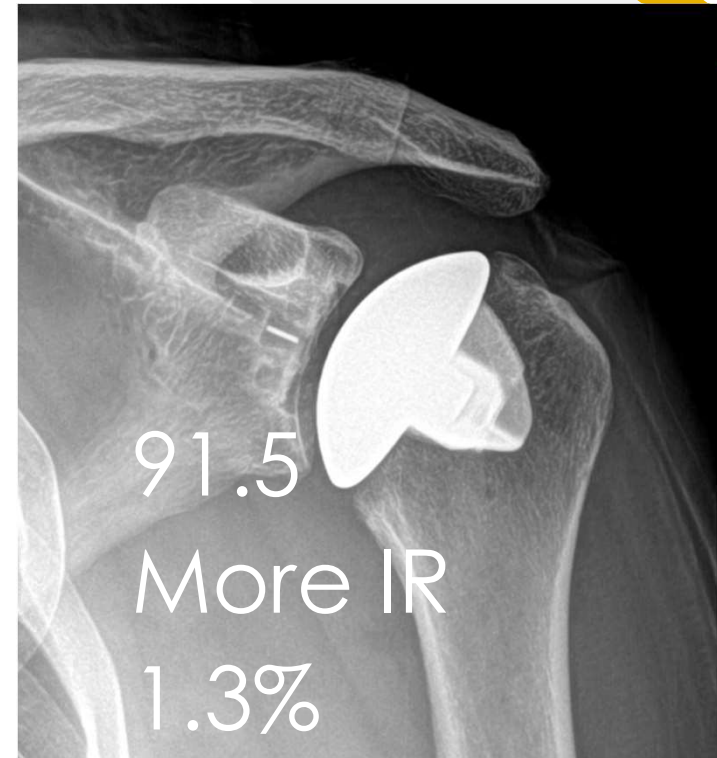
ASES Score  
Stress FX  
Instability

- 
- 86.4
  - 0.6%
  - <

Saini et al. *JAAOS* 2021

ASES Multicenter Research Group. *JSES* 2021

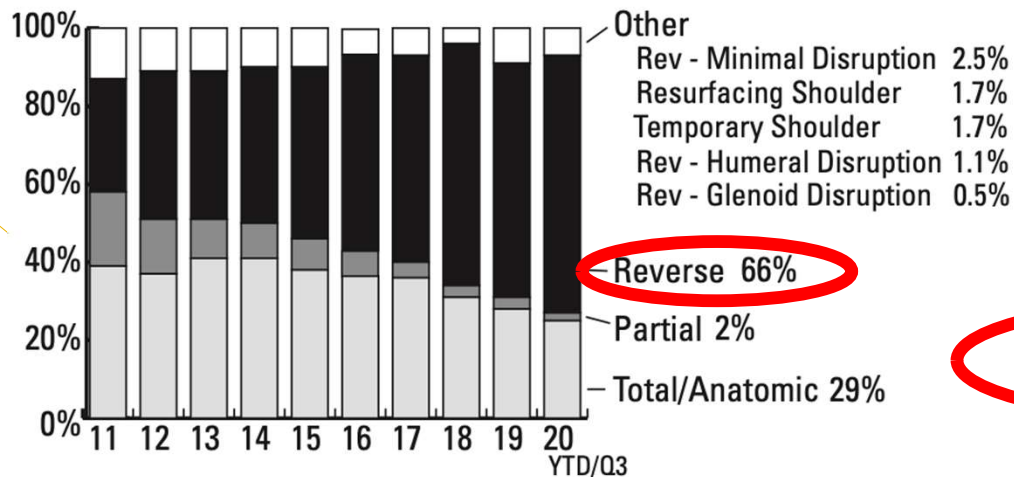
# RSA vs TSA for Arthritis



Kirsch et al. *JBJS Revisions*

# Reverses Outpace Anatomics

## Types of Shoulder Replacements, 2011 - 2020



Source: 2020-YTD/Q3 CRN

## Top 10 Hospitals with Medicare Shoulder Cases, 2018-2019

Institution	Year	Medicare Cases	Total Cases	Medicare Percent
1 Mayo Clinic Hospital Rochester, MN	18	443	718	62%
	19	443	761	58%
2 Hospital for Special Surgery New York, NY	18	393	672	58%
	19	403	697	58%
3 Barnes Jewish Hospital Saint Louis, MO	18	255	NA	NA
	19	273	NA	NA
4 New England Baptist Boston, MA	18	237	NA	NA
	19	254	NA	NA
5 Holy Cross Hospital Ft. Lauderdale, FL	18	213	328	65%
	19	223	355	63%

**2022**

**Work Related Injuries  
Workshop**

- No Idea is New
- RSA Use Initially Limited
- Now-Rapidly Changing Care
- Problems Still Ahead



The background features a light gray diagonal band crossing the frame from the top-left to the bottom-right. A dark blue parallelogram is positioned in the upper right area. A large yellow parallelogram is located in the lower left area. Several thin, light gray lines are scattered across the background, some parallel to the main diagonal band. The text "Thank You" is centered in the right half of the image.

**Thank You**



# What does the Shoulder Physical Examination Tell you about Treatment?

Suzanne L Miller MD

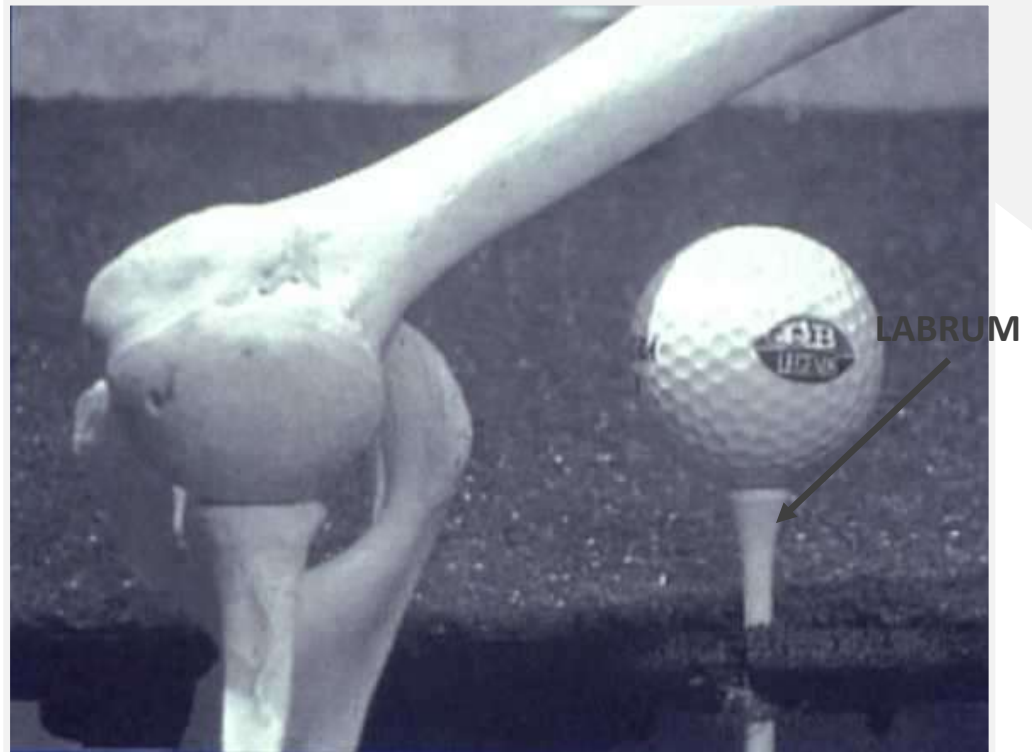
Boston Sports and Shoulder  
Center

April 30, 2022



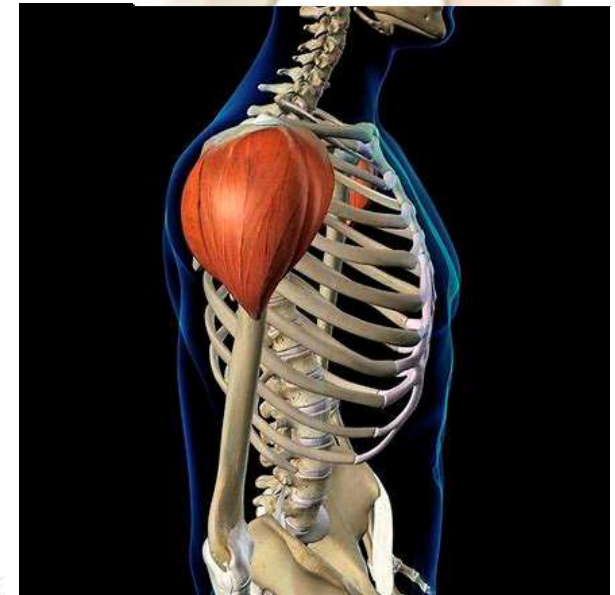
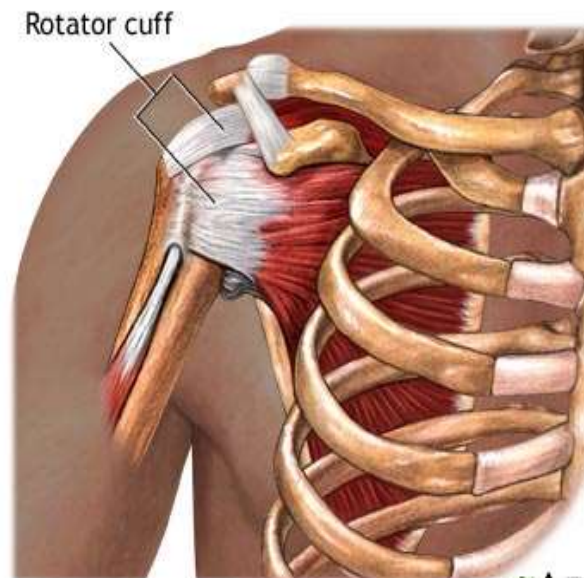
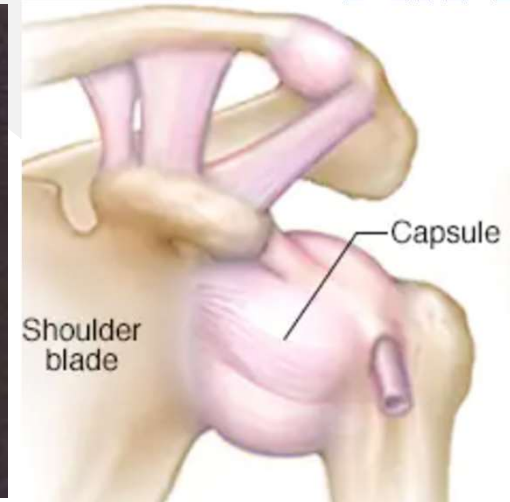
# Shoulder Anatomy

- Greatest global motion of any joint
- Prone to injury
- Glenoid is 1/3 width humerus
- Relies on soft tissue stability



# Shoulder Anatomy

- **Static Stabilizers**
  - Labrum
  - Ligaments
- **Dynamic Stabilizers**
  - Rotator Cuff
  - Deltoid

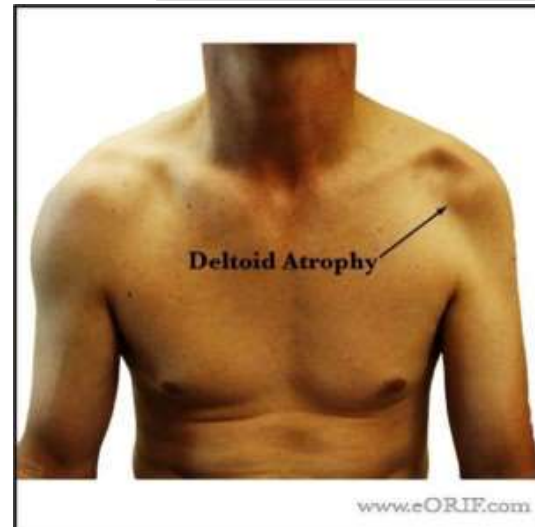


# Shoulder Physical Exam

- Visual Inspection
- Women should be in tank top/sports bra/gown open back
  - **Atrophy**
    - Nerve damage
    - Disuse
    - Tendon tear



Infraspinatus  
Atrophy



# Shoulder Physical Exam

- Look for old scars from prior surgery ?
- Look for deformity?
  - AC joint
  - Pec Major tears

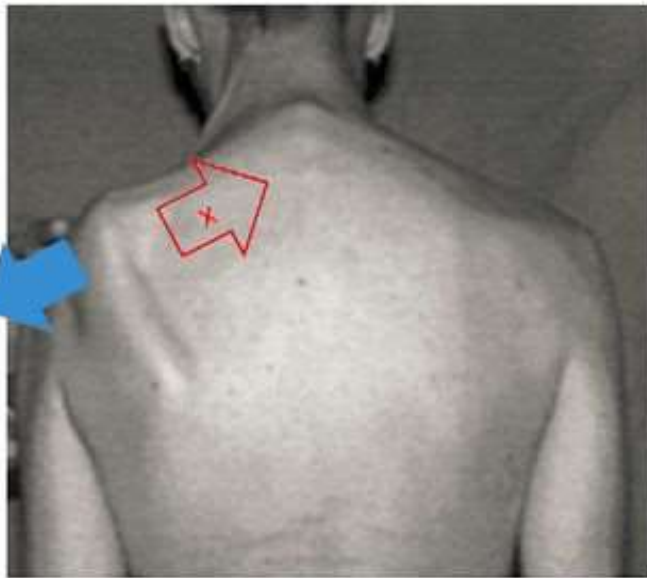




# Shoulder Physical Exam

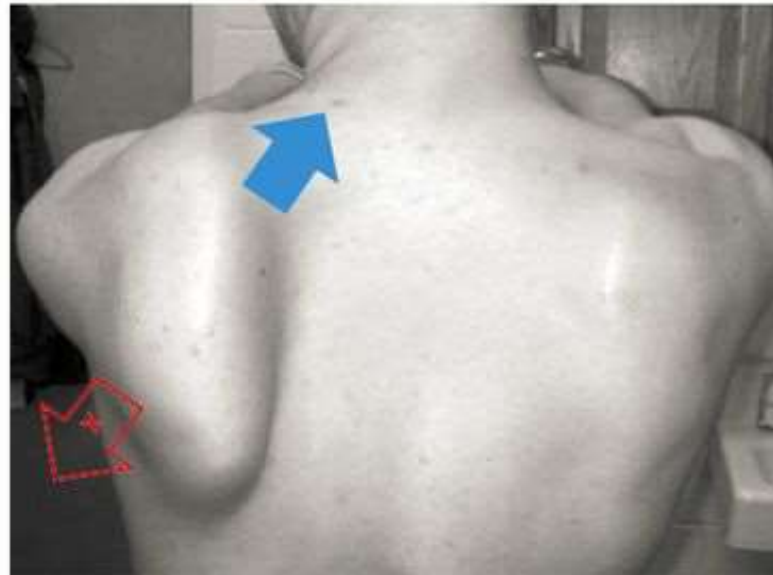
- Visual inspection for scapula winging?

Lateral Scapular Winging



Absent pull of trapezius due to  
Spinal Accessory Nerve palsy

Medial Scapular Winging

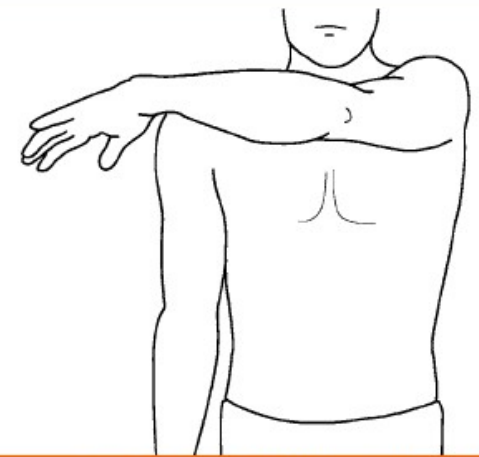


Absent pull of serratus anterior due to  
Long Thoracic Nerve palsy

# Shoulder Physical Exam

- **Palpation**

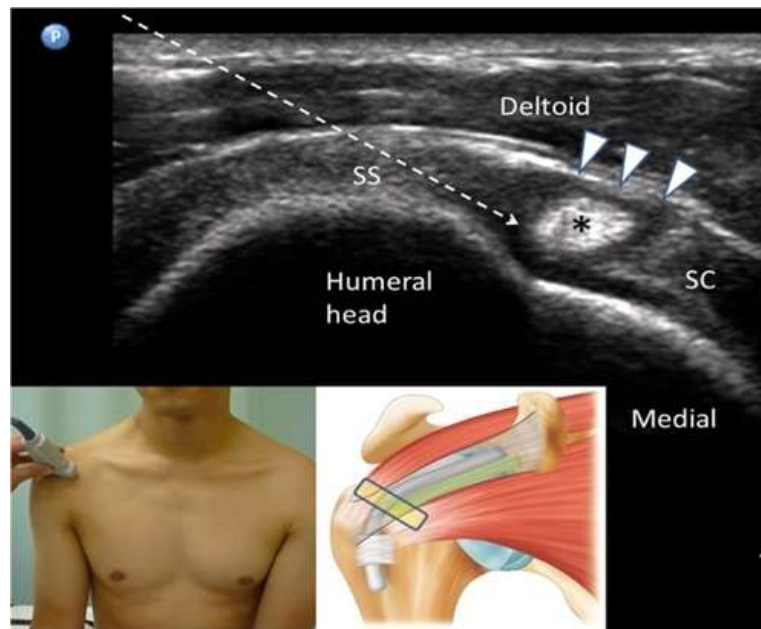
- Cross arm adduction
- Examine the AC joint
- Every MRI over age 40 will read AC joint arthritis
- Also palpate the biceps groove as can be a source of pain
- Must see if clinically relevant
- Do not want to miss
- However do not over treat based on MRI or X-ray changes as biceps and AC joint pathology are commonly seen on imaging



Source: Int J Clin Pract © 2005 Blackwell Publishing Ltd

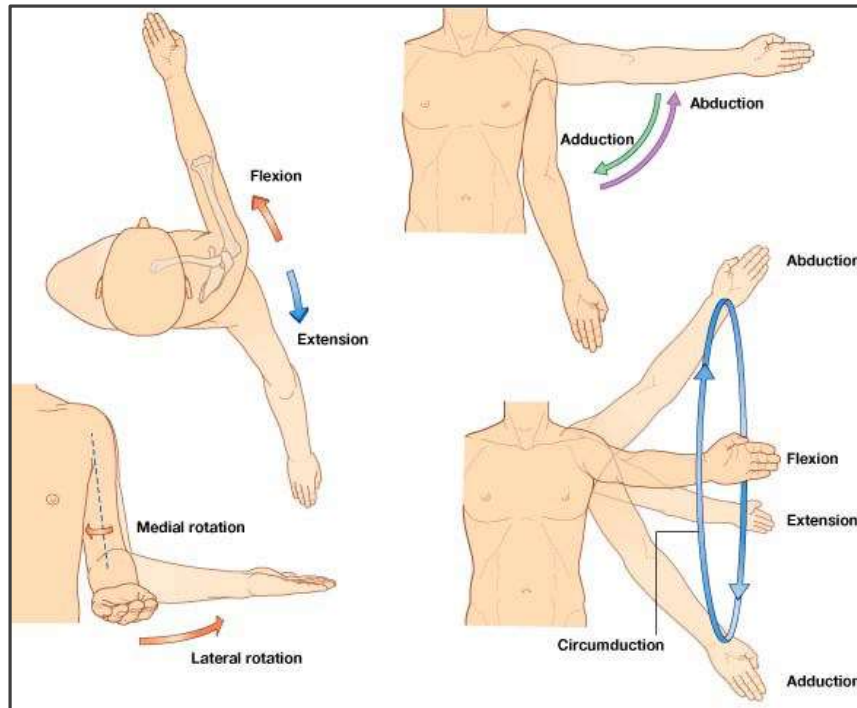
# Shoulder Physical Exam

- If not sure from physical exam
- Can do diagnostic lidocaine injections
- If AC joint pain from OA
  - Injection should temporarily relieve pain
- Biceps groove injection



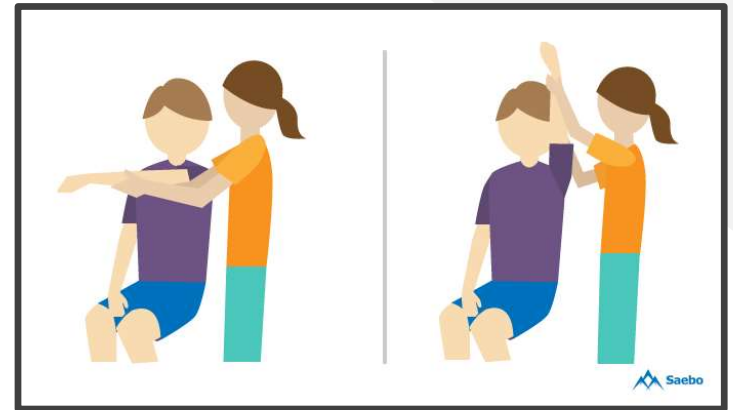
# Shoulder Physical Exam

- 1. ROM
- 2. ROM
- 3. ROM



# Shoulder Physical Exam

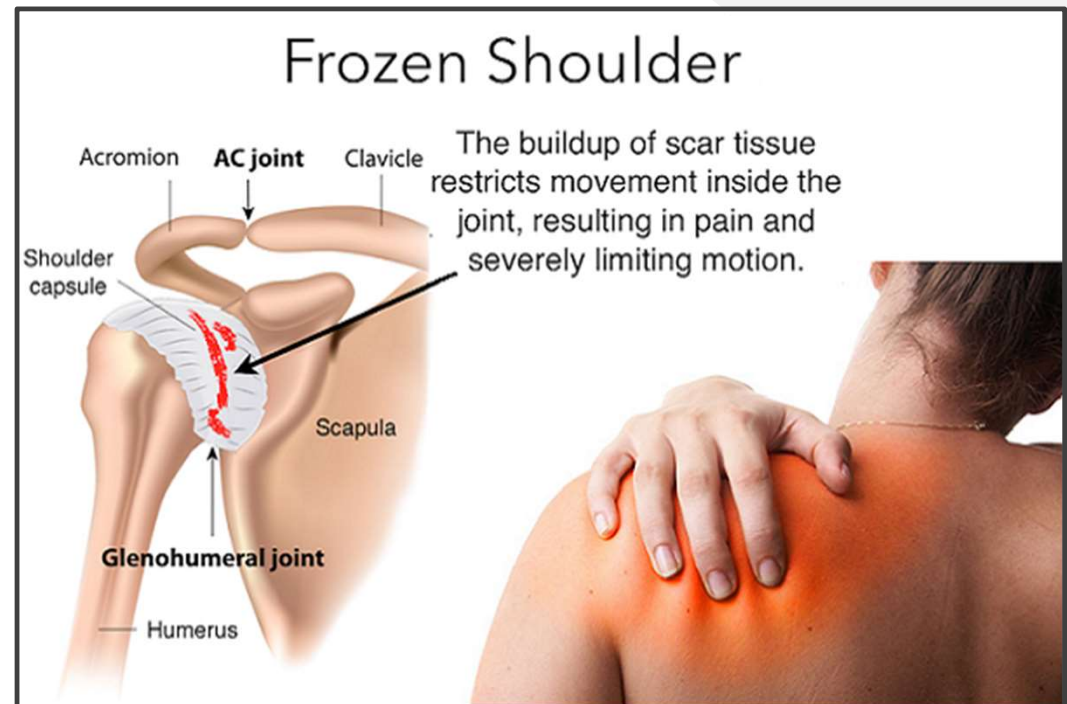
- Check ACTIVE and PASSIVE ROM !!
- **Active**- what the patient is willing to do
- **Passive**- what the provider can do
- If active = passive and stiff
  - Frozen shoulder
  - TREAT THE FROZEN SHOULDER
  - PAIN TYPICALLY RESOLVES WHEN ROM IS RESTORED
- If active < passive
  - Rotator cuff tear
  - Nerve injury





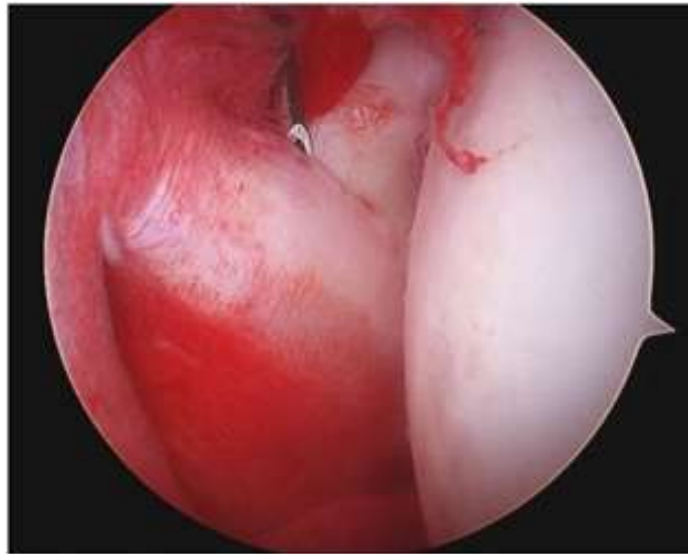
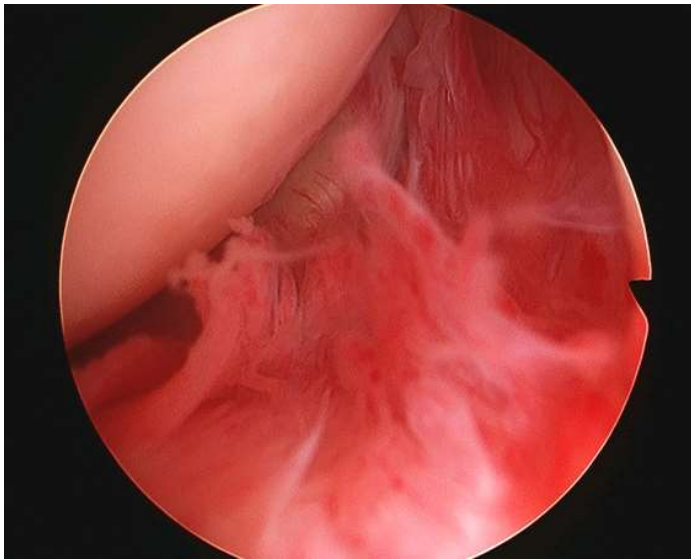
# Shoulder Physical Exam

- Adhesive Capsulitis or Frozen Shoulder
- Idiopathic
- Associated with-
  - Diabetes
  - Thyroid
  - Common middle age women
- Post Surgical
  - Post labral repair
  - Post rotator cuff repair



## **Shoulder Physical Exam**

- Arthroscopic view**
- Usually capsular inflammation**



# Shoulder Physical Exam

- MRI pathology is irrelevant if the shoulder is stiff !!!
  - Rotator cuff tears
  - Labral tears
  - Bicep tears

## MRI LEFT SHOULDER

Exam: 23rd November 2010  
Report: 24th November 2010

**Clinical:** loss of external rotation post-large rotator cuff tear.

### **Findings:**

- ~ There is superior subluxation of the humeral head, with disruption of the supraspinatus and infraspinatus tendons; teres minor remains intact. There is prominent muscle atrophy of both teres minor and infraspinatus.
- ~ There is near complete disruption of subscapularis.
- ~ There is subluxation of the tendinopathic long head of biceps tendon.
- ~ There is superior labral fraying; anterior labral tear with chondral loss in the anteroinferior glenoid.
- ~ Moderate glenohumeral effusion, most of the fluid situated within the subscapular recess.

**IMPRESSION:** Full thickness complete tears of supraspinatus and infraspinatus with as much as 3cm of medial retraction. The majority of subscapularis is also torn with long head of biceps tendon fraying. Chondral loss anteroinferior glenoid. Prominent atrophy of both teres minor and infraspinatus.



# Shoulder Physical Exam

- Fix the stiff shoulder first !
  - Usually physical therapy
  - Injections
    - Intraarticular
      - fluoroscopic or US guided
  - Rarely surgery
    - Manipulation under anesthesia
    - Arthroscopic capsular release



# Shoulder Physical Exam

- **Strength (Grade 0-5)**

- Torn tendon or muscle?
  - Test each rotator cuff tendon/muscle
  - Can often tell if multiple or single tendon injury



Bear-hug test for  
subscapularis



Empty can test for  
supraspinatus

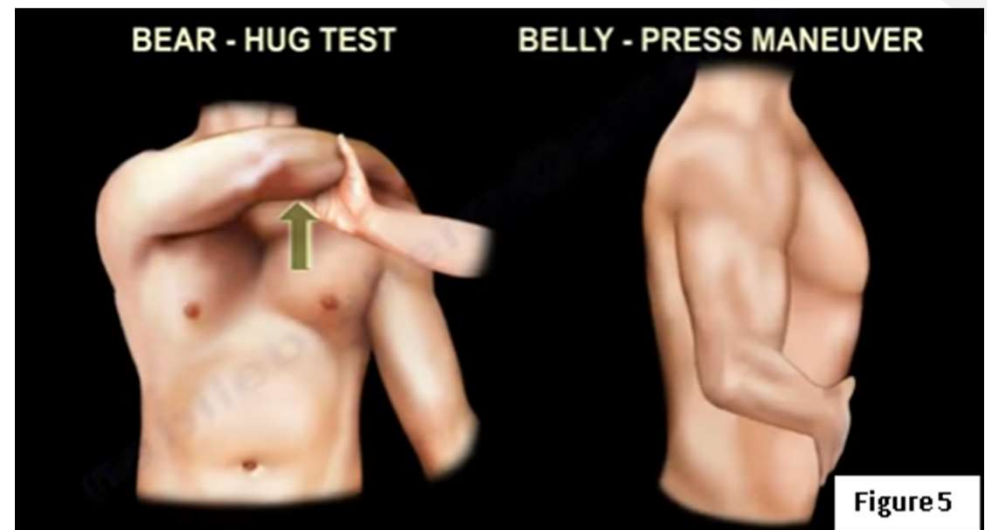


External rotation strength  
for infraspinatus and  
teres minor



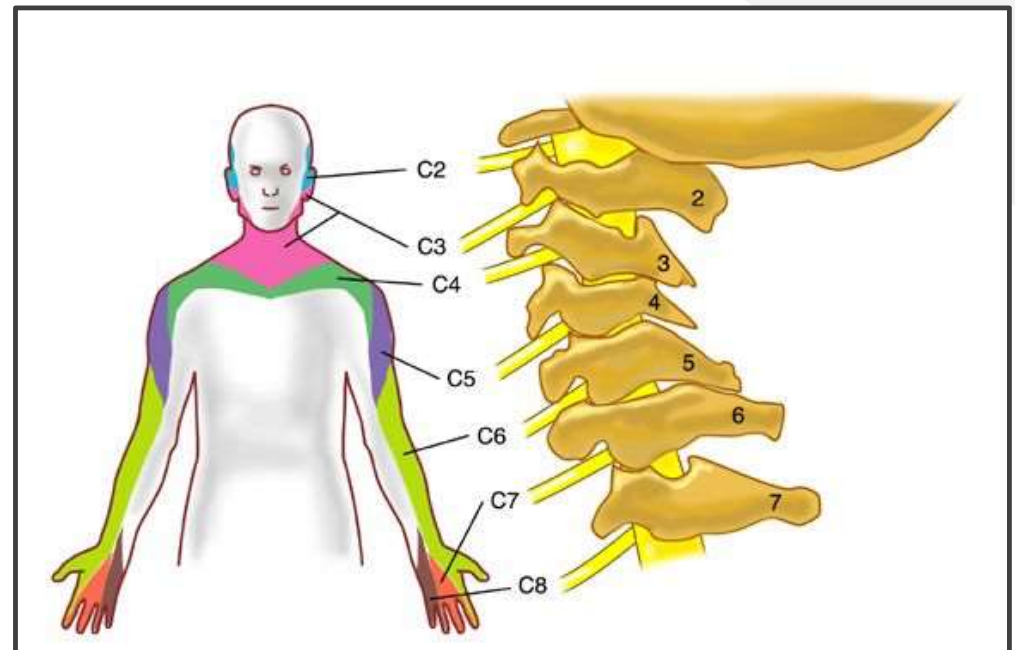
# Shoulder Physical Exam

- Give way weakness in ER
  - Likely a bigger tear involving the supraspinatus and infraspinatus
  - Tear progression starts from supraspinatus
- Positive lift off or belly press test
  - Subscapularis involvement
- Consider getting earlier MRI
  - Especially if hx of trauma



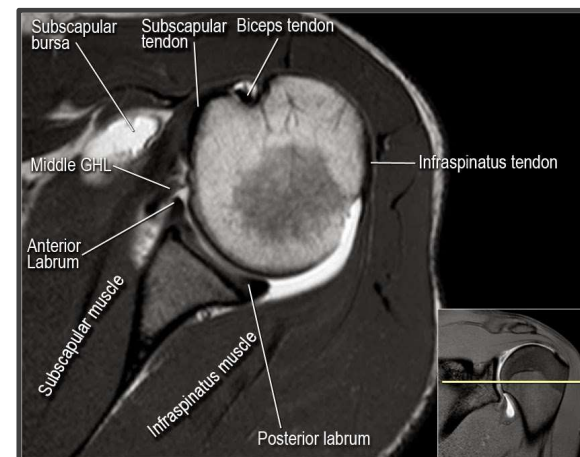
# Shoulder Physical Exam

- Don't forget to examine the neck !
- Symptoms below the elbow are not from the shoulder
  - Numbness
  - weakness
- Neck problem can mask as a shoulder issue
- Examine neck ROM
- Check spurlings
- Neuro exam C5-C8



# Shoulder Physical exam

- Must examine the patient
- Don't treat the MRI !!!
- Very Common MRI findings over 40
  - AC arthritis
  - Partial RC tears
  - Labral tears
- Don't miss or over treat AC joint or bicep tendon problems





**THANK YOU!!!**



# Rehabilitation & PT After Shoulder Surgery: When Can These Patients Return to Work?

Timothy Hartshorn, M.D.  
Ortho.Boston



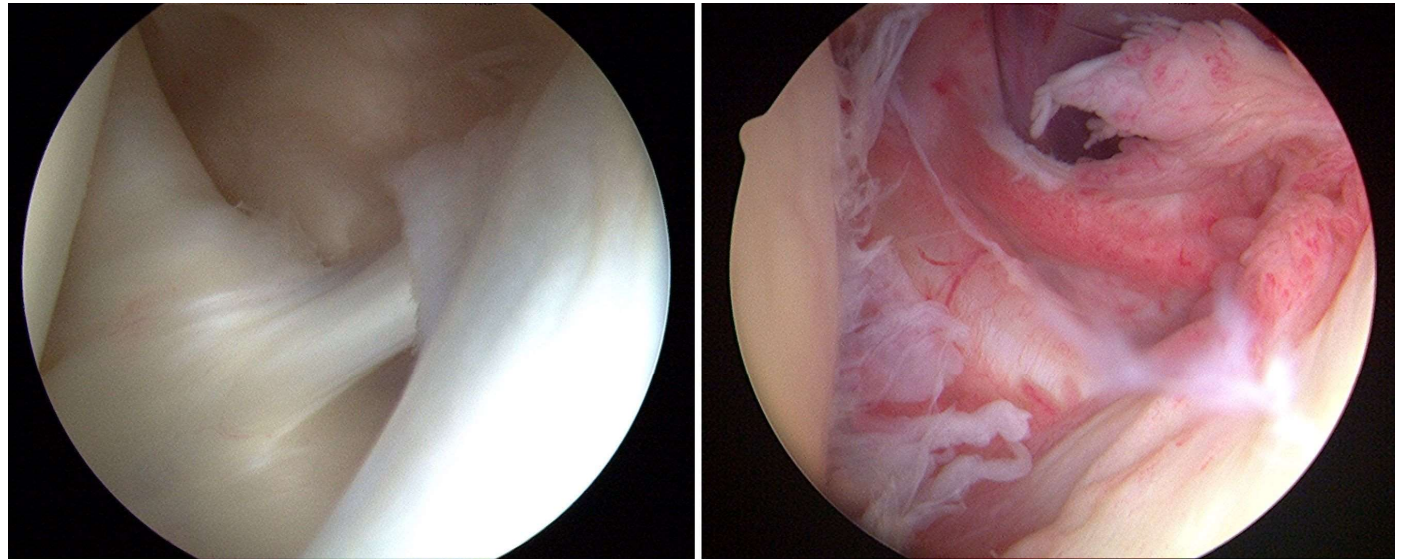


# Depends On Surgery Performed

- Simple debridement
- Rotator cuff repair
- Total shoulder arthroplasty

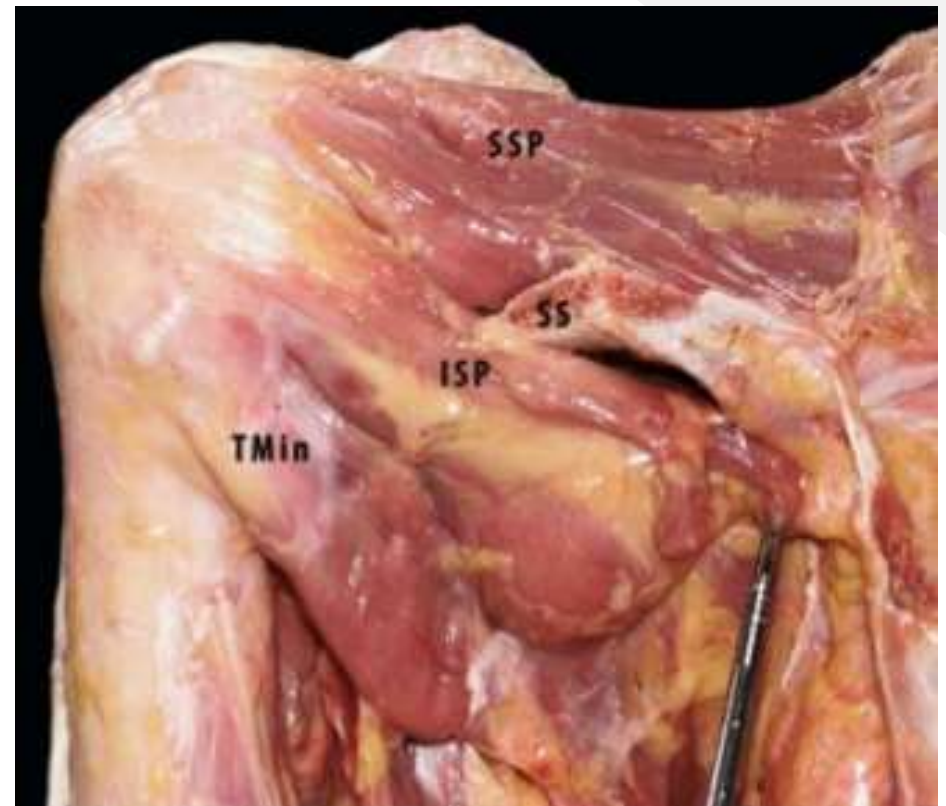
# Simple Debridement

- Does not require extensive rehab
- Period of disability prior to surgery
- Caveat is Frozen shoulder



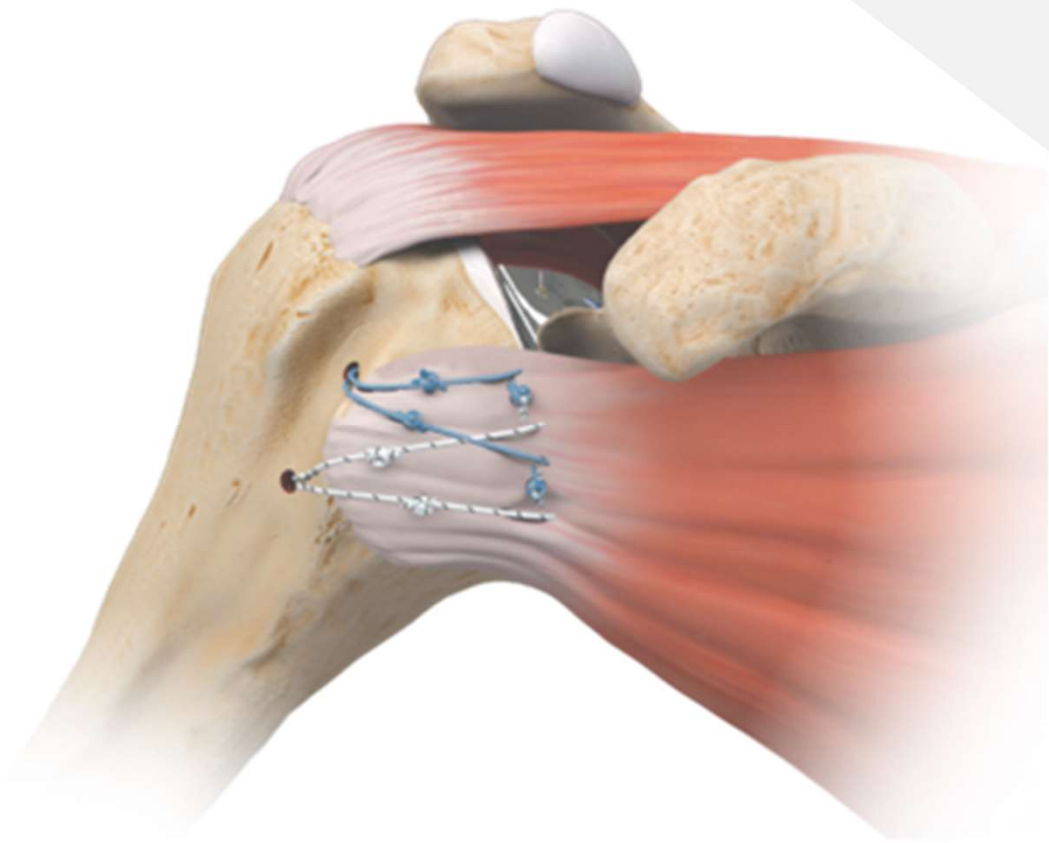
# Rotator Cuff Repair

- Use surgical limitations
- Protocols can vary
- Progressive not aggressive



# Total Shoulder Arthroplasty

- RTW similar to rotator cuff
- Subscapularis failure
- Reverse shoulder can vary



# Influence of Sling/Brace





**2022**

**Work Related Injuries  
Workshop**







# **CASE PRESENTATION**

Dr. Miller

Dr. Jawa

Dr. Hartshorn

# Case Presentation:

- 57 y/o laborer injured moving a pallet
- Prior history of a rotator cuff tear 5 years ago
  - Did well after initial surgery
  - Returned to work full duty
- Physical Examination
  - FF 100, ER 20, IR buttock
  - Weakness 4/5 strength testing
  - Subscapularis intact
- Has not done well with initial PT and injection

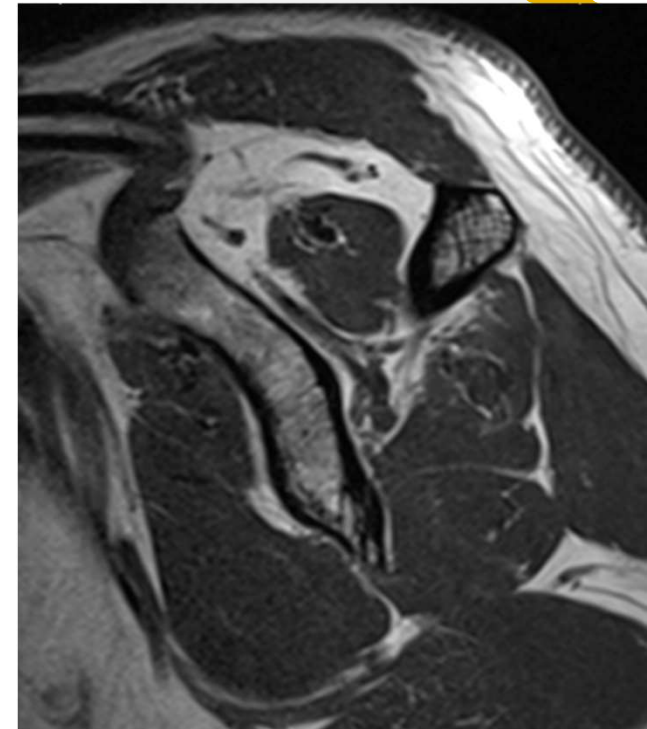
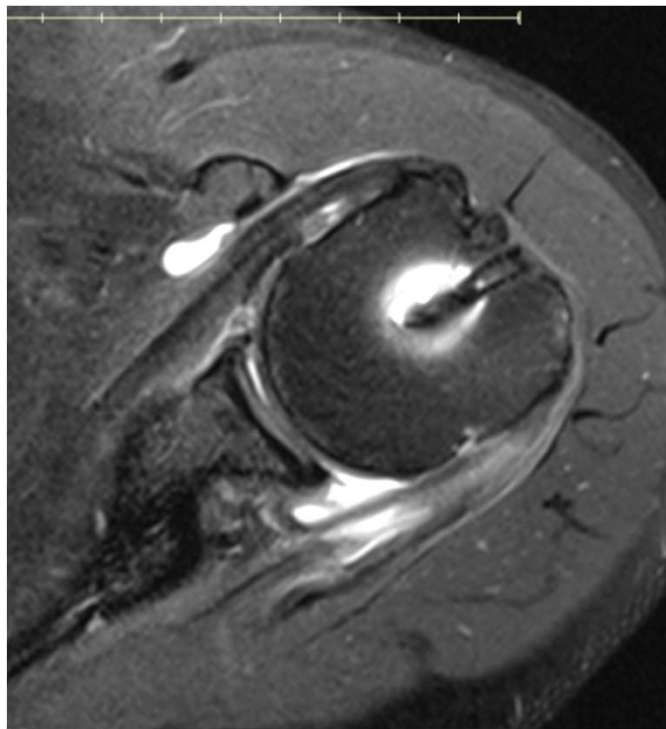
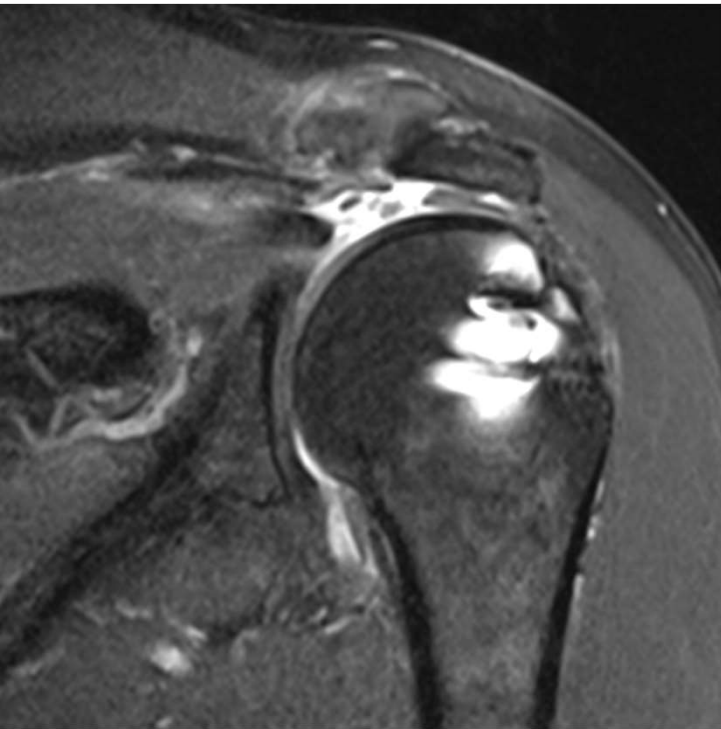
**2022**

**Work Related Injuries  
Workshop**



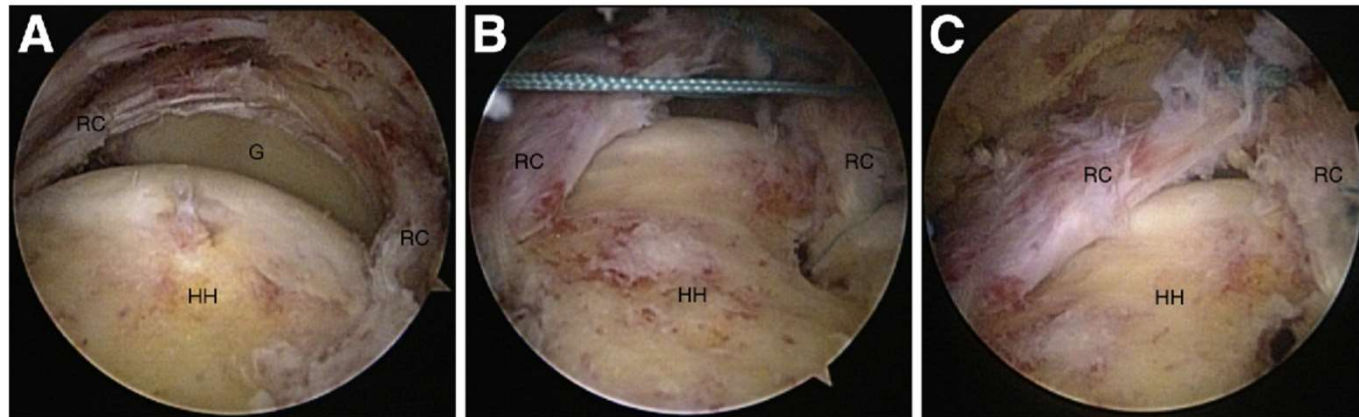
**2022**

**Work Related Injuries  
Workshop**



- **Many options for treatment, however none are great**
  - No perfect answer
  - May get different opinions
  - No option will restore perfect strength
- Scope/debridement/partial repair
- Superior capsular reconstruction
- Lower Trapezius Tendon Transfer
- InSpace Subacromial Balloon
- Reverse Shoulder Replacement

- **Arthroscopy – Partial rotator cuff repair**
- PROS:
  - Low surgical risk
  - Results OK in literature
- CONS:
  - Will not get full strength
  - May not heal
    - Persistent pain
  - 4-6 month recovery





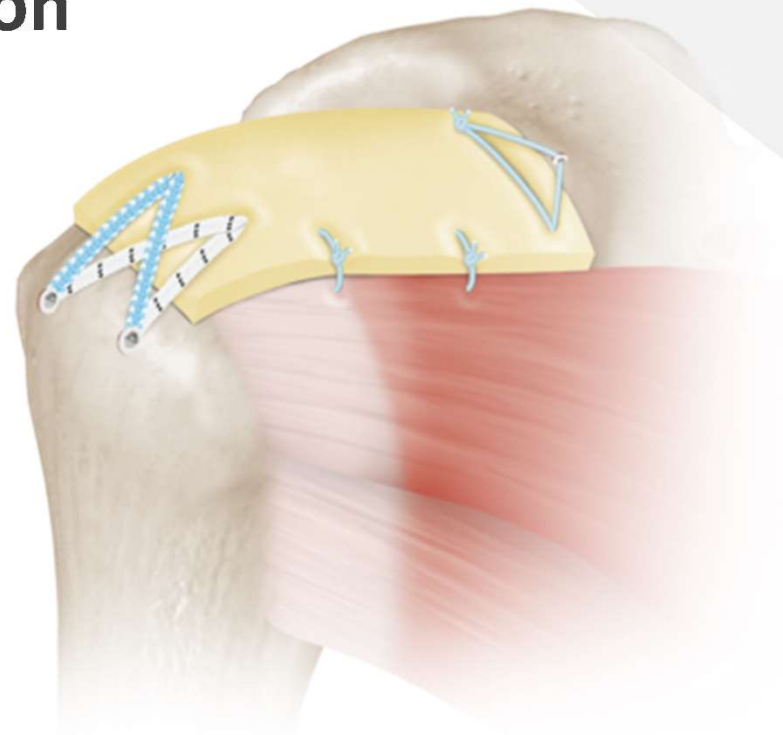
- **Superior Capsular Reconstruction**

- PROS:

- Can see good pain relief
- Can help to restore motion

- CONS:

- It may not heal
- Long recovery 6-9 months
- Expensive
- May complicate further surgery



- **Lower Trapezius Tendon Transfer**

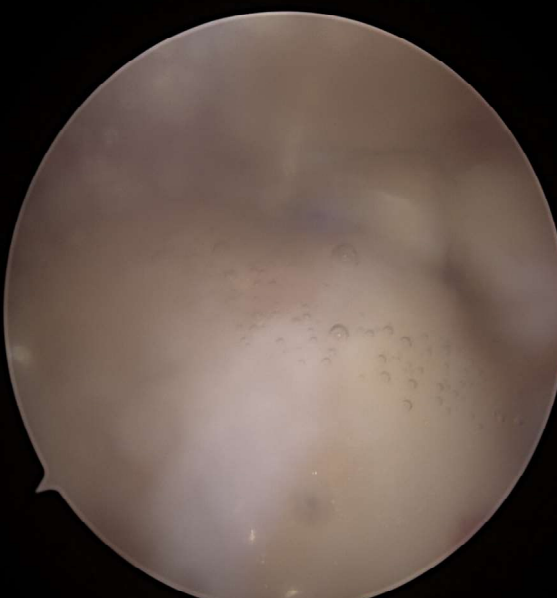
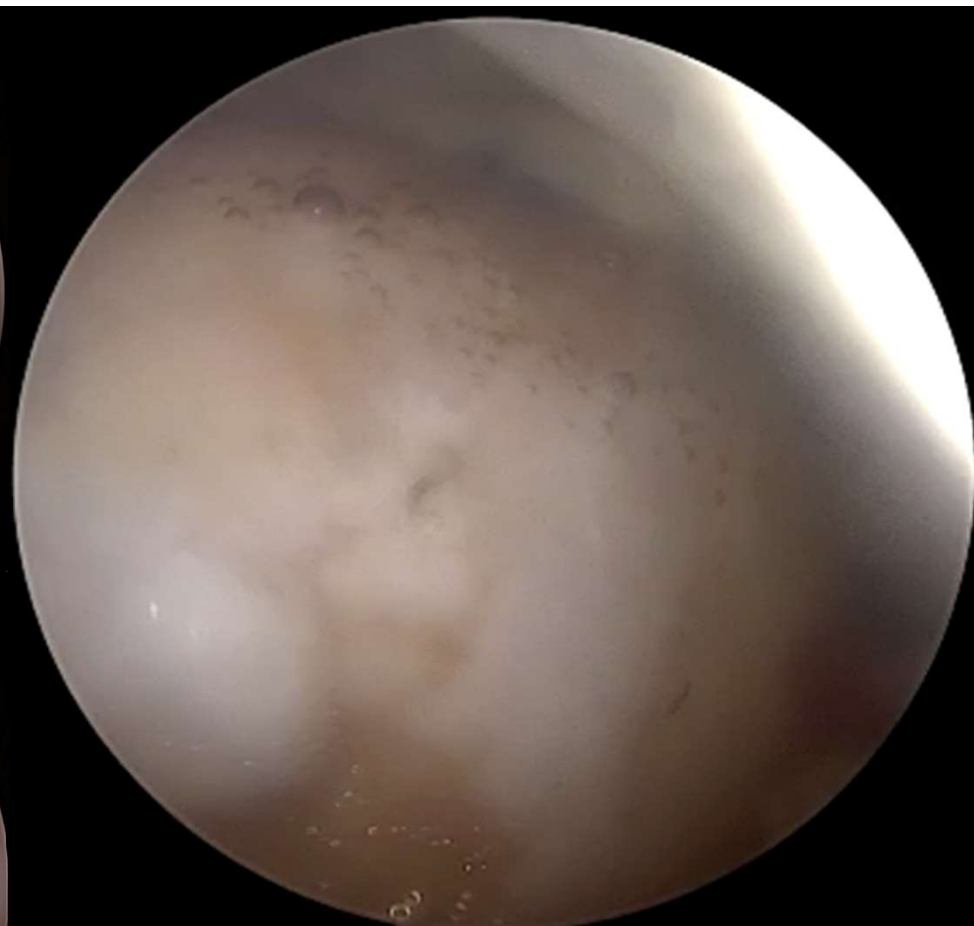
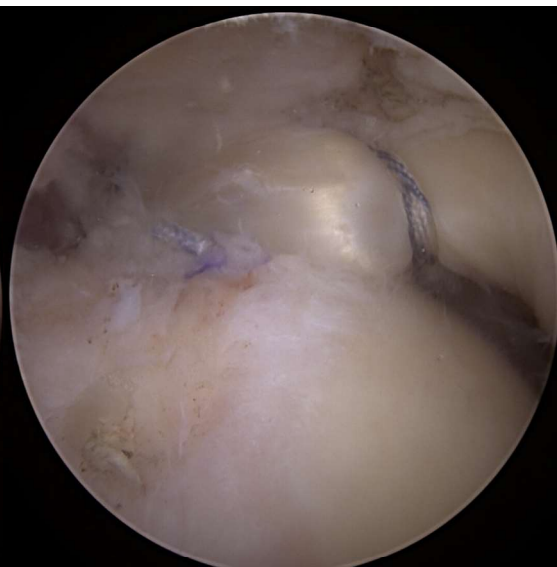
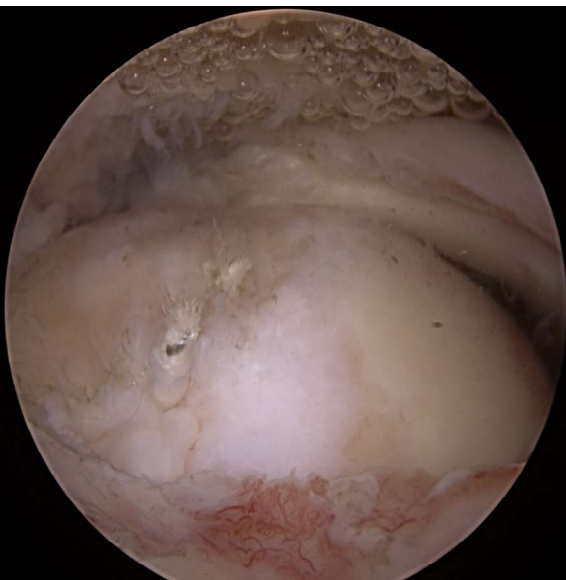
- **PROS:**
  - Can restore good external rotation power
- **CONS:**
  - Will not restore over shoulder height strength
  - Long recovery 6-12 months



- **InSpace Subacromial Balloon**

- Acts as humeral head depressor
- Absorbs approx 12 months
- PROS:
  - Short, low risk operation
  - Shorter recovery 3 months
  - May help with pain
- CONS:
  - May not last long term





## • REVERSE SHOULDER REPLACEMENT

- PROS:
  - Reliable pain relief
  - 85% survival at 15 years
  - Big operation
  - 3-4 month recovery
- CONS:
  - No good bail out if complication
    - infection, instability
  - Cannot get full pain relief
  - Revision options can be limited

