

Boomeritis: The Shoulder

James T. Mazzara, M.D.

Connecticut Center for Orthopedic Surgery

Manchester / Wethersfield
Manchester Memorial Hospital / Hartford Hospital

Patient Education Disclaimer

This presentation provides information to educate consumers on various health topics. Its is NOT intended to provide instruction on medical diagnosis or treatment.

The information contained in this presentation is compiled from a variety of sources. It may not be complete or timely. It does not cover all diseases, physical conditions, ailments or treatments. You should NOT rely on this information to determine a diagnosis or course of treatment. The information should NOT be used in place of an individual consultation, examination, visit or call with your physician or other qualified health care provider. You should never disregard the advice of your physician or other qualified health care provider because of any information you read in this handout or on any websites you visit as a result of this presentation.

If you have any health care questions, please consult your physician or other qualified health care provider promptly. Always consult your physician or other qualified health provider before you begin any new treatment, diet or fitness program.



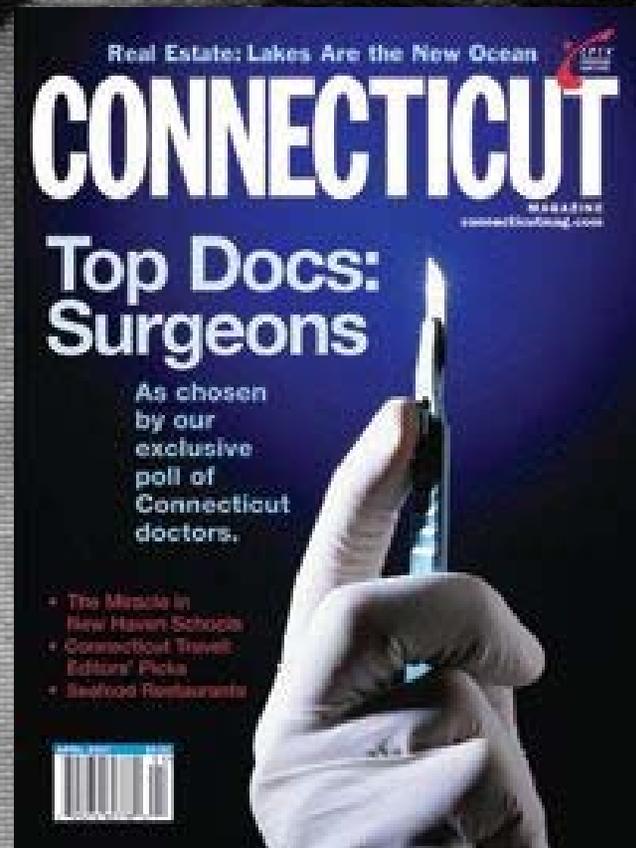
My Background

- 16 years in practice
- Over 7000 surgical procedures
- Board Certified, Recertified Adult reconstructive surgery
- Hartford Hospital
- Manchester Memorial Hospital
- Shoulder, Upper Extremity and Knee Surgery



A second of shameless self promotion

- Only one ECHN orthopedic surgeon made the Top Docs List
- Can you guess who?



April, 2007



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

What is Boomeritis?

- Describes wear and tear changes, vulnerabilities and injuries that most of us have or will develop with our musculoskeletal system
 - Nicholas DiNubile, MD
- Baby boomers have a desire to remain active despite age-related changes
- Boomers are born between 1946 and 1964



Life expectancy increases

- 1900 46 years
- 2007 80 years
- Life expectancy increases while the durability on our frame and joints remains unchanged
- Wear and tear is predictable with age



Orthopedic Ailments

- 2001: Orthopedic complaints are number 1 reason for doctors' visits
- 14% healthcare spending
- Affects 1 in 7 Americans
- 2.5% of GNP



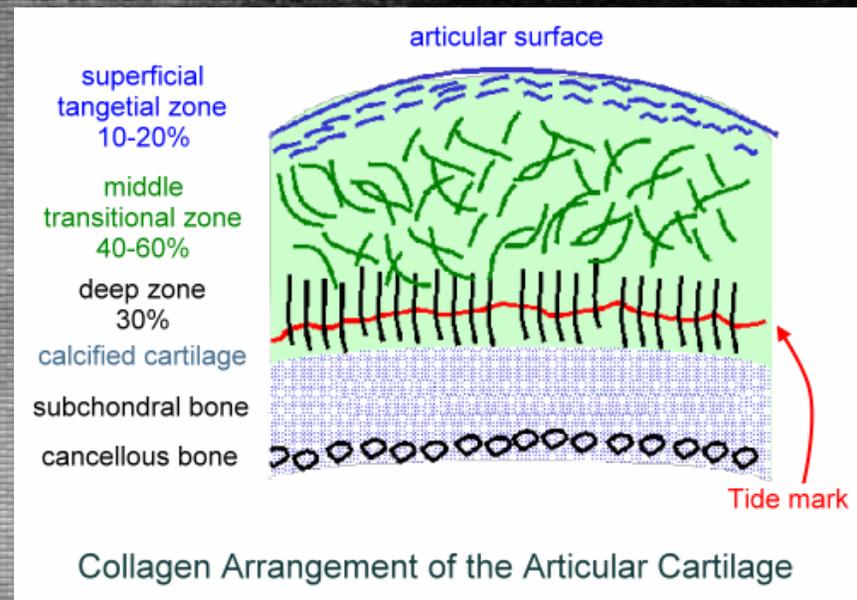
When are you “old”?

- When your back goes out more than you do
- When you sing along with the elevator music
- When your ears are hairier than your head
- When you watch cable for the weather channel
- When your address book starts with names that start with Dr.
- When you and your teeth don't sleep together
- When you try to straighten out the wrinkles in your socks and discover that you are not wearing any



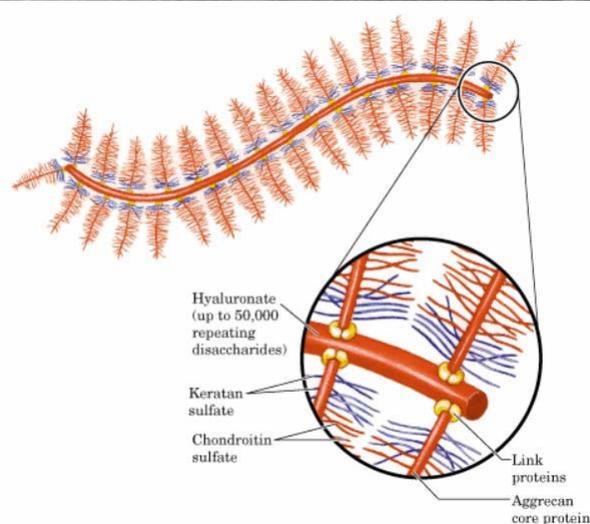
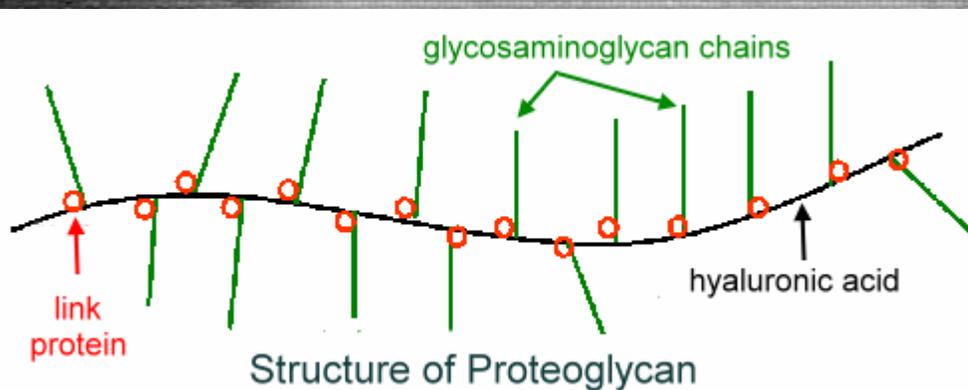
Age-related Cartilage Changes

- Older cartilage is less cellular
- Cartilage cells do not reproduce after growth plates close
- Chondrocytes only in lower layers
- Water content decreases



Age-related Cartilage Changes

- Proteoglycans change
 - Chondroitin decreases
 - Keratin increases
 - PG chains become shorted and retain less water
 - Decreased PG levels leads to decreased cartilage function

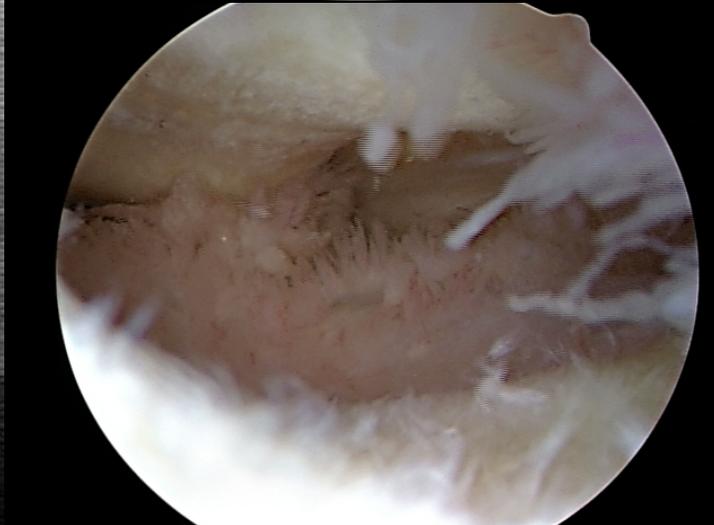
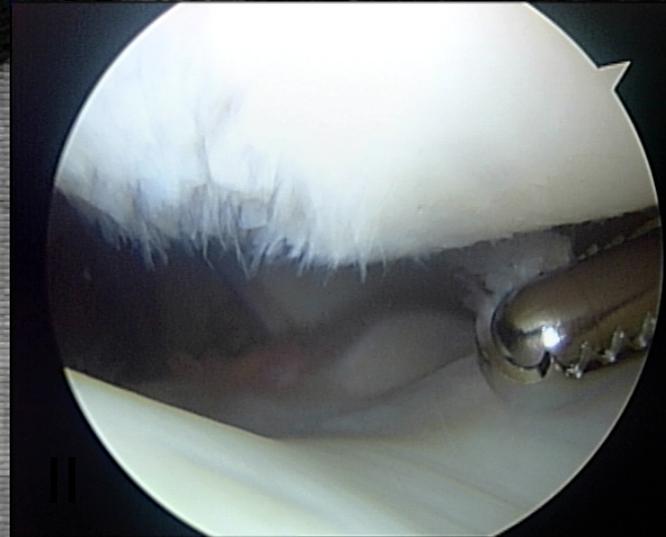
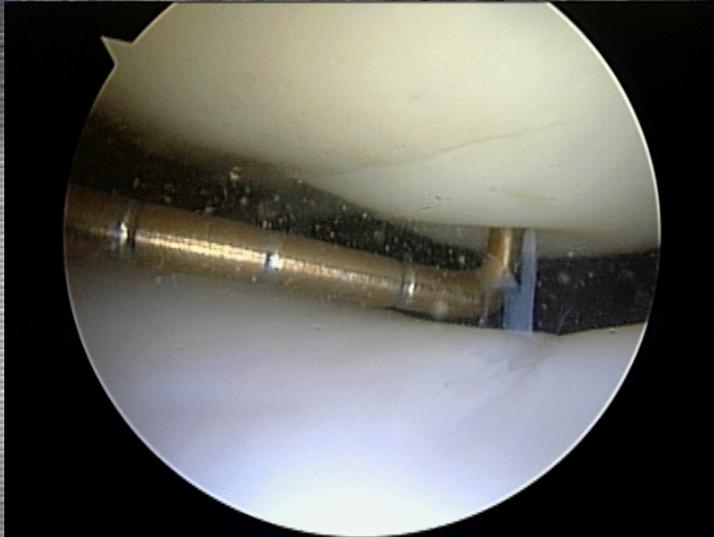


Grading Cartilage Wear

- Outerbridge Classification
 - Stage I Soft discolored superficial fibrillation
 - Stage II Fragmentation $< 1.3 \text{ cm}^2$
 - Stage III Fragmentation $> 1.3 \text{ cm}^2$
 - Stage IV Erosion to subchondral bone (eburnation)



Grading Cartilage Wear



Osteoarthritis

- 43 million American adults have doctor-diagnosed arthritis
- 100 different types
- Osteoarthritis – “wear-and-tear arthritis” – is the most common
- Exact causes are unknown
- Researchers say genetics may play a role in 40-65 percent of knee osteoarthritis cases



Age-related Muscle Changes

- “Senile Sarcopenia”
 - Muscle mass decreases by 1/3 between 50 and 85
- Loss of strength is a major cause of falls
- Sarcopenia is not diffuse atrophy
 - Loss of muscle mass, fiber number, and specific force reduced
 - Shift toward slow twitch fibers



Age-related Ligament Changes

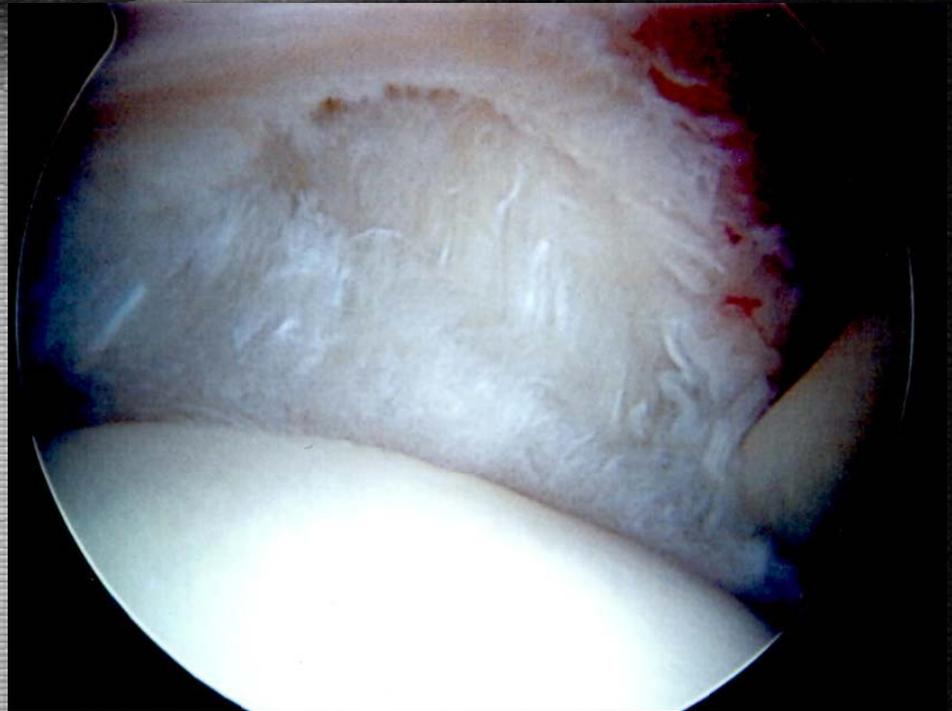
- Ligaments become weaker and are more likely to tear in midsubstance rather than pull away from the bone as in younger stronger ligaments

Collateral Ligament Injuries



Age-related Tendon Changes

- Older tendon contains fewer fibroblasts, decreased tendon fibril diameter, decreased stiffness
- Tendon can be partially restored to strength (65%) and elasticity (69%) with eccentric exercises



Managing These Inevitable Changes

- Nutrition
 - Weight control
- Exercise
 - Properly designed and performed program



Lifestyle Changes

- Weight loss
- Exercise to reduce weight, improve strength and endurance
- Exercise improves sense of well being



Exercise as a Prescription

- Too little exercise can have negative effects
- Incorrect exercise can result in injuries
- Good nutrition combined with the right dose of balanced well designed exercises can lead to a healthy frame and joints



Glucosamine

- Involved in maintenance and repair of joint cartilage
- Stimulates production of synovial fluid, proteoglycans, and glycosaminoglycans
- Anti-inflammatory
- 1200 – 2000 mg/ day
- Higher doses
 - Obesity
 - GERD
 - Diuretic use



Glucosamine

- Proteoglycans form the ground substance of the extracellular matrix in cartilage
- Of these, glycosaminoglycan hyaluronic acid is vital for the structure and function of cartilage
- Decrease incidence of severe joint space narrowing by 60%
- Treatment for >12 months reduces risk for TKR by 73% at 5 years

Pavelka, Am Coll Rheum 2004



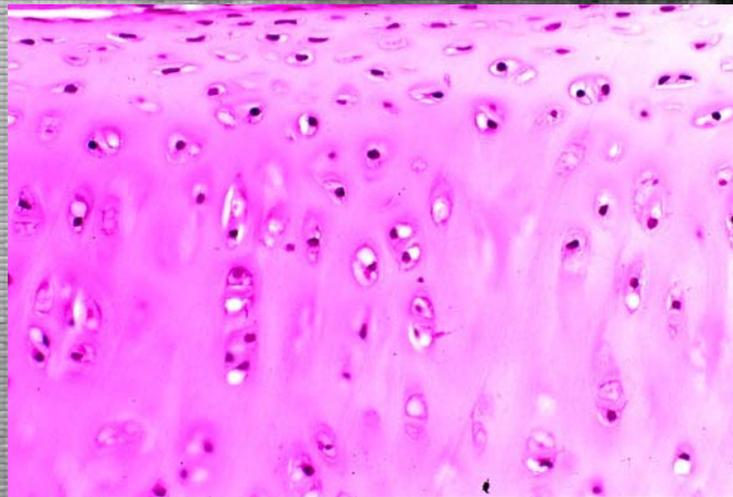
Chondroitin Sulfate

- Influences synthesis and metabolism of glycosaminoglycans
- Increases total proteoglycan production
- Inhibits collagen breakdown by chondrocytes
- Increased production of synovial fluid
- Anti-inflammatory
- Chondroprotective
- 600-1500 mg per day



Glucosamine / Chondroitin

- Multiple conflicting studies
- No problems with side effects on liver or kidney
- No affect on diabetes
- Mild infrequent GI upset
- Seems to help moderate to severe OA
- Must be taken for 1-3 months to see effects



Nonsteroidal Anti-inflammatory

inflammatories

- Affect the inflammatory mechanism
- NSAIDS may cause
 - Gastric ulceration
 - Renal insufficiency
 - Prolonged bleeding time
- Patients >60 may have 4-5 X risk of
 - GI ulceration and bleeding
 - Renal failure requiring hospitalization



NSAIDs

- High risk individuals
 - >60
 - h/o peptic ulcer disease
 - Anticipated duration of treatment over 3 months
 - Moderate to higher doses
 - Concurrent oral steroid use



NSAIDs Efficacy

- Mild OA
 - NSAID = Tylenol
 - COX-2 > Nonselective NSAID > Tylenol
- COX-2
 - Faster onset for OA
 - Efficacy within first 6 days correlates with efficacy at 6 weeks



NSAIDs Adverse Effects

- Nonselective NSAID > COX-2 > Tylenol
 - Edema
 - Hypertension
 - Cardiovascular disease is a concern in COX-2 use



Corticosteroids

- Very effective in acute flairs
- Most effective in first 1-3 weeks
- Less effective than viscosupplements from 6 weeks - 6 months
- No more than 3 times per year

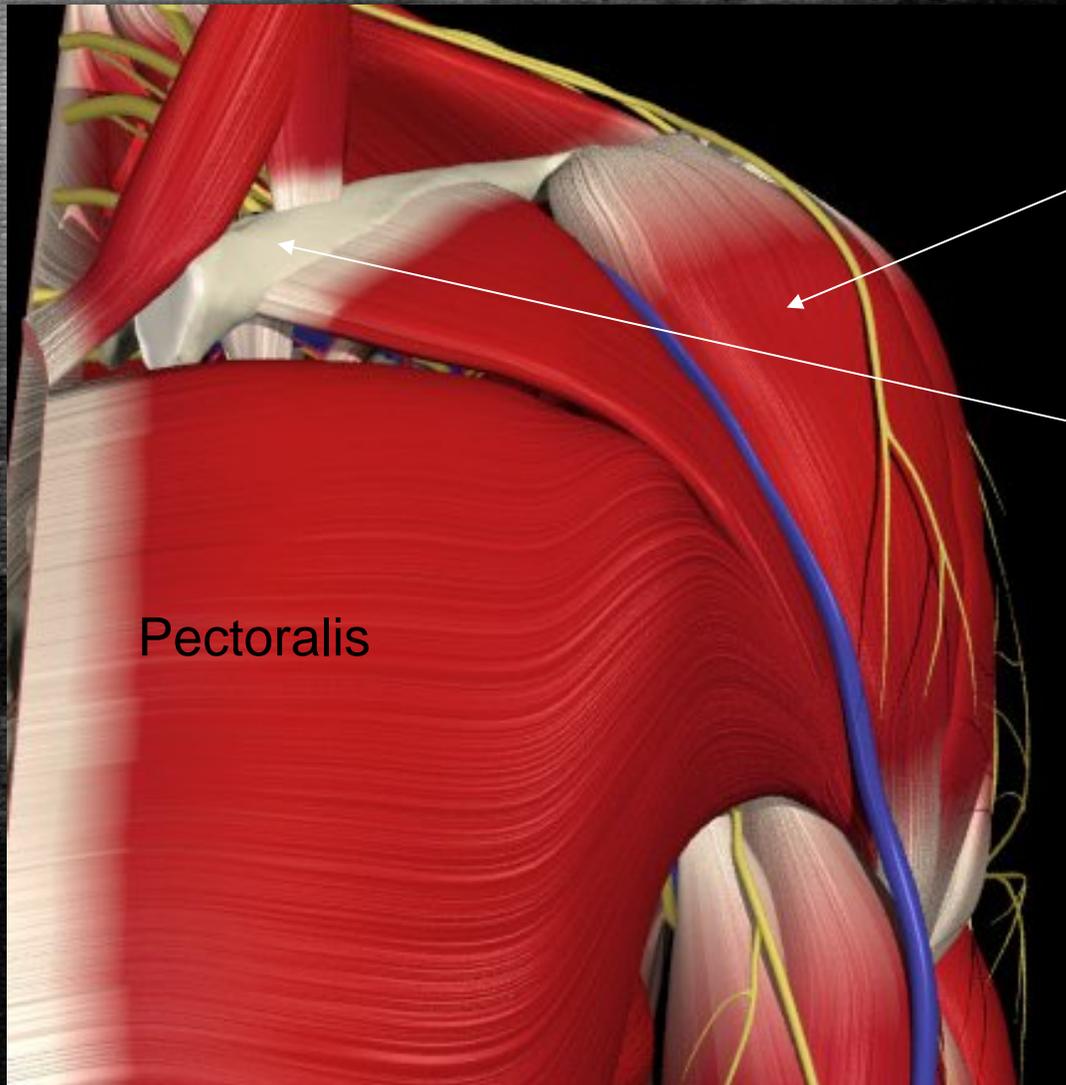


Common Shoulder Problems

- Rotator Cuff
 - Tendinitis, Bursitis, Partial and complete tears
- Arthritis
 - Wearing out of the joint cartilage
- Instability
 - Loose and Dislocating joints



The Shoulder Complex



Deltoid Muscle

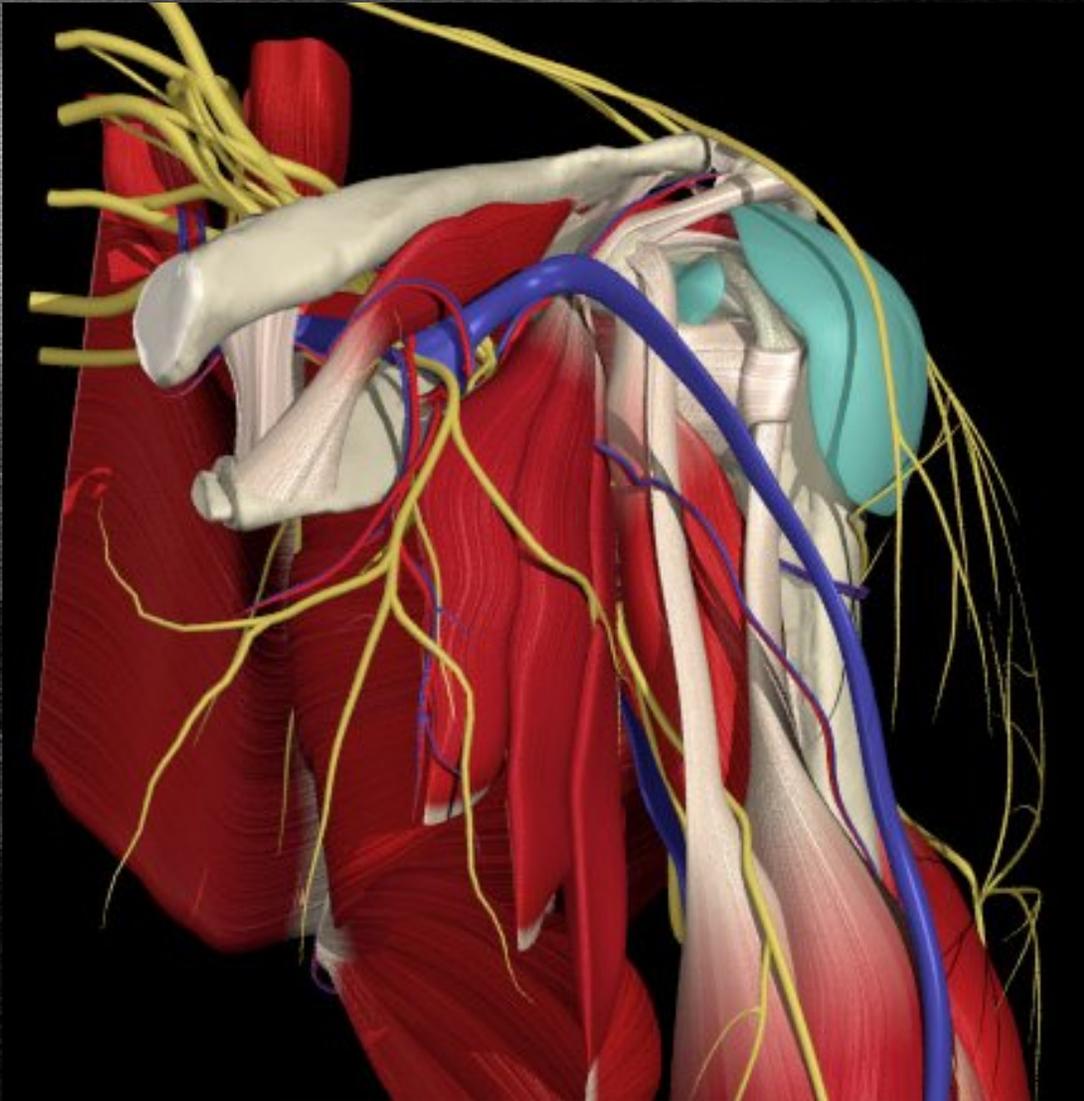
Clavicle (Collar Bone)

Pectoralis



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

The Shoulder Complex

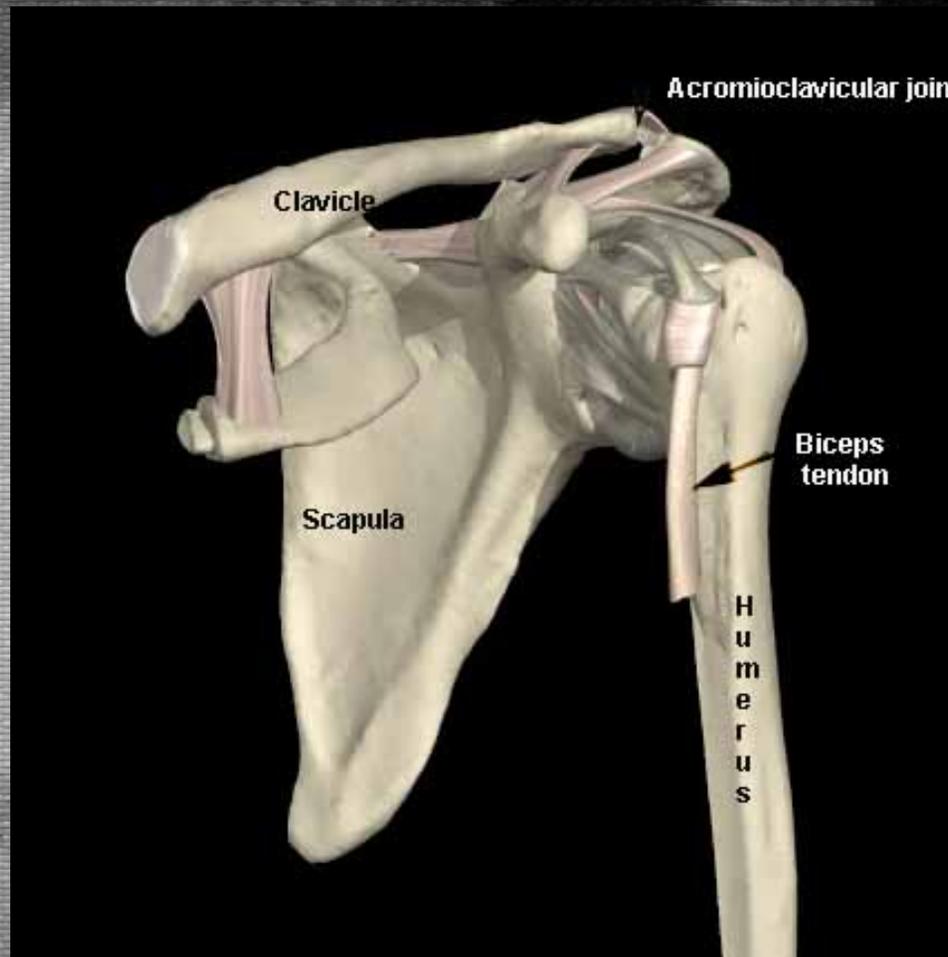


Deltoid muscle
removed

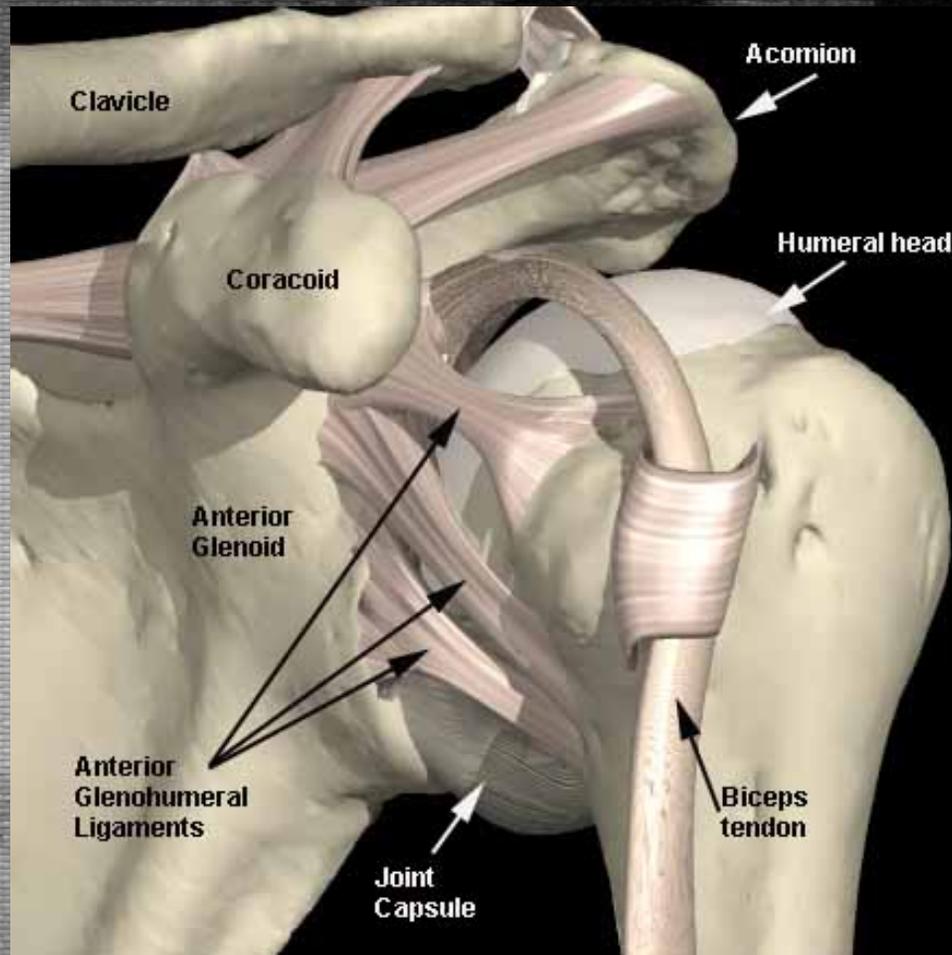


CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

The Shoulder Complex

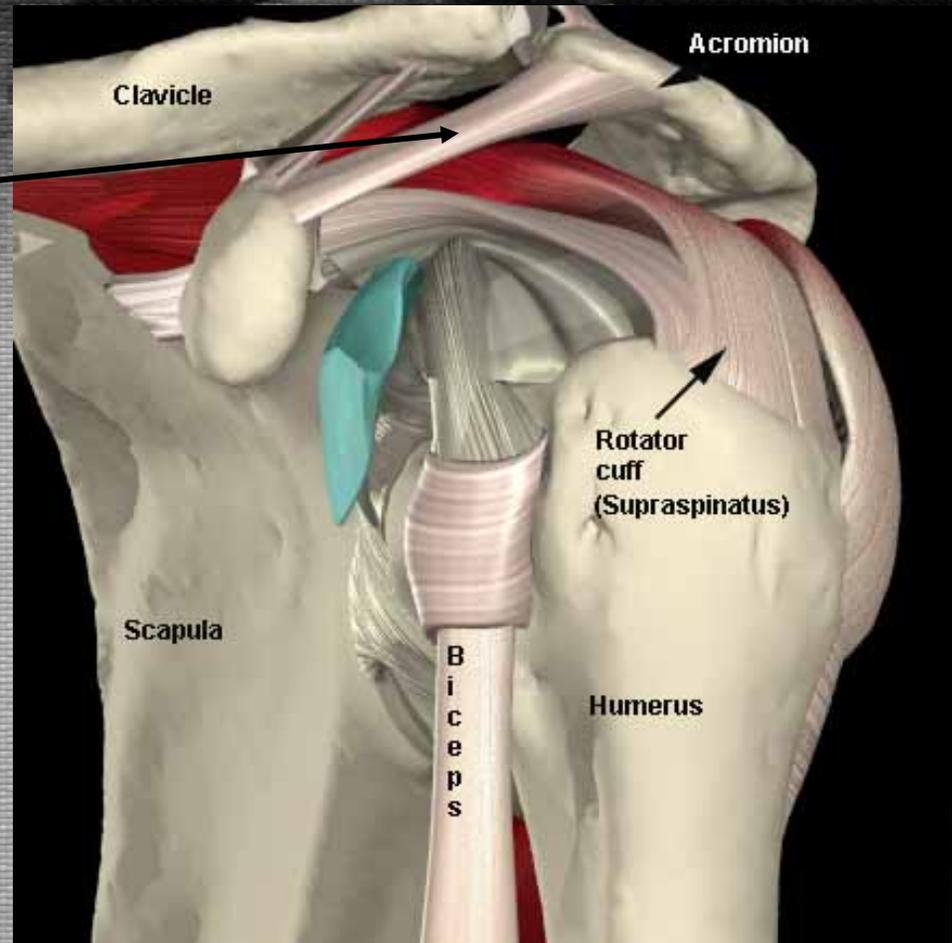


Glenohumeral Joint



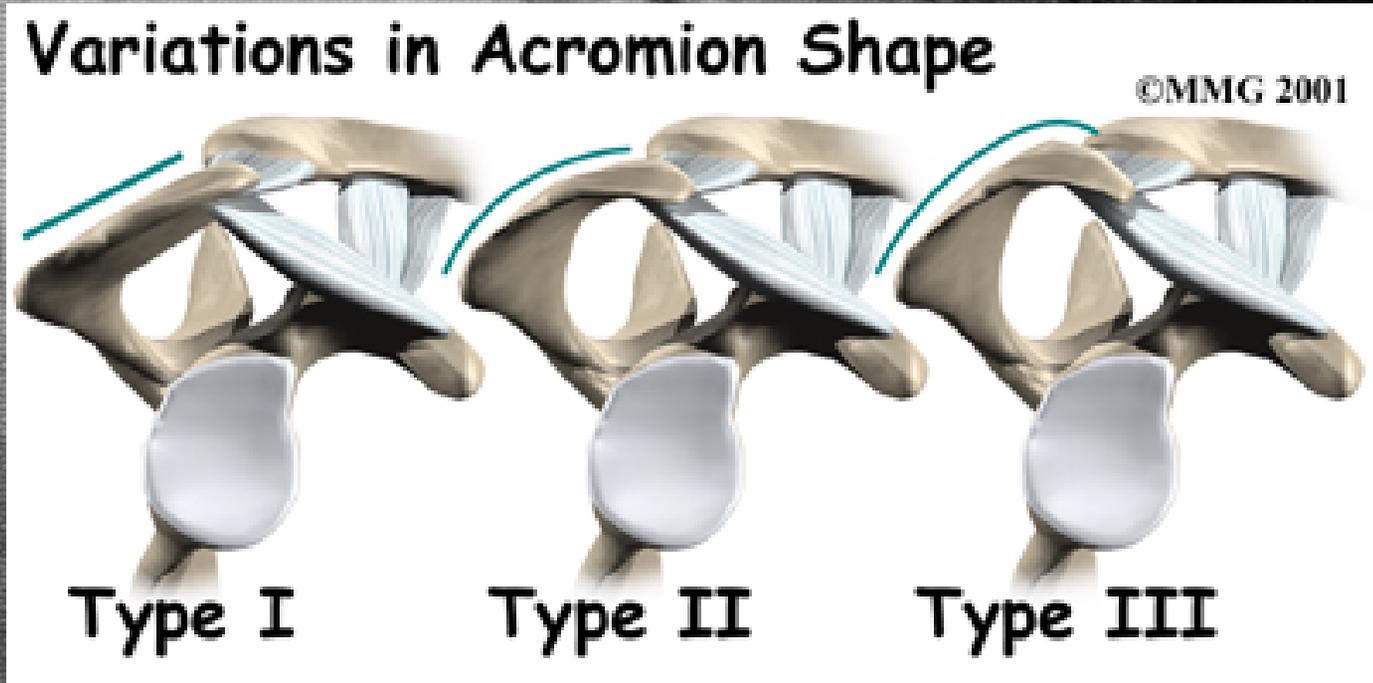
Coracoacromial Arch

- Acromion & CA ligament
 - Protective arch over the GH joint
 - Secondary restraint for the humeral head



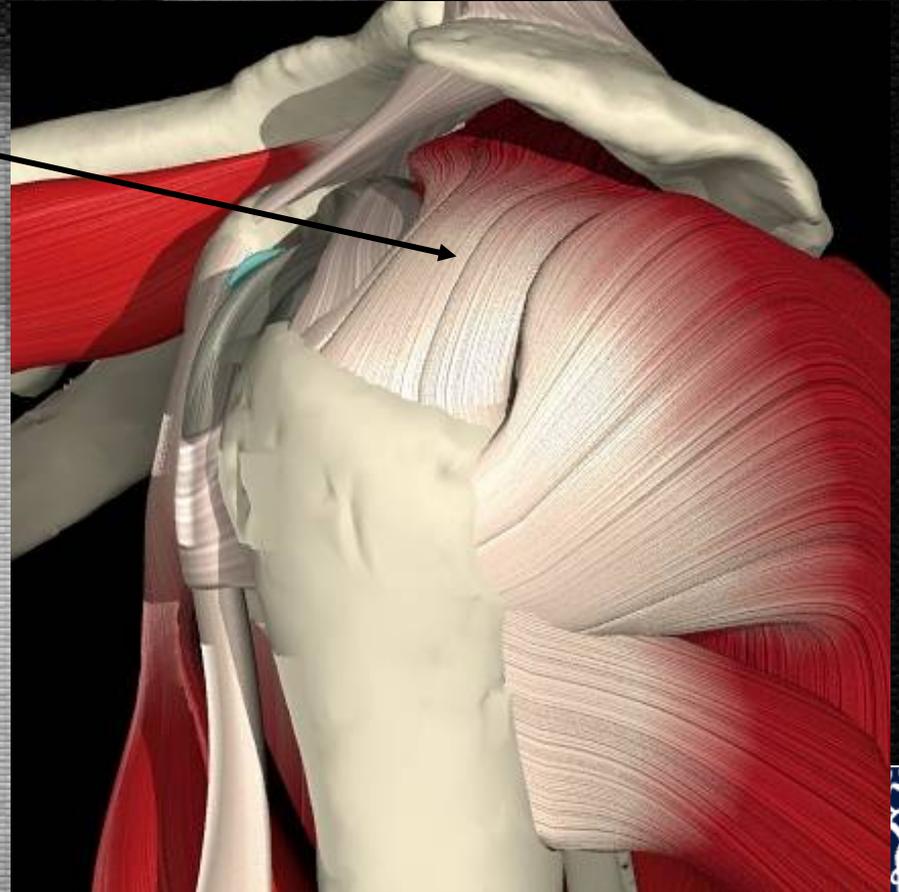
Acromial Shape

- 3 shapes



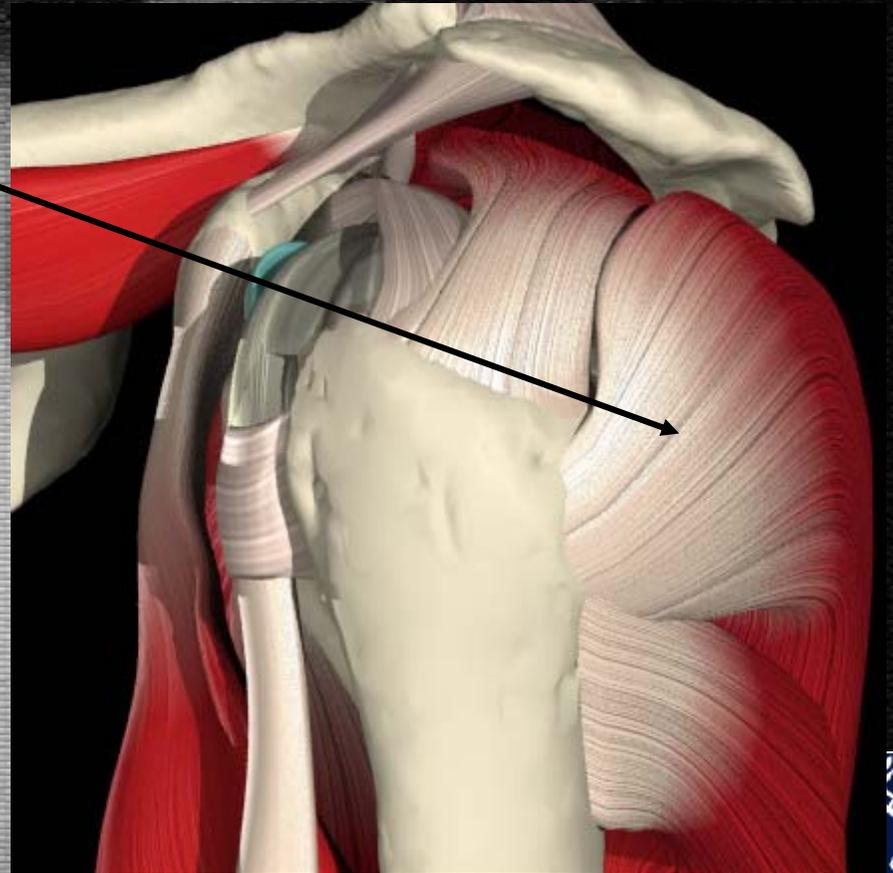
Rotator Cuff

- Supraspinatus
 - Active in any elevation of the arm
 - Stabilizes the shoulder joint



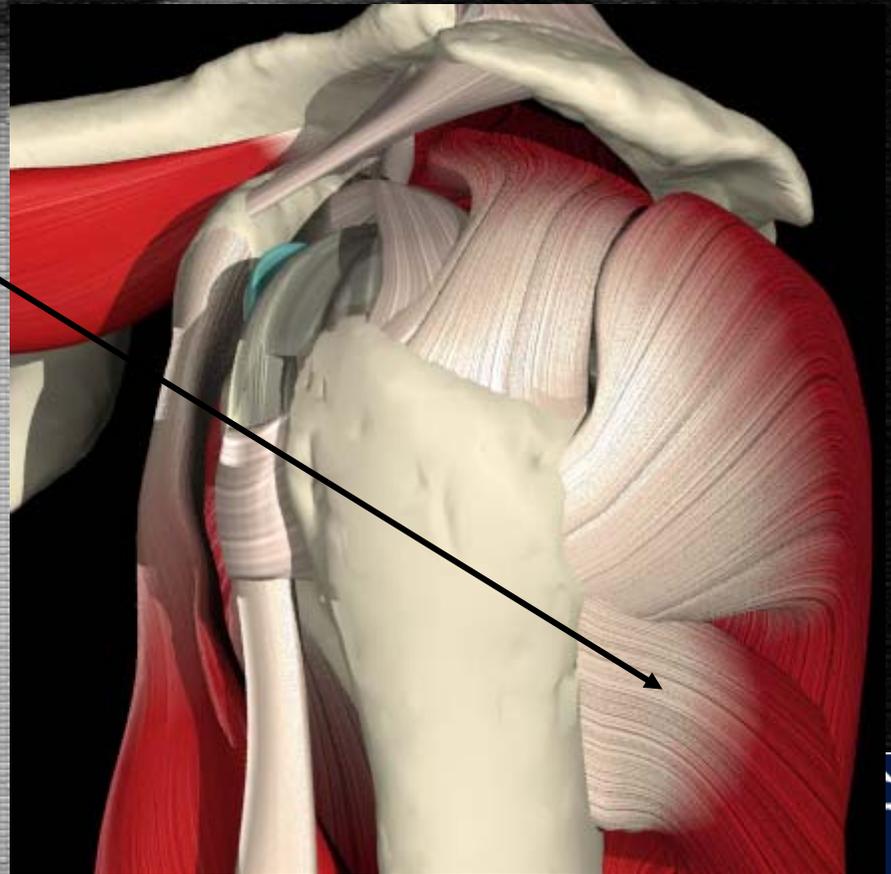
Rotator Cuff

- **Infraspinatus**
 - **Depressor** of the humeral head
 - **Stabilizer** of the back of the shoulder



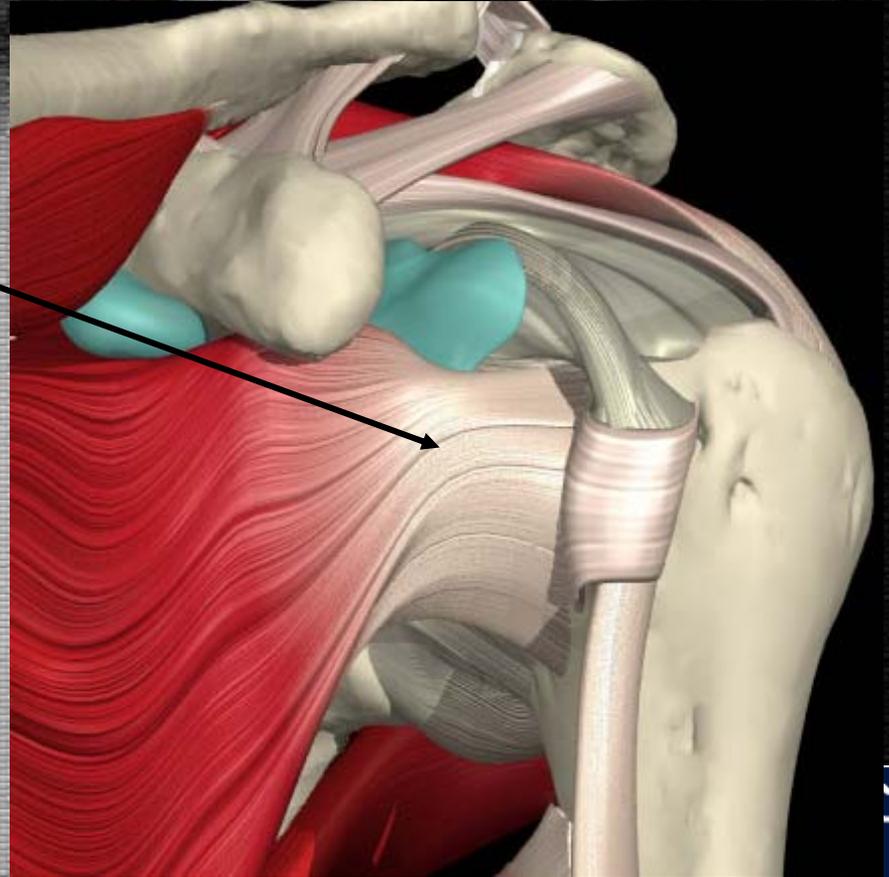
Rotator Cuff

- Teres Minor
 - Rotates the shoulder out from the side



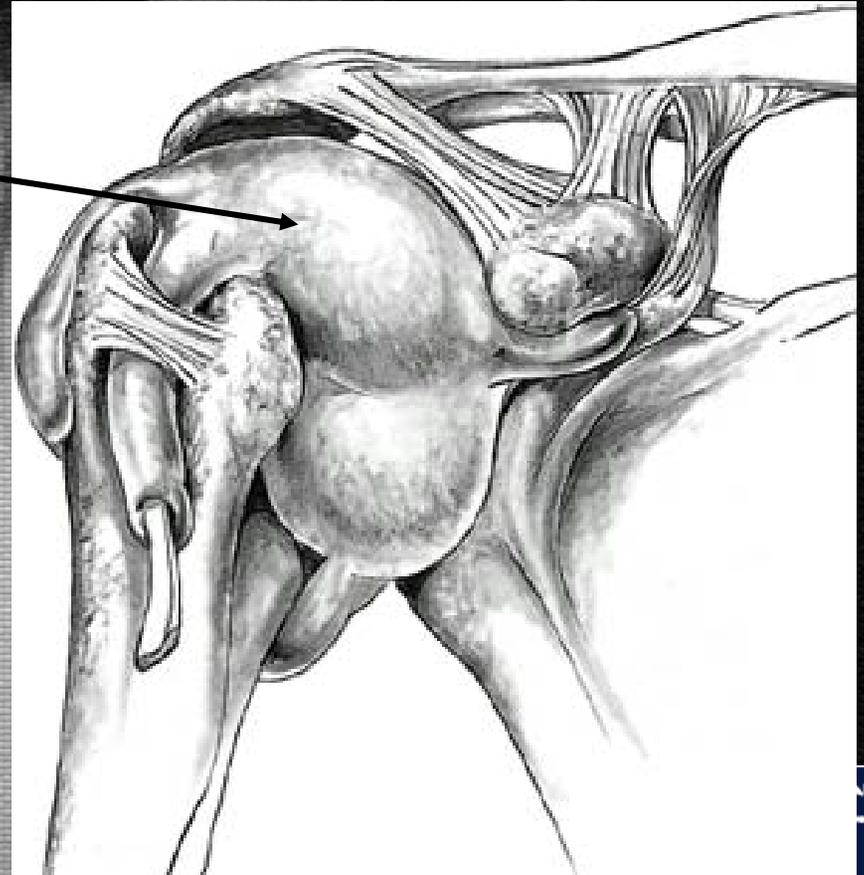
Rotator Cuff

- Subscapularis
 - Stabilizes the front of the shoulder
 - Rotates the arm inward

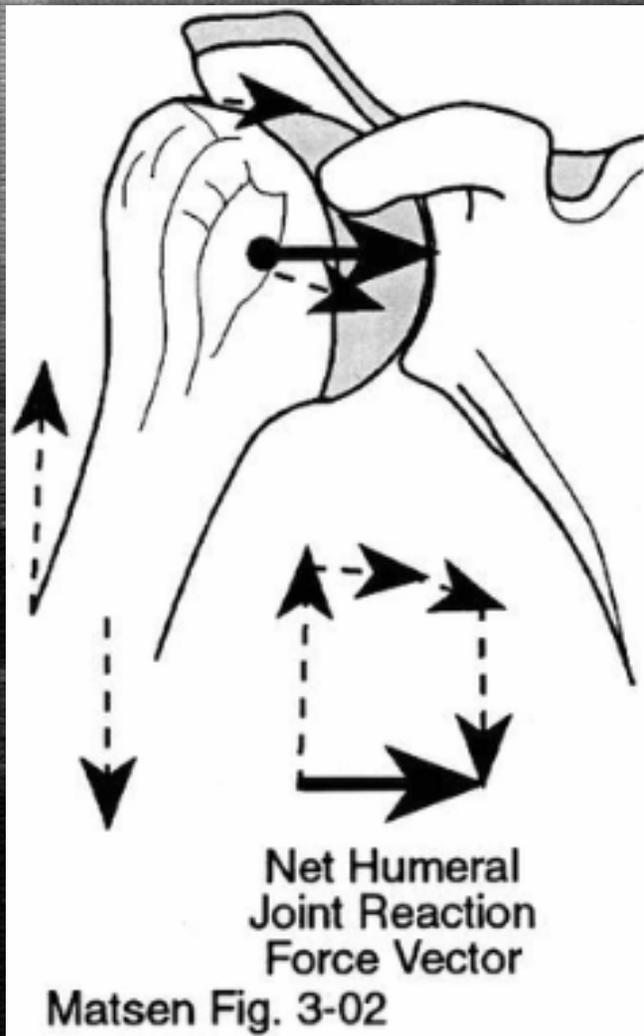


Bursa

- Subacromial and subdeltoid bursa
 - Thin sac-like structure
 - Lubricate motion between rotator cuff and overlying CA arch



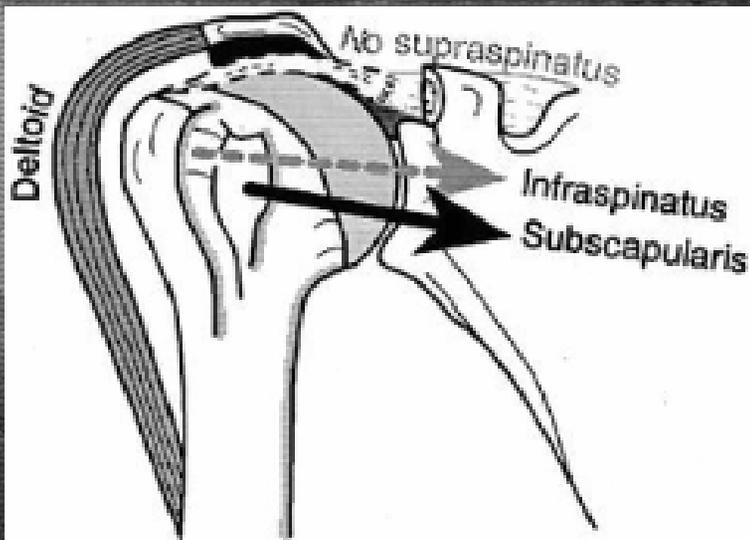
Rotator Cuff Balance



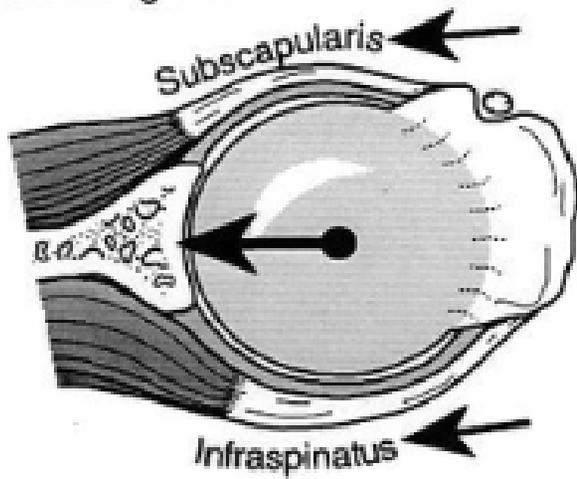
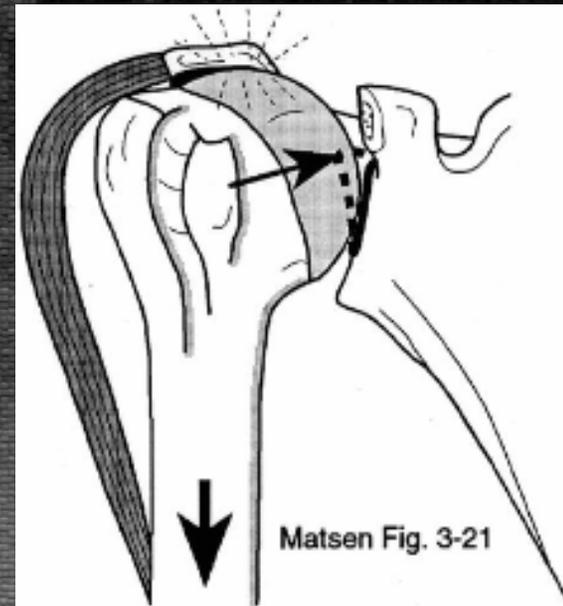
- Proper function depends upon balance between all muscle and ligament forces around the shoulder



Rotator Cuff



Matsen Fig. 3-20



A weak or torn rotator cuff results in abnormal shoulder mechanics and abnormal motion that results in pain and further damage.



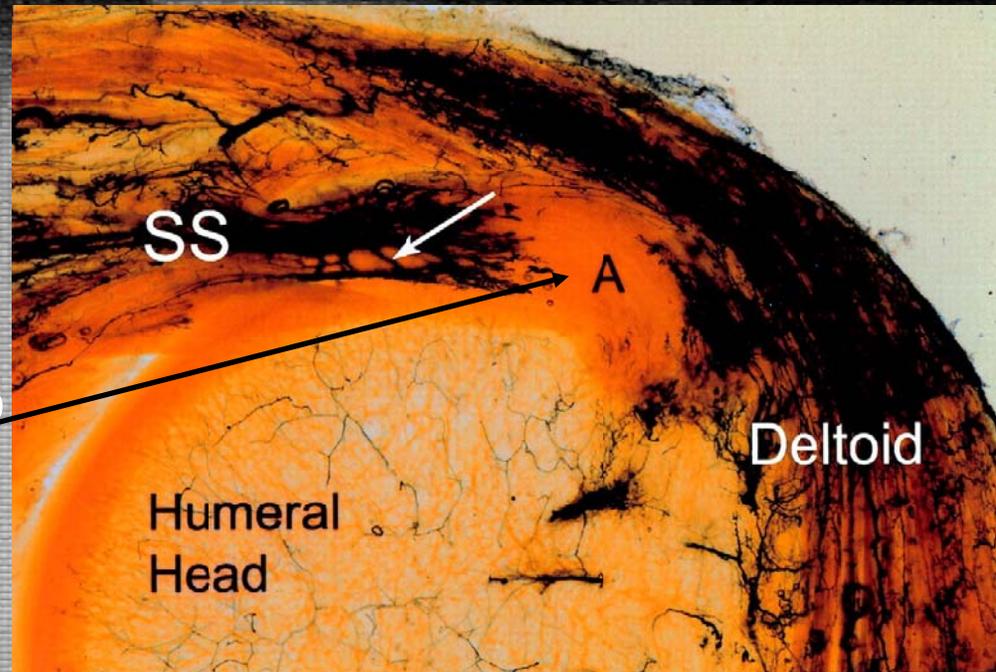
Why Tears Occur

- Tendon connective tissue weakens with age and disuse
 - Weakened tendons require less force to disrupt
- Repetitive and / or substantial loads



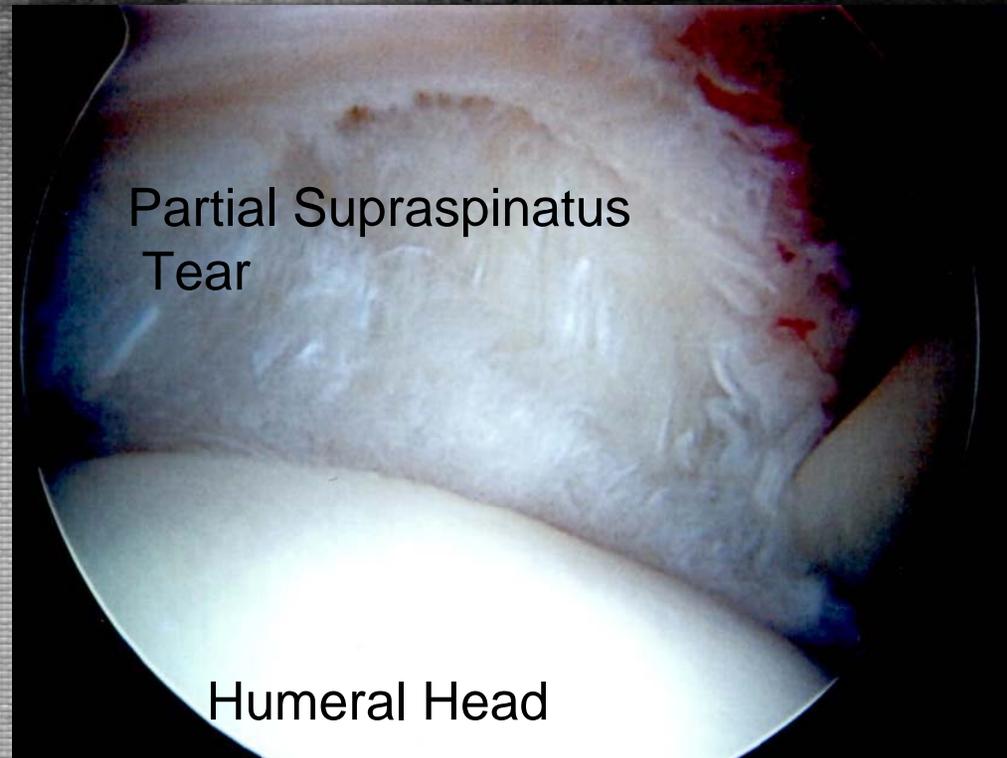
Tendon Degeneration

- Age-related changes
 - Decreased vascularity at the tendon attachment to the bone
 - Leads to weak tendon that tears easily



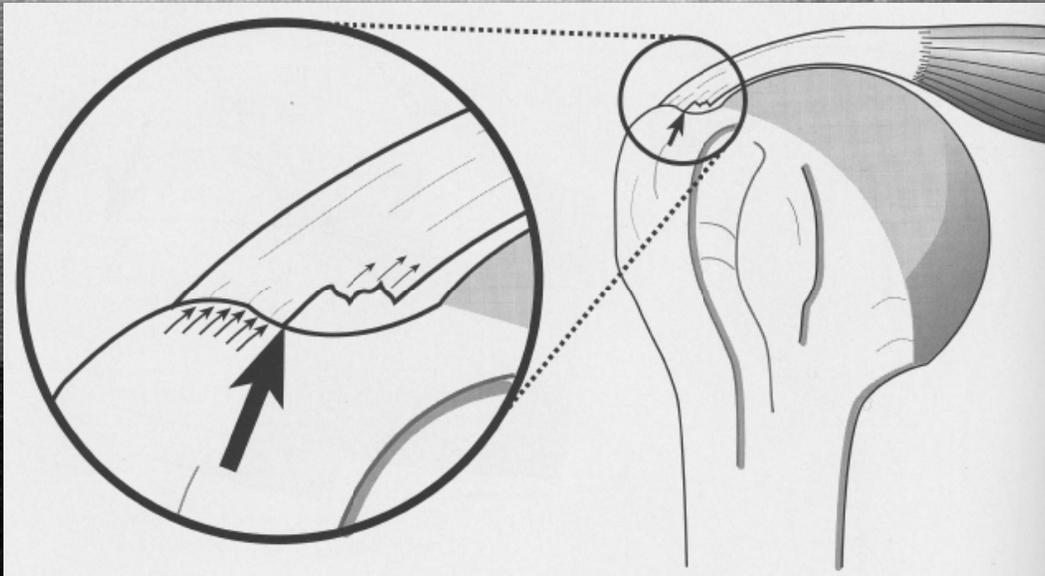
Rotator Cuff Tears

- Tears begin where the stresses are the greatest
 - Tendon fibers fail a few at a time or all at once
 - Arm may be at rest
 - Torn fibers retract when torn



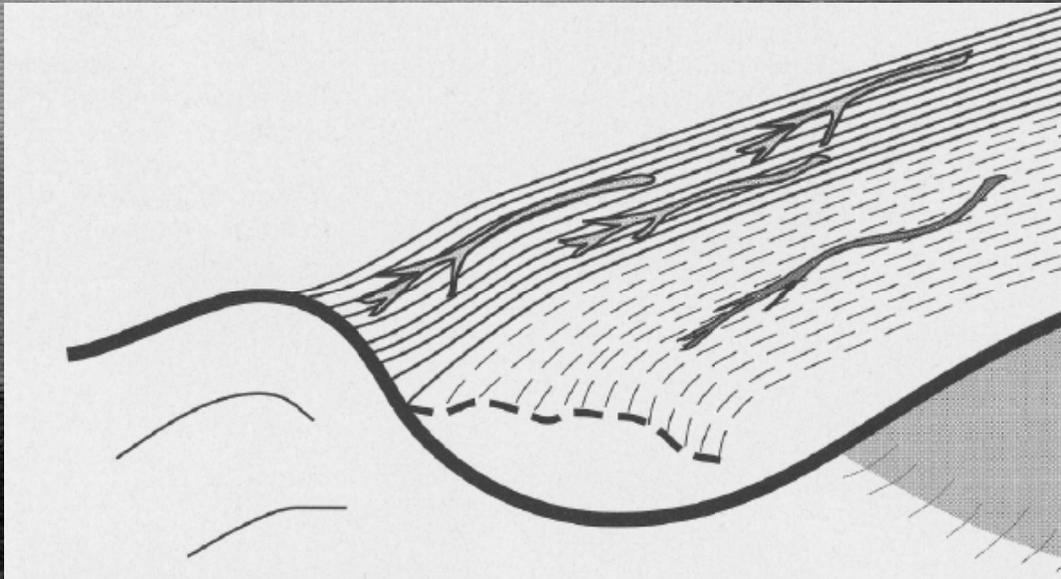
Consequences of rupture

- Increasing loads applied to the intact fibers
- Muscle fibers become detached from the bone resulting in weakness



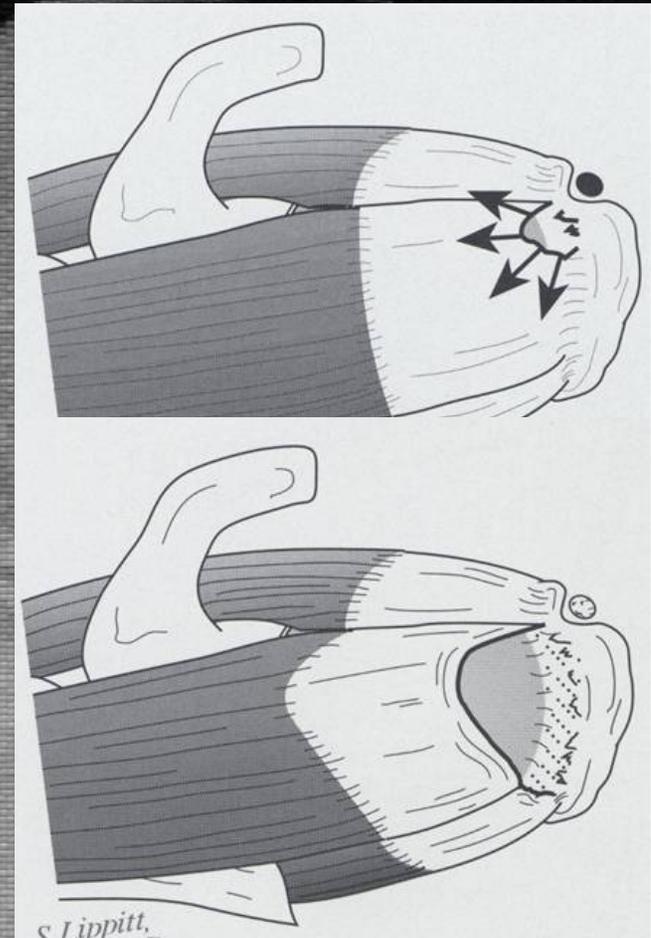
Consequences of rupture

- Retracted cuff fibers place additional tension on remaining microcirculation compromising cuff viability
- Increasing amounts of tendon are exposed to joint fluid which prevents tendon healing



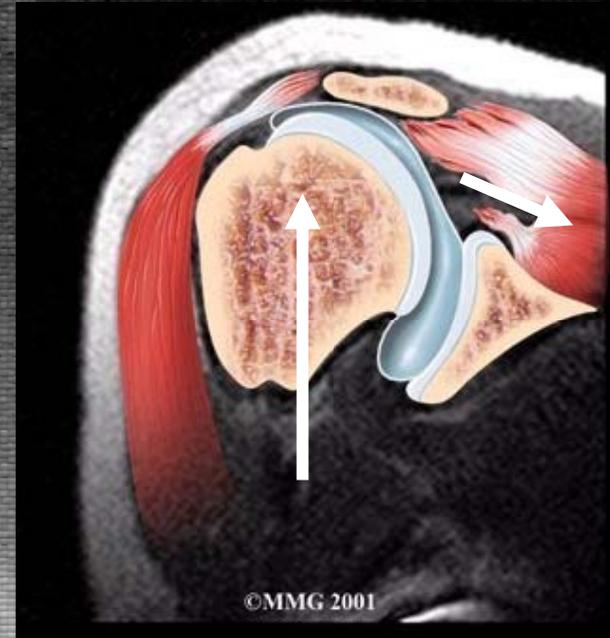
Full Thickness Tears

- Loads are concentrated at the margins of the tear
- Further tearing occurs with smaller loads
- *Partial tears become complete*
- *Smaller tears become large*
- *Large tears eventually become unfixable*



Progressive Tearing

- Spacer effect of the cuff is lost
- Humeral head displaces superiorly
- Biceps tendon eventually ruptures



Early Cuff Failure

- Compression of the humeral head is less effective
 - Deltoid pulls head upward
 - Upward pull of the deltoid results in cuff abrasion & further cuff damage



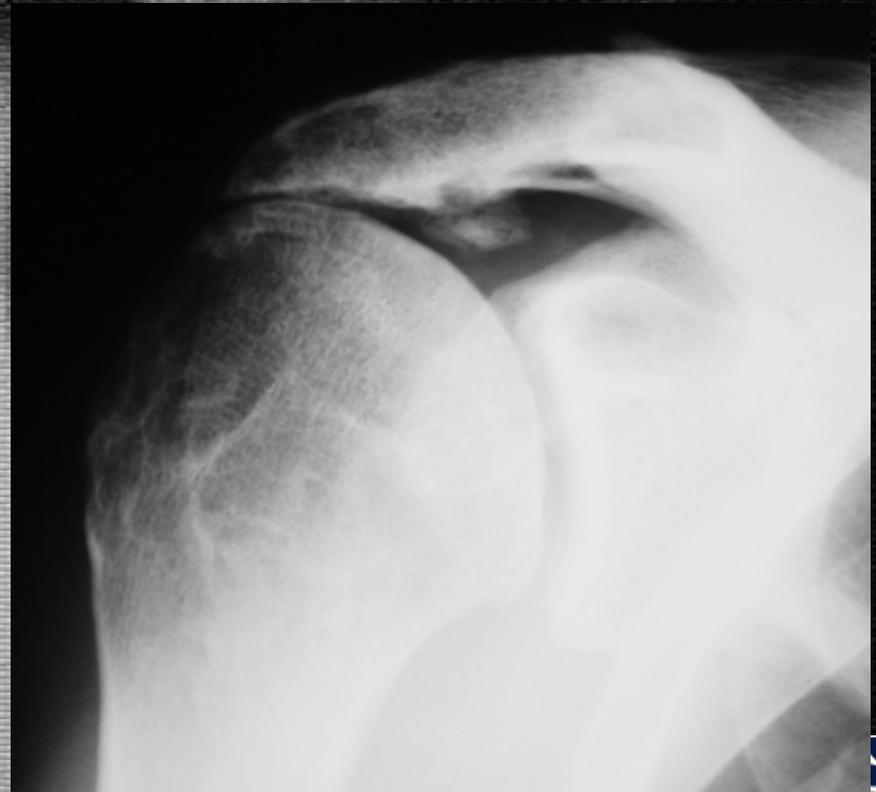
Late Cuff Failure

- Traction spurs develop in CA ligament
- Humeral head penetrates through the cuff tear



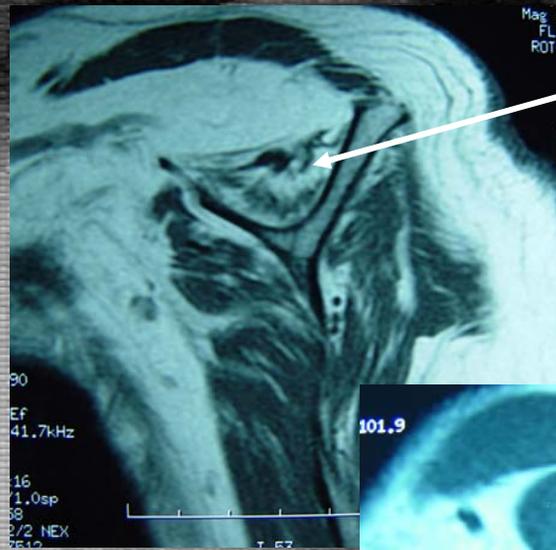
Chronic Cuff Failure

- Humeral head forms a joint with the arch above
- Secondary joint disease occurs called *cuff tear arthropathy*



Chronic Cuff Tears

- Muscle atrophy
- Fatty infiltration of muscle belly
- Tendon retraction
- Bone osteoporosis
- Loss of muscle and tendon excursion
- Irreversible
- Progressively worse



Fatty infiltration
with muscle
wasting



Healthy
muscle, no
fat stripes

Prevalence of Rotator Cuff Tears

- Cadaver studies 7-40%
- MRI & Ultrasound studies
 - 34% of asymptomatic individuals
 - 54% of asymptomatic individuals over 60y
- Ultrasound study
 - 13% of asymptomatic individuals: 50-59y
 - 51% of asymptomatic individuals: over 80y



Prevalence of Rotator Cuff Tears

- 40%: no history of strenuous physical labor
- 50%: no history of trauma
- Frequently bilateral
- Many heavy laborers never get cuff tears



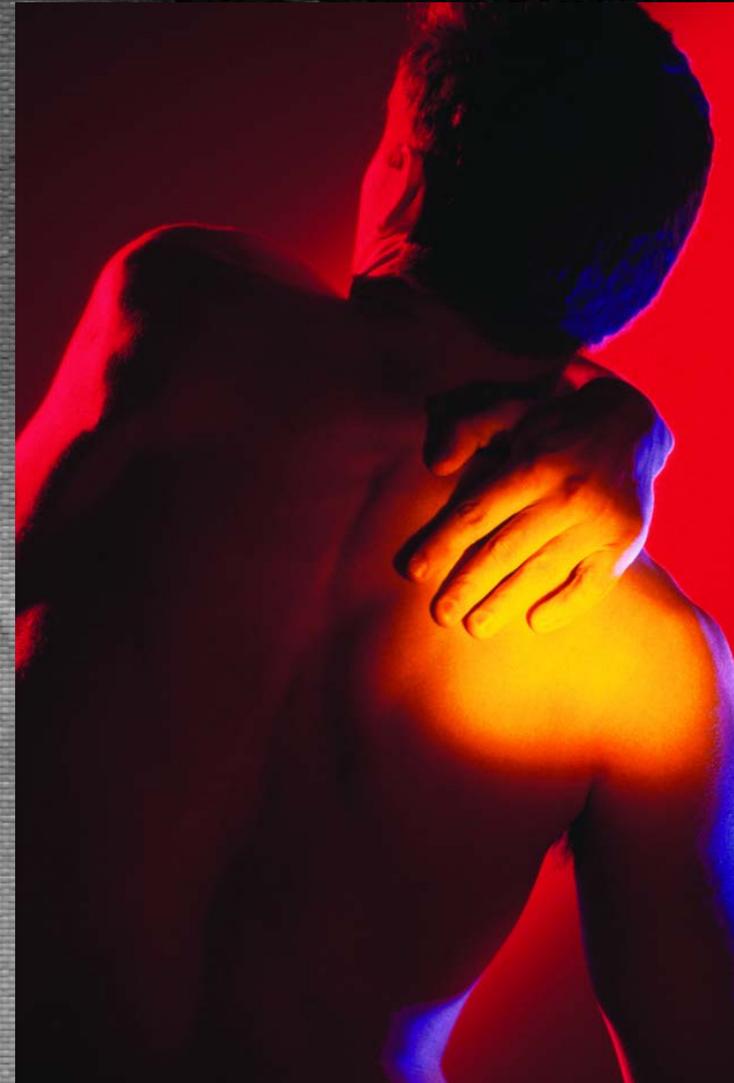
Healing Potential

- None without surgery
 - Cuff tears never heal spontaneously
 - Without a blood supply, there is never any chance a cuff healing spontaneously
- 40% progress to larger tears
- 51% of asymptomatic RCT become symptomatic



Patient History

- Important things to know
 - Chronic symptoms or acute exacerbation
 - Stiffness, loss of motion
 - Weakness (when)
 - Functional impairment
 - Catching, crepitus, grinding
 - Treatments and response



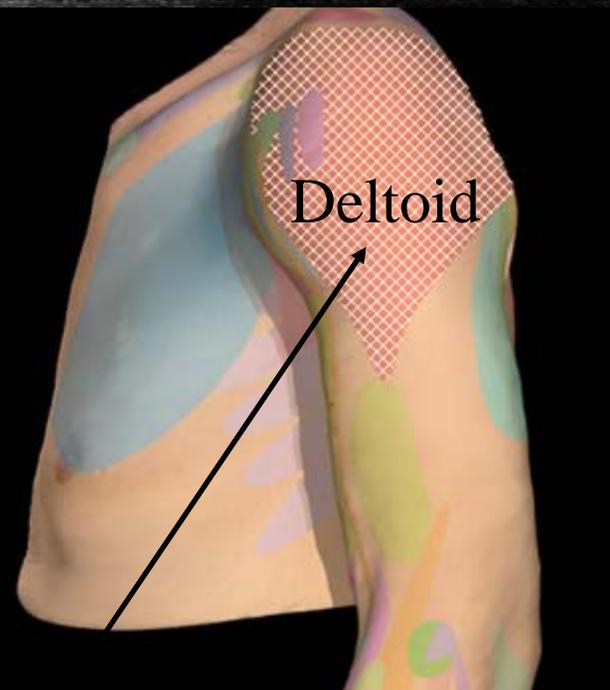
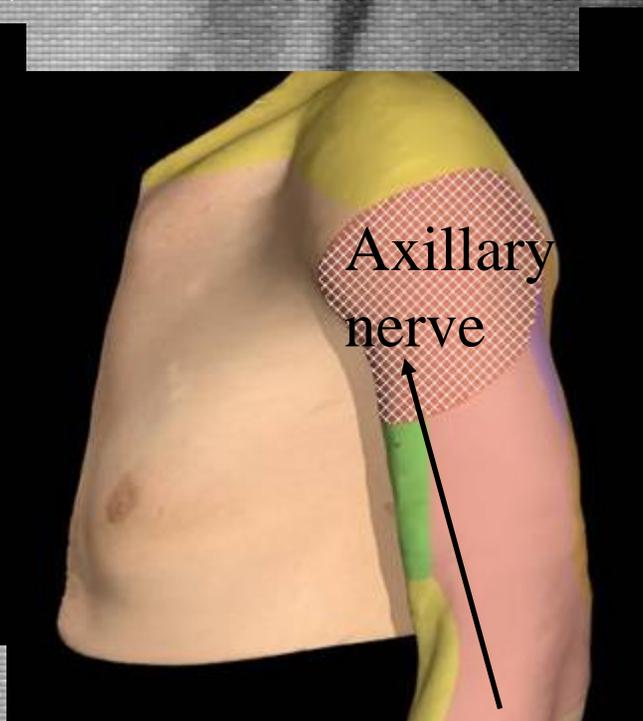
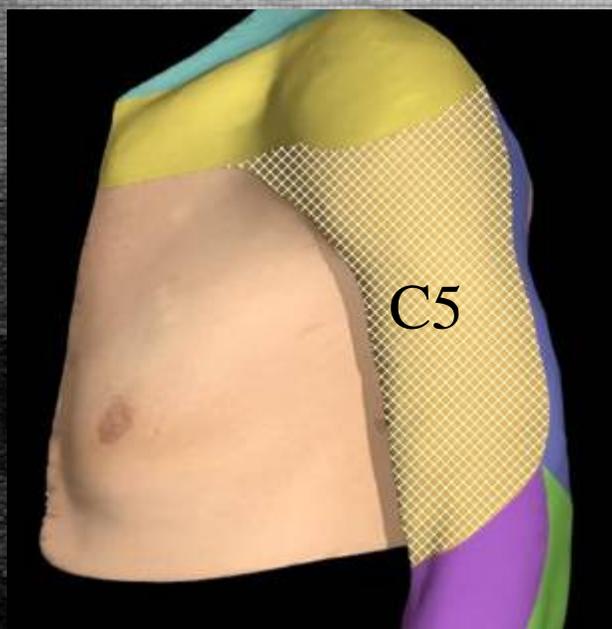
Shoulder Pain with Cuff Tears

- Rotator cuff pain
 - Constant ache
 - Varies with activity
 - Night pain
 - Wake up with position change
 - May be severe
 - Constant or intermittent



Rotator Cuff Shoulder Pain

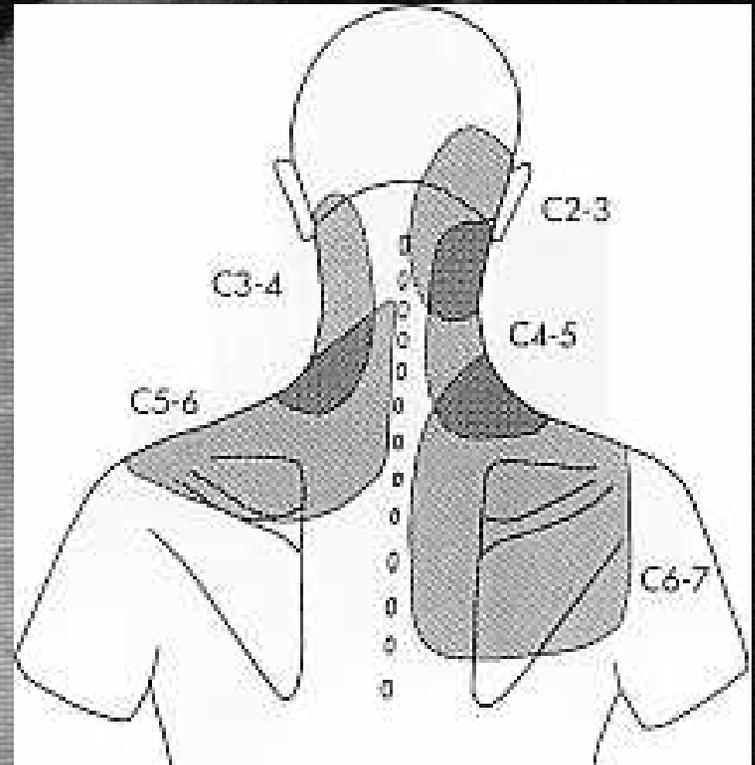
- Deep, dull, diffuse ache



The pain from rotator cuff pathology is often referred to the outer part of the arm. Sometimes as far as the elbow.

Non Rotator Cuff Shoulder Pain

- Pain to the *back* of shoulder upper back or neck
- Pain to top of shoulder
 - Think arthritis of the neck
- Pain *beyond* the elbow
 - Think pinched nerve in the neck



Timing of Pain

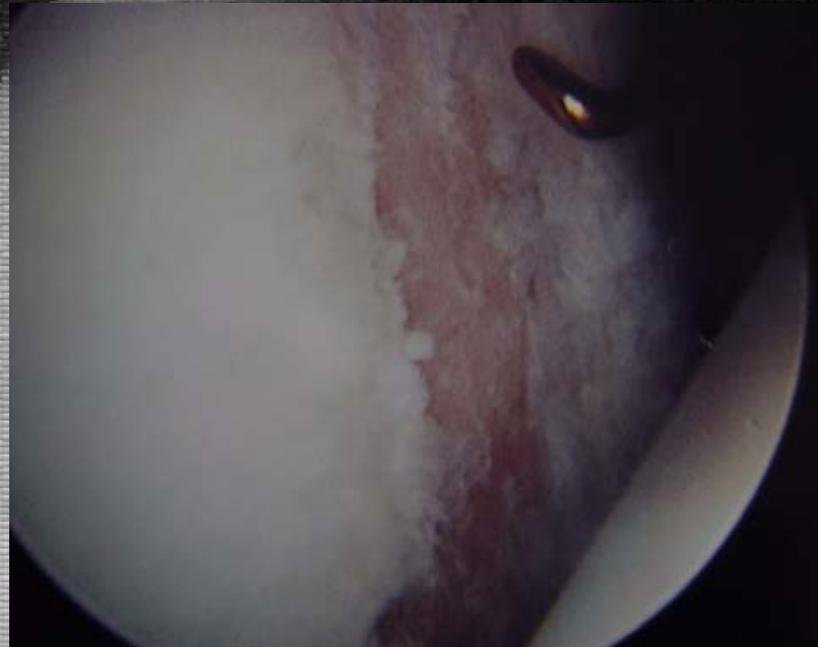
- Rest Pain (constant)
 - Synovitis
(Inflammation of the joint)



- Calcific tendinitis or bursitis (constant and intense)
- Calcification**

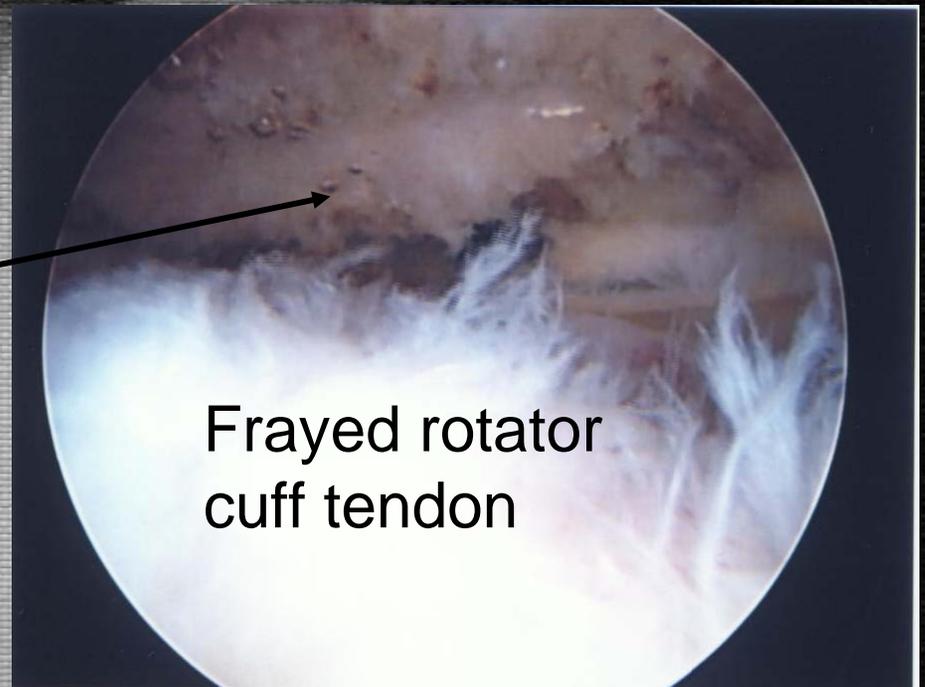
Timing of Pain

- Pain in mid range of motion
 - Arthritis - Damaged joint surface
 - Inflamed irregular joint surface
 - Inflamed tissues

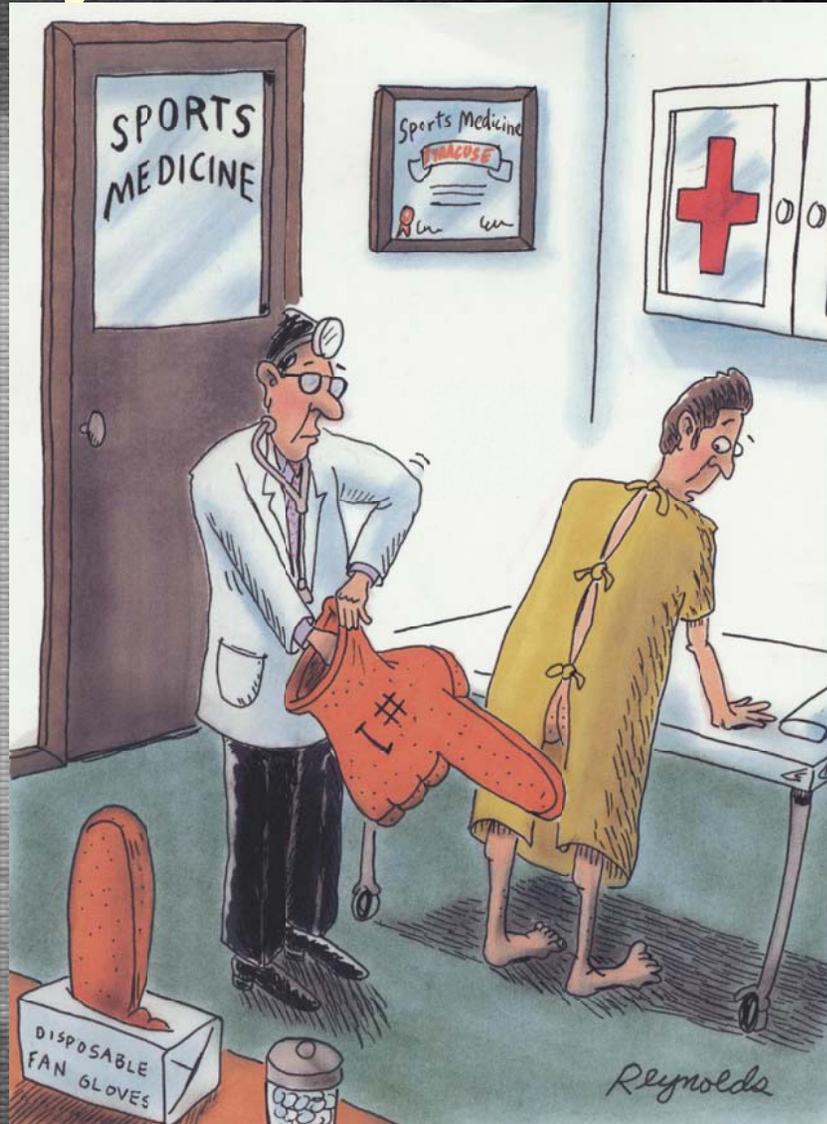


Timing of Pain

- Pain at the end of the range of motion
 - Impingement pain
 - Bone spurs
 - Pinched and stretched tissues around the shoulder joint

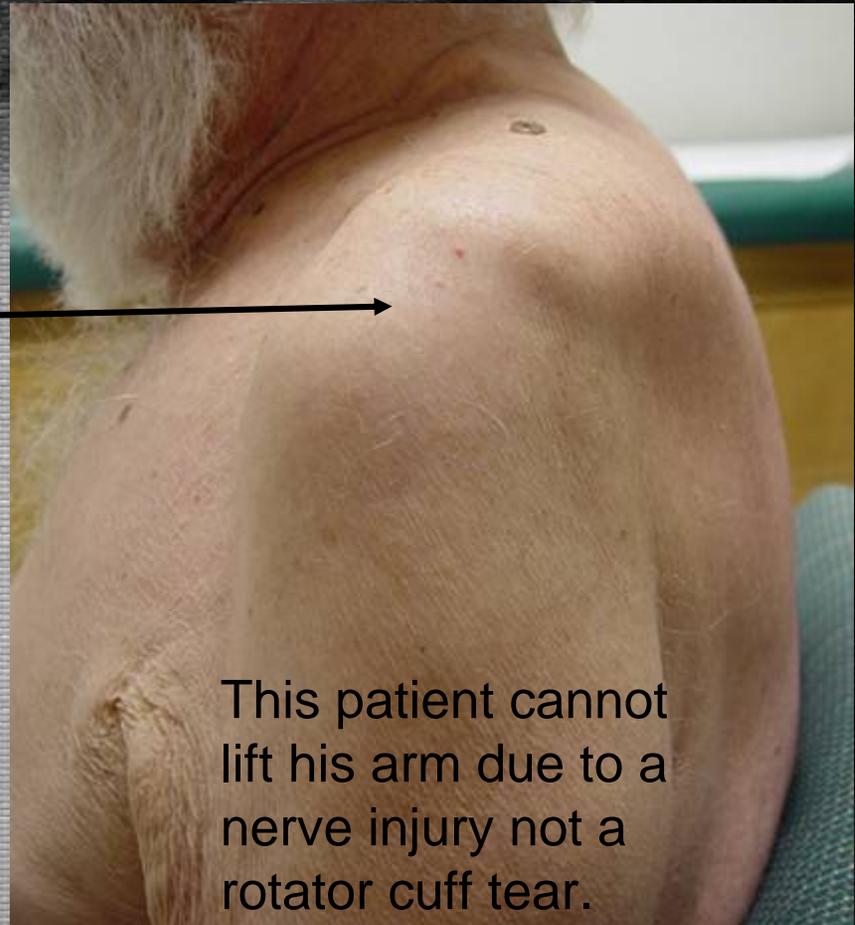


Physical Examination



Physical Examination

- Inspection
 - Symmetry
 - Atrophy
 - AC prominence
 - Biceps rupture



Range of Motion

- Range of Motion
 - Active and passive
 - Forward elevation
 - ER @ side
 - ER in abduction
 - Internal rotation



Rotator Cuff Weakness

- May be due splinting from pain
- Significant only if present after a xylocaine block
- Weakness after an injury
 - Rotator cuff tear
 - Suprascapular
 - Axillary
 - Brachial plexus
 - Cervical disk herniation



Strength Testing

- Assess elevation, abduction, ER, IR strength
- Compare to opposite side
- If weak, check reflexes



External Rotation Weakness

- Supraspinatus &/or infraspinatus
- Small tears
 - Minimal if any weakness noted
- Large tears
 - Weakness notable
 - May result in inability to maintain external rotation
 - Fall off into internal rotation



Impingement Signs

Neer



Hawkins



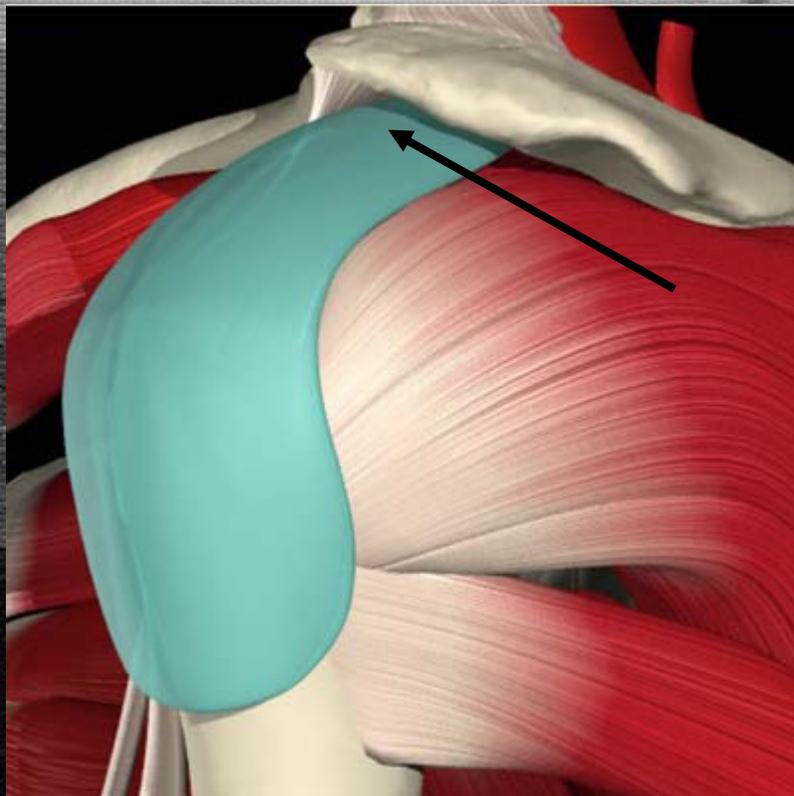
Impingement Test

- Subacromial injection of 10cc 1% xylocaine (often with a corticosteroid)
- Rotator cuff tear
 - Pain relieved, weakness persists
- Impingement (tendinitis), bursitis
 - Pain relieved, strength improves
- Adhesive capsulitis / arthritis
 - Pain persists, motion unchanged



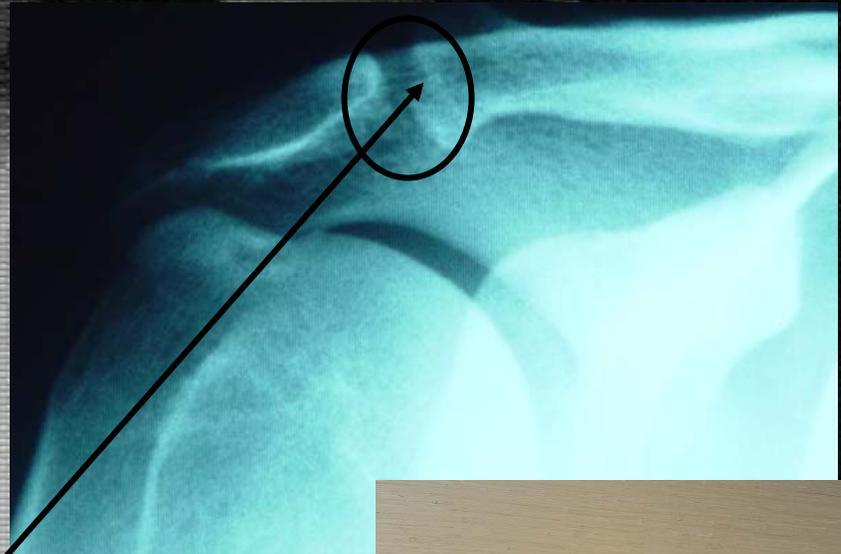
Impingement Test

- Subacromial injection of 1% xylocaine
 - At least 50% pain relief



AC Joint Exam

- Inspect for prominence
- Palpate for tenderness
- Provoke pain with “cross-body adduction”
- Relieve pain with 1cc xylocaine injection
- Consider arthritis and osteolysis



Best Tests for Diagnosing Cuff Tears

1. Weak supraspinatus testing
 - Arm in 90° forward elevation in scapular plane
2. Weakness in External Rotation
 - Arm at the side
3. Positive Impingement Sign



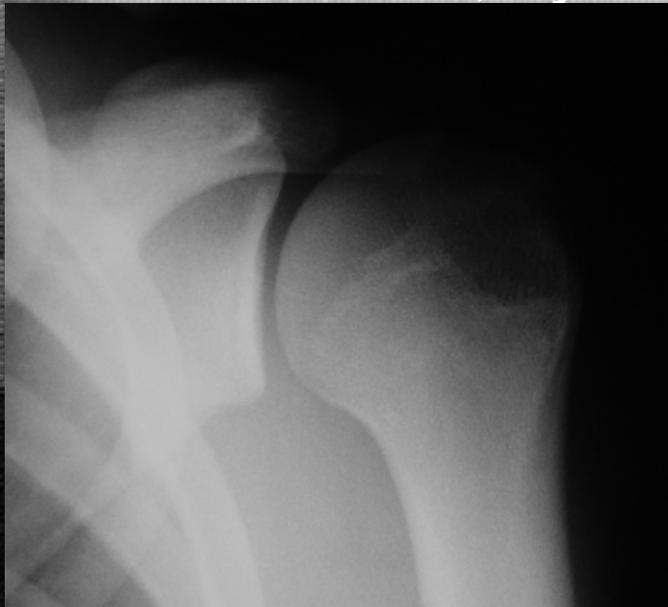
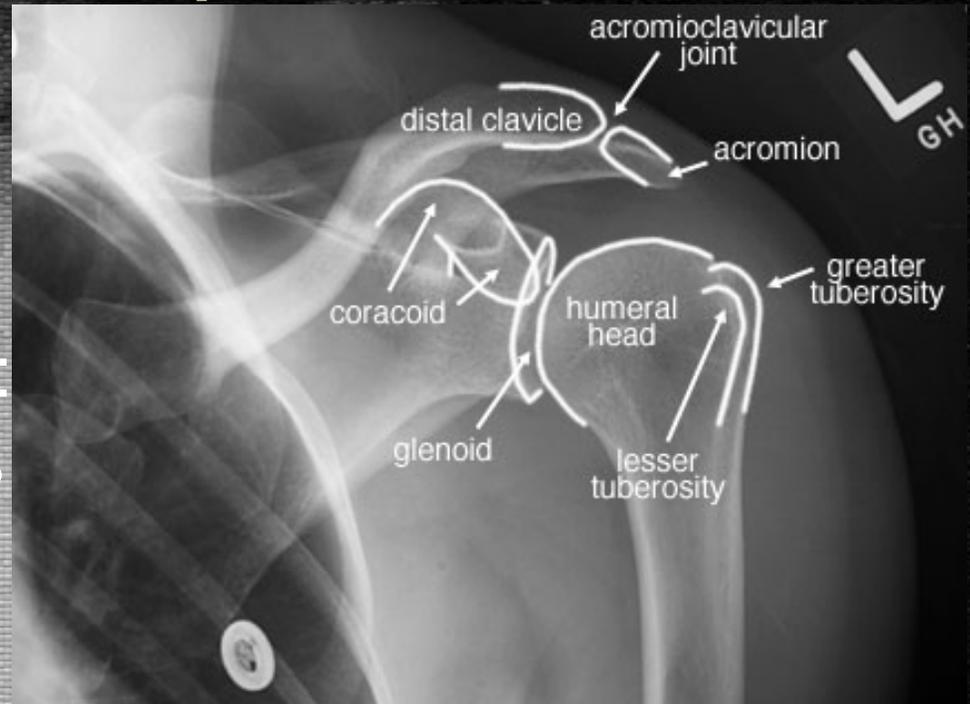
Radiographs

- Acromial shape
- Position of humeral head
- AC arthritis
- Calcific tendinitis
- Glenohumeral arthritis
- Destructive lesions



1 & 2: AP in Scapular Plane

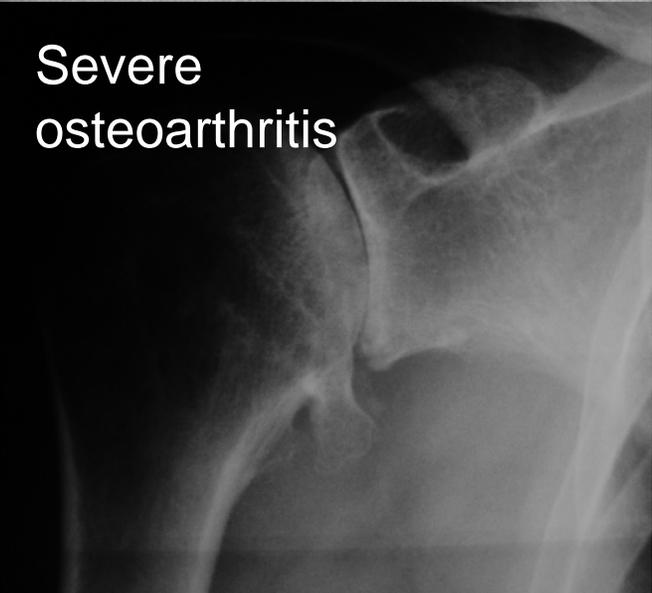
- 2 Views: IR, ER
- Calcium deposits
- Greater tuberosities: excrescences, cysts



1 & 2: AP in Scapular Plane

- 2 Views: IR, ER
- Calcium deposits
- Greater tuberosities: excrescences, cysts

Severe
osteoarthritis

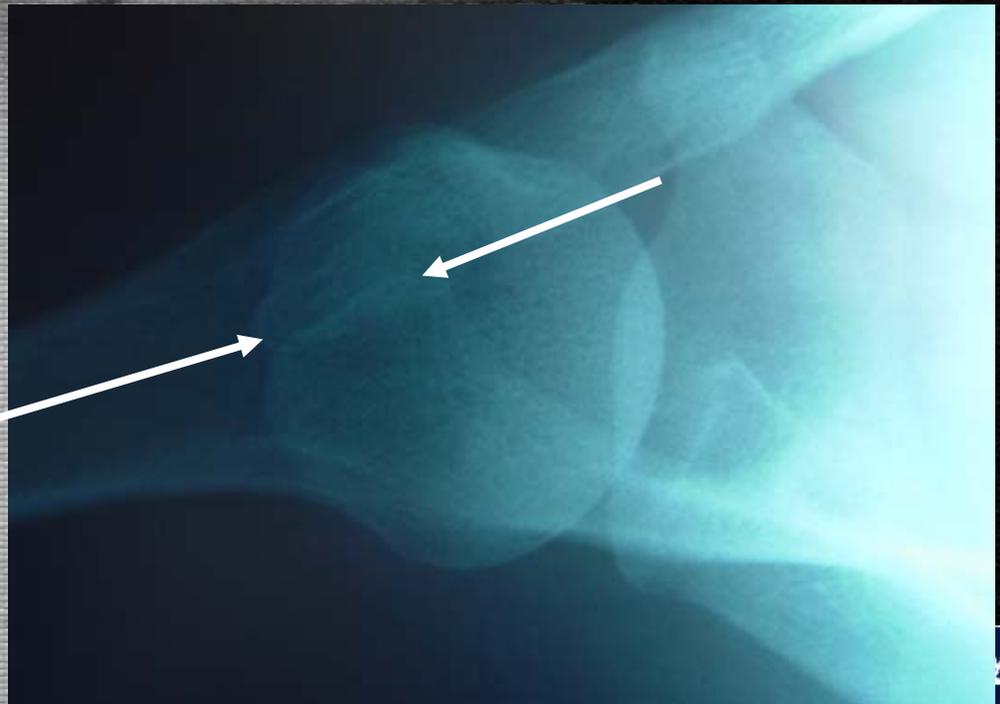


Moderate
osteoarthritis



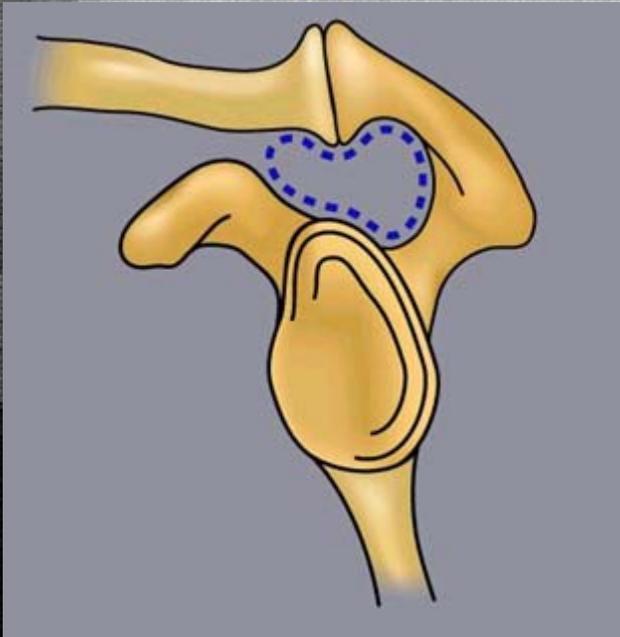
3: Axillary View

- Evaluate GH joint & tuberosities
- Glenoid version
- Joint space narrowing
- Os acromiale
 - This is an anatomic variation best seen on this special view



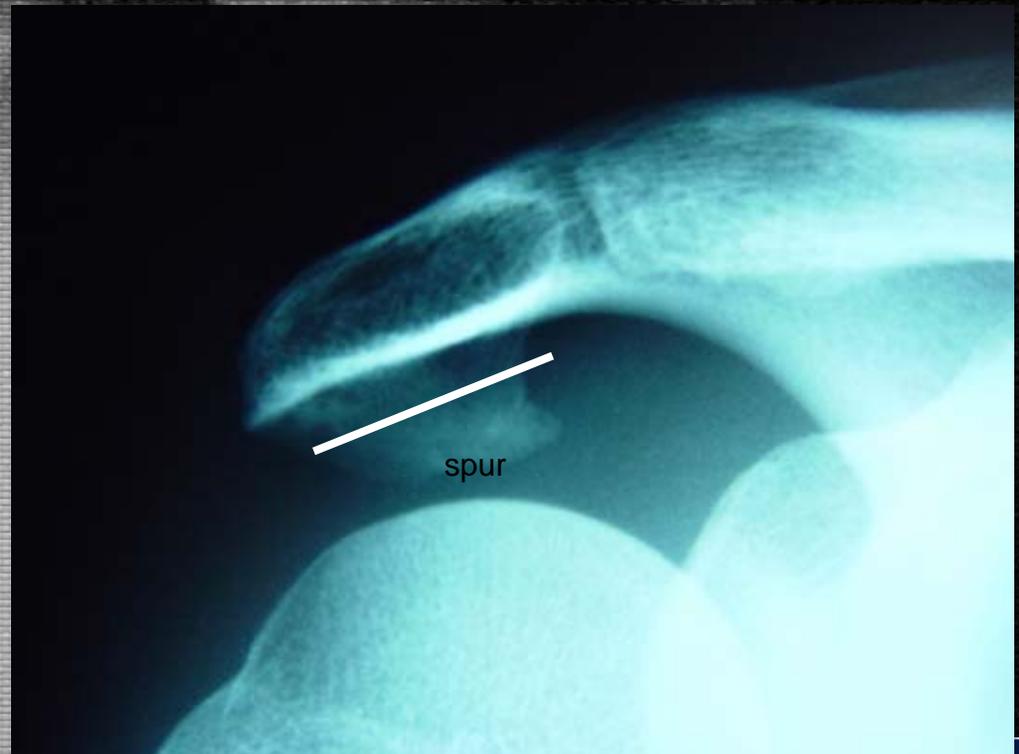
4: Outlet View

- Evaluate subacromial space
- Acromial shape and thickness



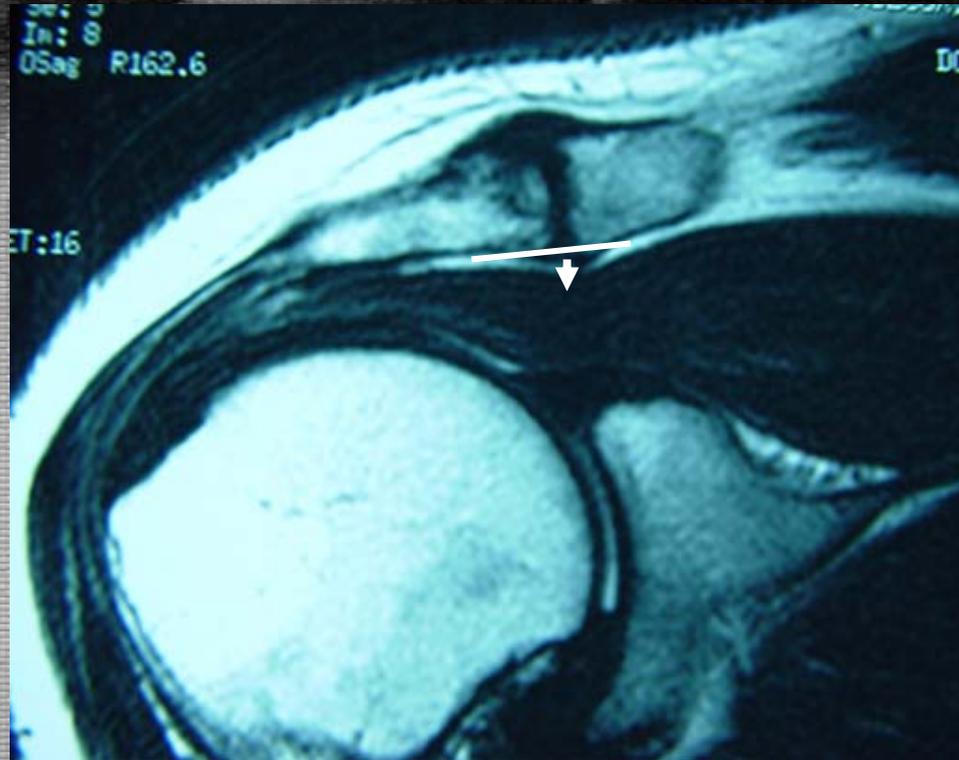
5: 30° Caudal Tilt View

- AP view with a 30° caudal tilt
- Demonstrates anterior acromial projection



Tendon Imaging

- MRI
 - 90% accurate in diagnosing *complete* RC tears
 - 70% accurate in diagnosing *partial* RC tears
 - These data may vary. It depends on who is reading the MRI.



This spur is pushing on the rotator cuff causing “impingement”.



Best Studies for Diagnosing Cuff Tears

Full Thickness Tears	Accuracy
Clinical Exam	0.4
Ultrasound	0.7
MRI	0.7
Arthroscopy	0.9
Partial Thickness Tears	<0.2 for all studies

DETECTION AND QUANTIFICATION OF ROTATOR CUFF TEARS

COMPARISON OF ULTRASONOGRAPHIC, MAGNETIC RESONANCE IMAGING,
AND ARTHROSCOPIC FINDINGS IN SEVENTY-ONE CONSECUTIVE CASES

BY SHARLENE A. TEEFEY, MD, DAVID A. RUBIN, MD, WILLIAM D. MIDDLETON, MD, CHARLES F. HILDEBOLT, MD,
ROBERT A. LEIBOLD, MD, AND KEN YAMAGUCHI, MD

Investigation performed at Mallinckrodt Institute of Radiology, St. Louis, Missouri

Overall Detection Accuracy	Full thickness	Partial Thickness
Ultrasound	98%	68%
MRI	100%	63%

JBJS, 86-A, April, 2004



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

DETECTION AND QUANTIFICATION OF ROTATOR CUFF TEARS

COMPARISON OF ULTRASONOGRAPHIC, MAGNETIC RESONANCE IMAGING,
AND ARTHROSCOPIC FINDINGS IN SEVENTY-ONE CONSECUTIVE CASES

BY SHARLENE A. TEEFEY, MD, DAVID A. RUBIN, MD, WILLIAM D. MIDDLETON, MD, CHARLES F. HILDEBOLT, MD,
ROBERT A. LEIBOLD, MD, AND KEN YAMAGUCHI, MD

Investigation performed at Mallinckrodt Institute of Radiology, St. Louis, Missouri

	Full thickness	Partial Thickness
Ultrasound	73% (retraction) 87% (width)	85% (length) 54% (width)
MRI	63% (retraction) 85% (width)	75% (length) 75% (width)

JBJS, 86-A, April, 2004



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

Nonoperative Treatment

- Helpful in ~50% (33-92%)
- Acute rupture
 - 75% may have reduced pain with therapy
 - But the tendon tear will never heal without surgery.
- Chronic pain (>6 months)
 - poor response with therapy



My Approach

- Chronic pain, no or minimal weakness
 - PT for 3-6 weeks
 - MRI if not improving in 4-6 weeks
 - MRI after 6 weeks if improving but @ plateau
 - MRI if still in pain but patient does not want surgery



My Approach

- Acute pain, weakness
 - Office evaluation
 - X-rays
 - Injection
 - MRI
 - May be age dependent



Analyzing the Data

- If the weakness and pain are inconsistent with MRI findings
 - Look for other causes
 - C spine, nerve injuries
 - Consider multiple causes
 - Older patients with dislocations
 - Concurrent cuff tears, brachial plexus injuries, or axillary nerve injuries



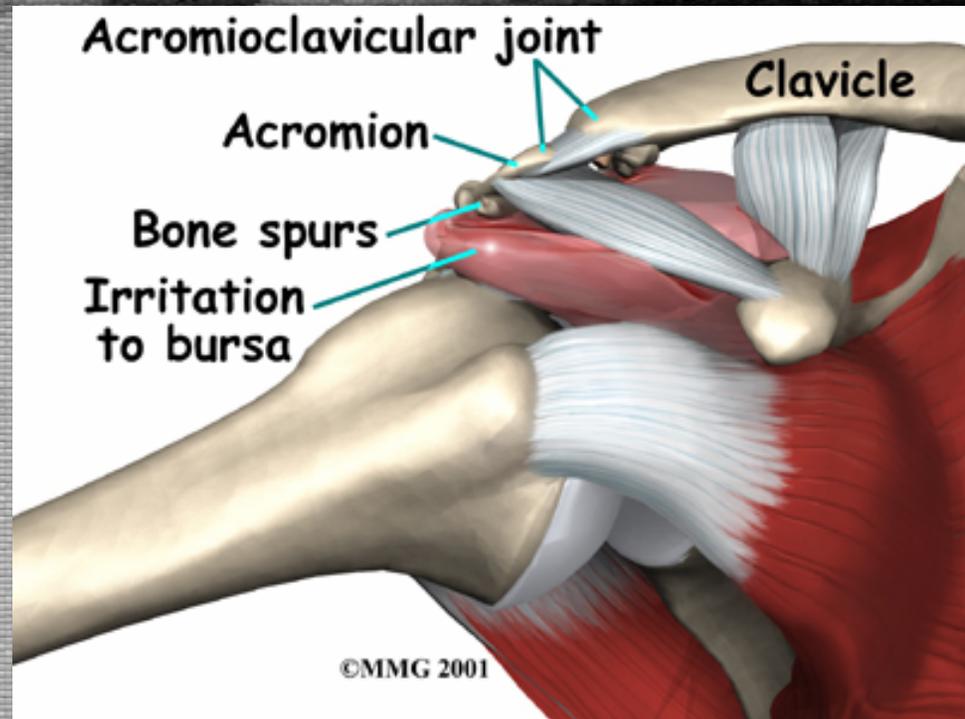
Surgical Indications

- Patient dependent
- Impingement syndrome & Partial tears
 - Pain with functional impairments
 - Failure to respond to nonoperative treatment
- Chronic tears
 - Consider 3-4 months of nonsurgical treatment
- Acute tears
 - Best results if repaired within 3 weeks

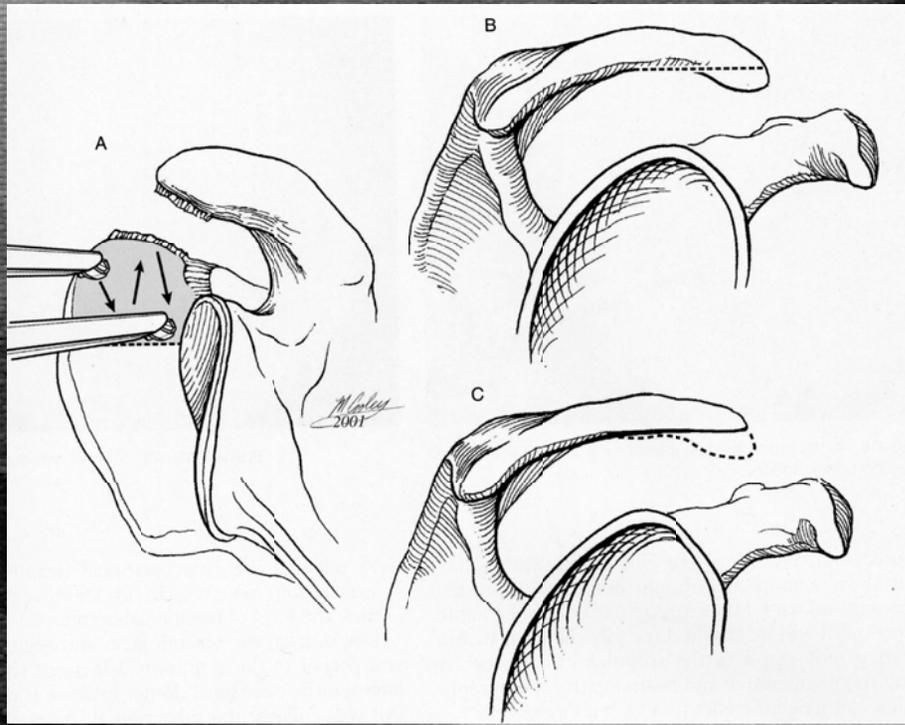


Arthroscopic Acromioplasty

- Relieves impingement between the CA arch & the cuff
- Performed with arthroscopic or mini-open cuff repair



Technique of Arthroscopic Acromioplasty



- Bone spurs can be removed through small arthroscopic incisions by using a motorized burr.



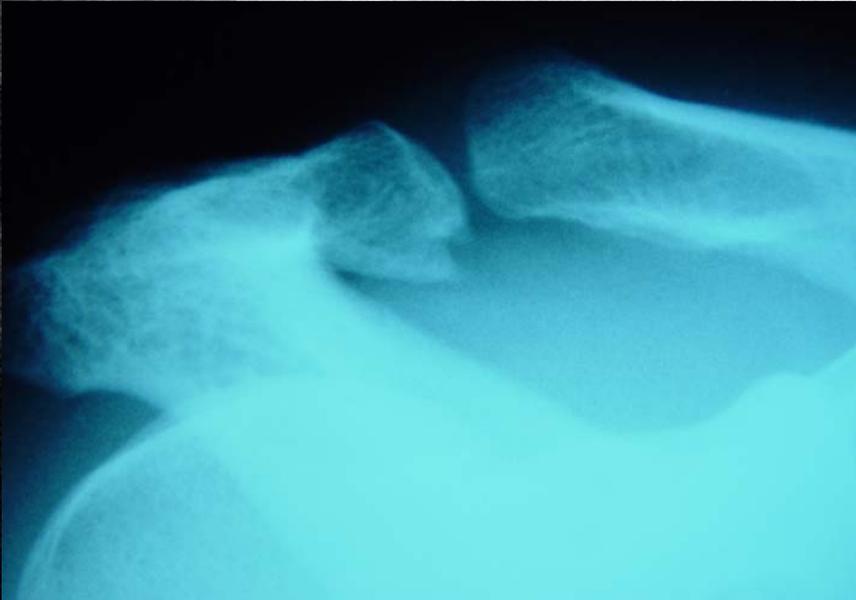
Arthroscopic v. Open Acromioplasty

- Arthroscopic group do better in first 3 months
- After 3 months, both methods give equal results
- Long-term: no difference
- 90% excellent results



Post-op Arthroscopic Acromioplasty

- Sling for 1-2 days
- Begin active motion immediately
- Advance as tolerated



Post-op Arthroscopic Acromioplasty

- Anticipated post-op goals
 - 1 month: Full motion (range 1-4 weeks)
 - 12 weeks: 75% functional recovery
 - 6 months: Full recovery



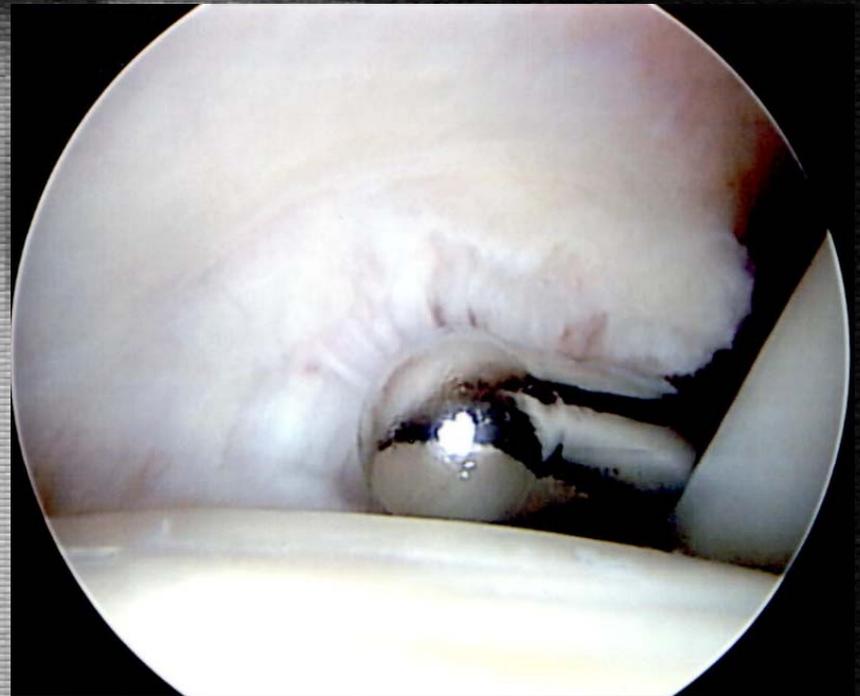
Surgery for Partial Thickness Tears

- Debridement alone
- Debridement and acromioplasty
- Acromioplasty, excision of damaged tendon with primary repair



Partial RCT: Debridement Alone

- Young athletes and workers
- Failed nonoperative therapy
- Tears related to overuse not impingement
- 80-85% success



Partial Tendon: Debridement & Acromioplasty

- Older patients
- Partial tear is debrided if $\leq 50\%$ tendon thickness
 - Remove free flaps of torn tendon edge
- Remove the bone spurs
 - Performed arthroscopically



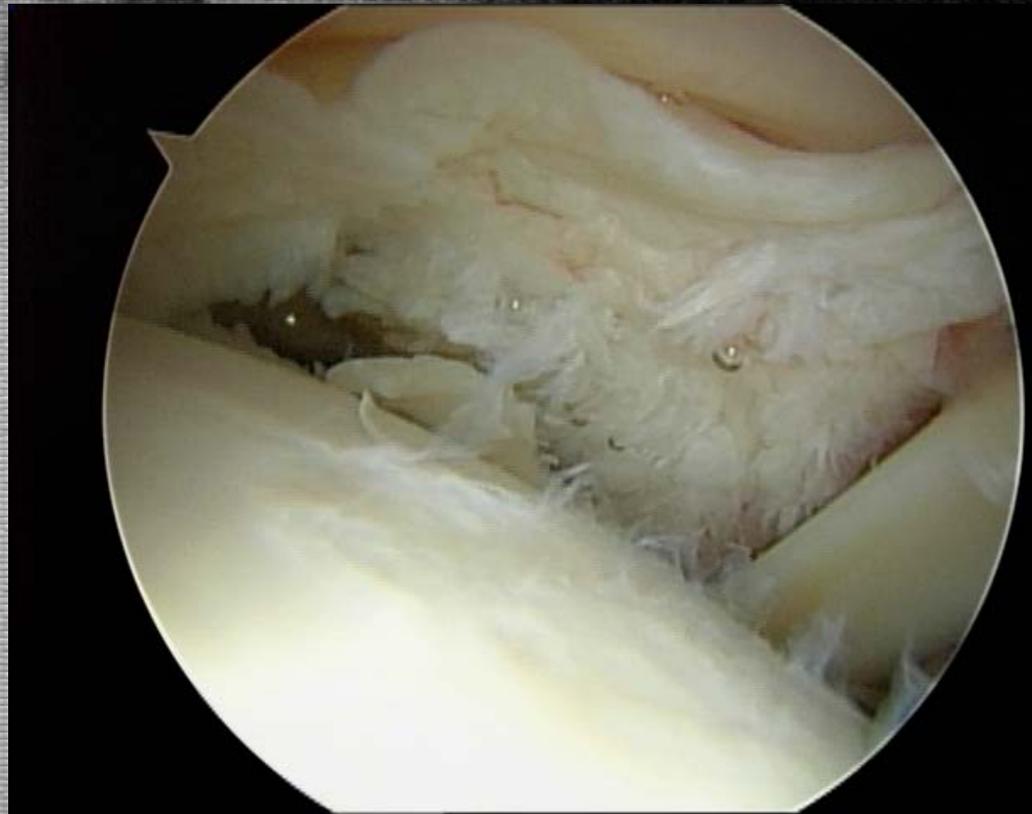
Partial Tendon Tears: Acromioplasty, Excise and 1^o Repair

- For tears **>50%** tendon thickness
- Post-op treat same as a full thickness RC repair



Full Thickness Cuff Tears

- Arthroscopic repairs
- Mini-open repairs
- Open repairs



The Outcome and Repair Integrity of Completely Arthroscopically Repaired Large and Massive Rotator Cuff Tears

- *Massive defined as > 2 cm*
- *17 of 18 retears @ 12 months post op (94%)*
- *2/3 improved after surgery*
- *Not doing as well @ 24 mo.*

- *“An arthroscopic repair arguably may not be the most appropriate procedure for a younger person with a massive tear in whom long-term strength is more important...”*



Cuff Integrity Following Arthroscopic v. Open Rotator Cuff Repair

- American Shoulder and Elbow Surgeons Meeting
- Intact Cuffs are associated with better strength and outcome scores

Intact by MRI after 1 year	Open Repair	Arthroscopic Repair
Tears < 3cm	74%	84%* → 82%
Tears > 3cm	62%	24%* → 21%

- *Bishop, Flatow, et.al., ASES Meeting, March 2004
- Bishop, Flatow, et.al., ASES Meeting, October 2004

ARTHROSCOPIC REPAIR OF FULL-THICKNESS TEARS OF THE SUPRASPINATUS: DOES THE TENDON REALLY HEAL?

BY PASCAL BOILEAU, MD, NICOLAS BRASSART, MD, DUNCAN J. WATKINSON, FRCS,
MICHEL CARLES, MD, ARMODIOS M. HATZIDAKIS, MD, AND SUMANT G. KRISHNAN, MD

*Investigation performed at the Department of Orthopaedic Surgery and Sports Traumatology,
Hôpital de L'Archet, University of Nice, Nice, France*

- 65 patients, 2 1/2 year follow up
- All arthroscopic repair
- CT-arthrogram evaluation post-op
- 71% healed, 95% patient satisfaction
- **Healed tendons were stronger w/ better function**
- *Factors negatively impacting healing rate*
 - Age over 65y
 - Larger tears (Delamination of subscap and infraspinatus tendons)



Arthroscopic versus mini-open rotator cuff repair: A comparison of clinical outcomes and patient satisfaction

Thomas Youm, MD, Doug H. Murray, MD, Erik N. Kubiak, MD, Andrew S. Rokito, MD, and Joseph D. Zuckerman, MD, New York, NY

- Studied 84 patients with tears smaller than 5 cm (=massive tears)
- Found **equivalent** results regarding patient satisfaction between mini-open and arthroscopic repair at 2 years
- Results determined by subjective scoring system



Arthroscopic versus mini-open rotator cuff repair: A comparison of clinical outcomes and patient satisfaction

Thomas Youm, MD, Doug H. Murray, MD, Erik N. Kubiak, MD, Andrew S. Rokito, MD, and Joseph D. Zuckerman, MD, New York, NY

- Issues with this study
 - Healing time was the same in the 2 groups
 - MRI s were not performed to evaluate cuff integrity which impacts long term success
 - 2 years may not be a long enough follow up on young active patients or those who perform physical labor



Outcome and Patient Satisfaction of Arthroscopic Rotator Cuff Repair v. Mini-open Cuff Repair

Compared 2 groups of patients with tears
of various sizes

- 24-70 month follow up: equivalent functional and patient satisfaction scores (UCLA and ASES scores)
- Despite less post-operative morbidity in ARCR, mid-term results are equivalent

Youm, Rokito, et.al., ASES Meeting , March, 2004



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

Cuff Integrity and Outcome in Open Repairs

- Prospective study, 47 patients
- MRI at 1 year post op
- Overall 69% intact
 - Tears < 3cm: 74% intact
 - Tears > 3cm: 62% intact
- Intact cuffs yielded a better functional outcome
- Patients with retears still had improved clinical outcomes including strength

Kleppe, Flatow, et.al., AJSM, 32, 7, 2004



Other Literature

- Harryman, JBJS, 1991
 - 80% 1 tendon tears intact at follow up
 - 57% 2 tendon tears
 - 32% 3 tendon tears
 - Better results with an intact repair
- Liu & Baker, Arthroscopy, 1994
 - 66% intact with mini-open repair
 - Tear size correlated with cuff integrity at follow up
 - Functional outcome did not correlate with cuff integrity



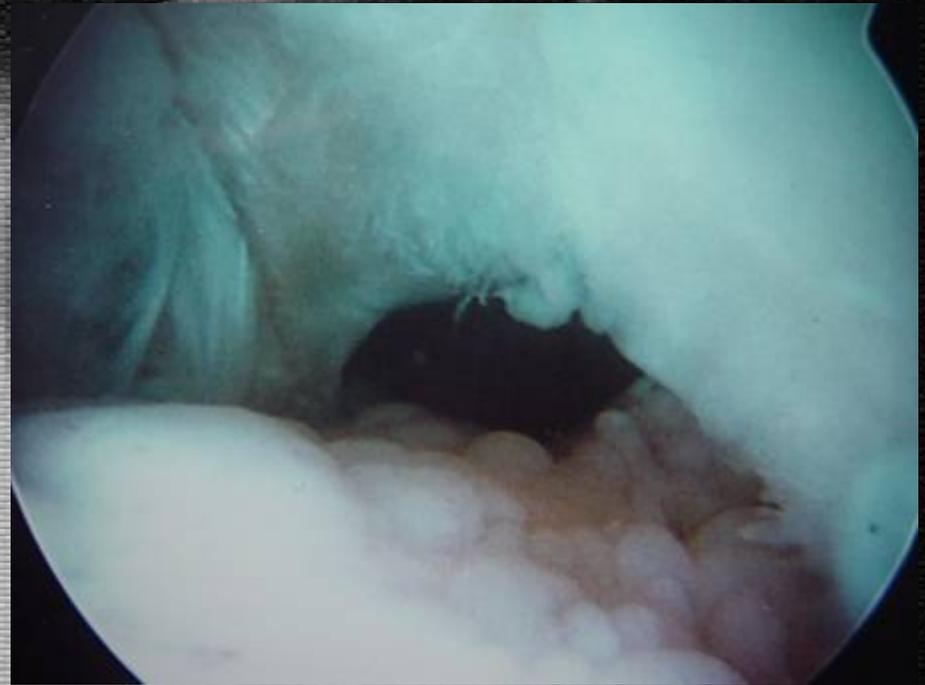
Other Literature

- Thomazeau, Clinics in Orthopedics, 1997
 - 73% intact
 - Better outcome correlate with intact repair
- Gerber, JBJS, 2000
 - 66% intact, massive 2 tendon tears
 - Better results with intact repairs



Arthroscopic Cuff Repair

- Arthroscopy allows for a more complete evaluation of the joint and tendon
- Removal of bone spurs
- Rotator cuff repair using anchors



Arthroscopic Cuff Repair

- Advantages
 - Improved joint assessment, incl. biceps
 - Improved tendon mobilization
 - Decreased surgical trauma to deltoid
 - Faster rehabilitation (in first 3 months)



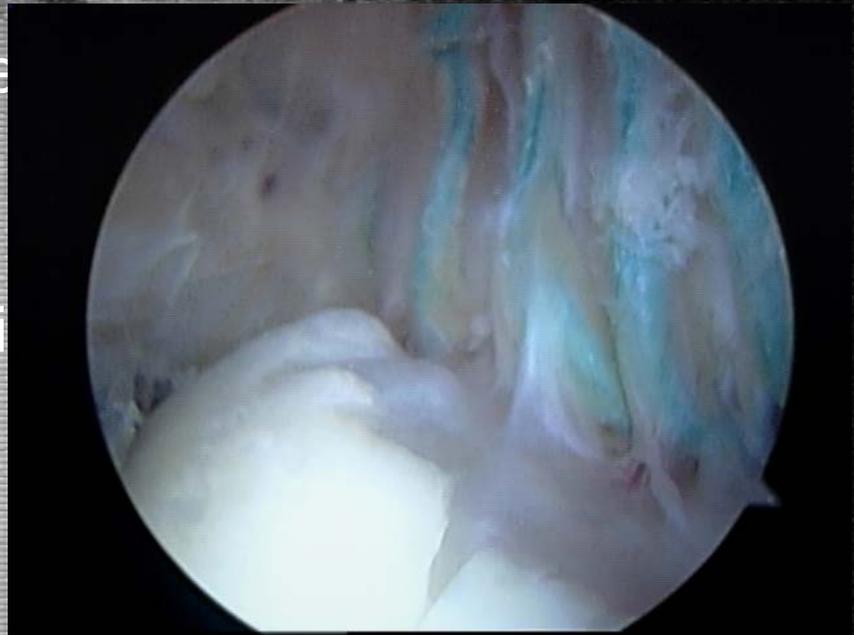
Arthroscopic Cuff Repair

- Advantages
 - Earlier return to function
 - 6 weeks to heal, 6 months for overhead work
 - Less Pain
 - No evidence of this
 - Shorter hospitalization
 - Every cuff repair goes home the day of surgery
 - Cosmetic
 - Multiple smaller incisions vs. one incision

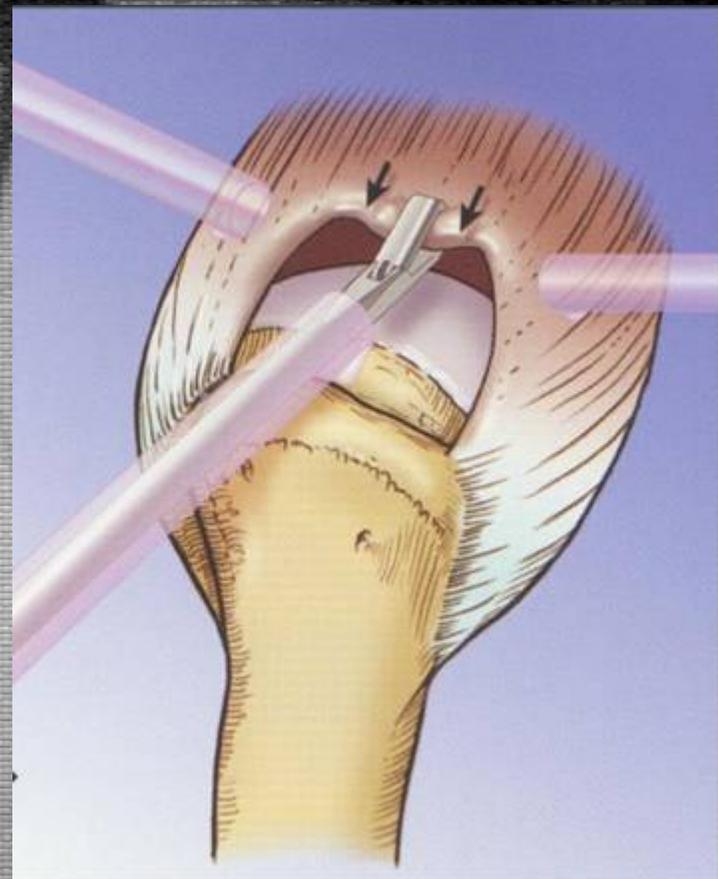
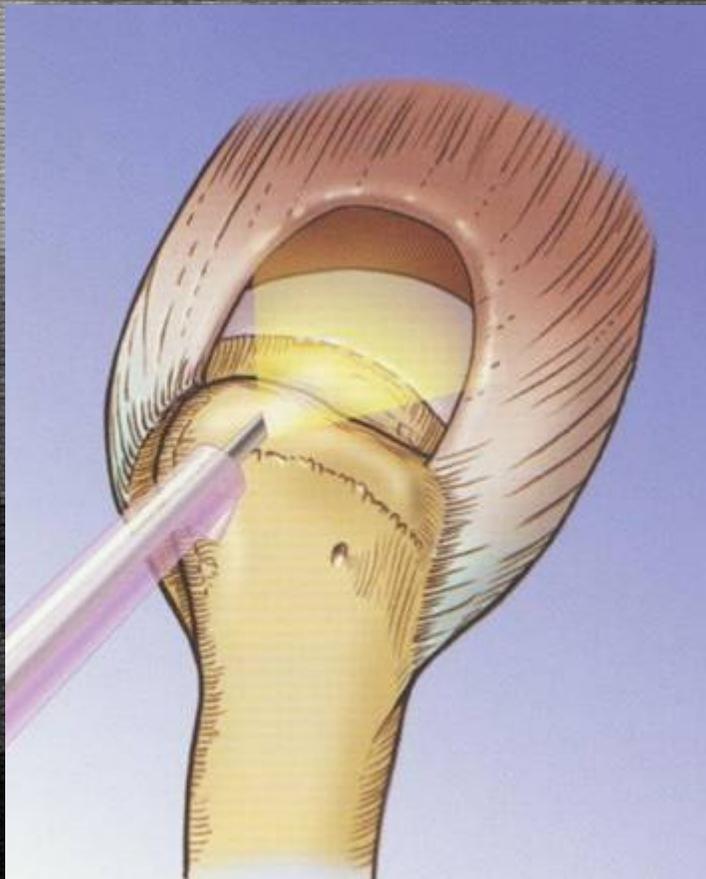


Arthroscopic Cuff Repair

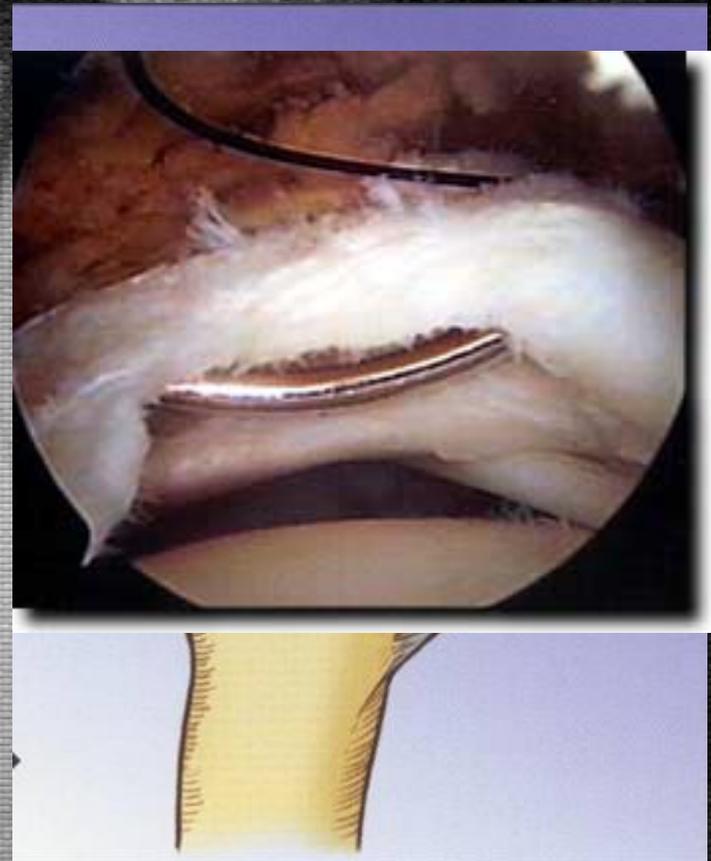
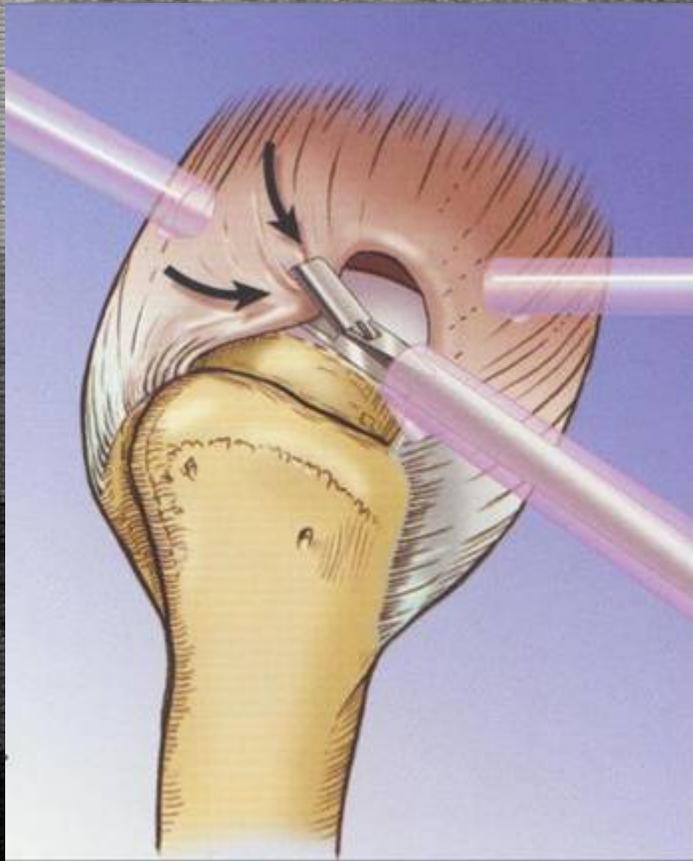
- Disadvantages
 - Longer operative time
 - Cannot place tendon gripping sutures
 - Anchors less secure in weak bone
 - Anchors are costly
 - No studies have proven the long term results to be superior to mini-open repairs



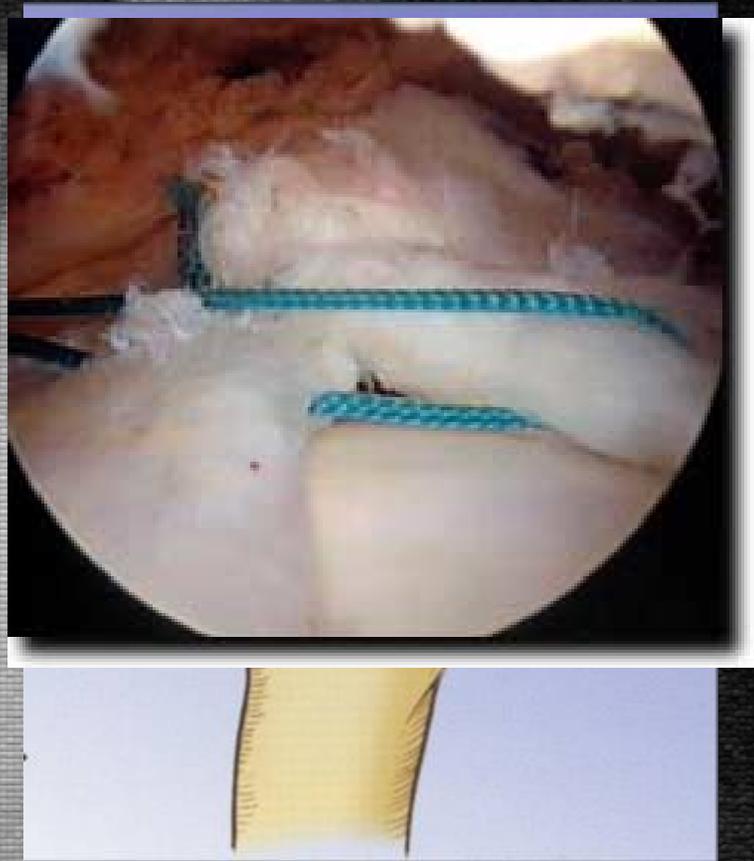
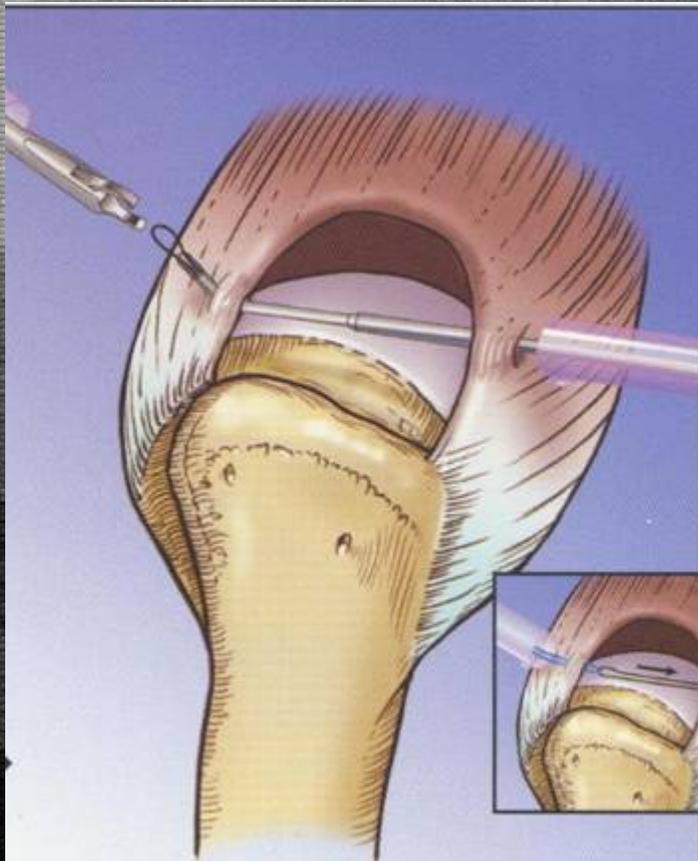
Arthroscopic Cuff Repair



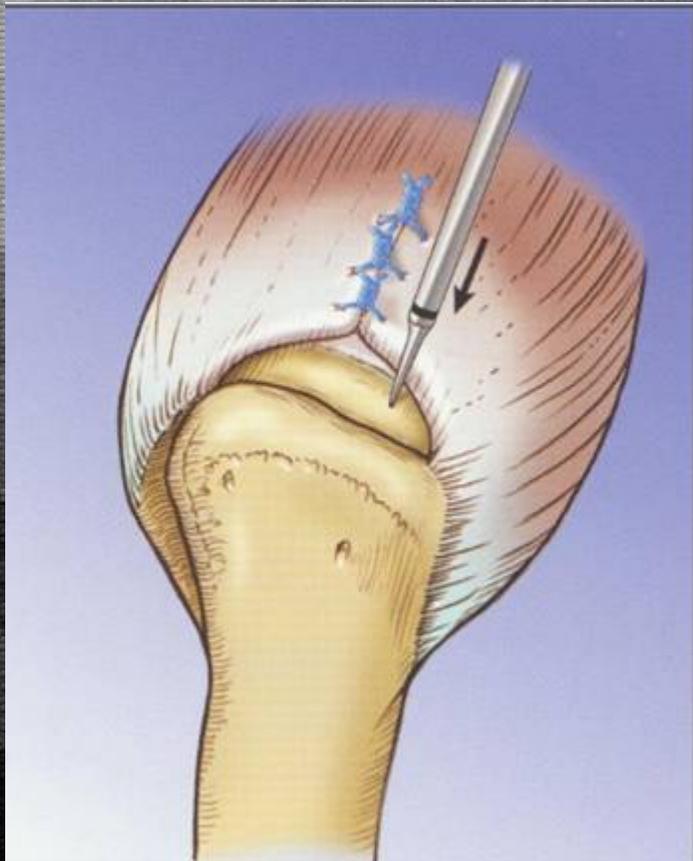
Arthroscopic Cuff Repair



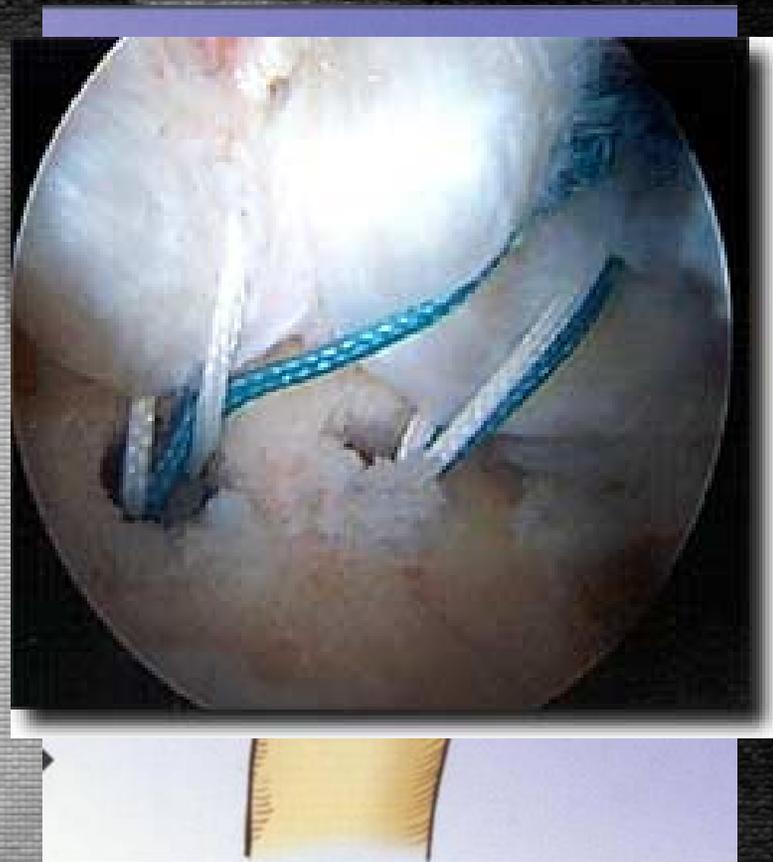
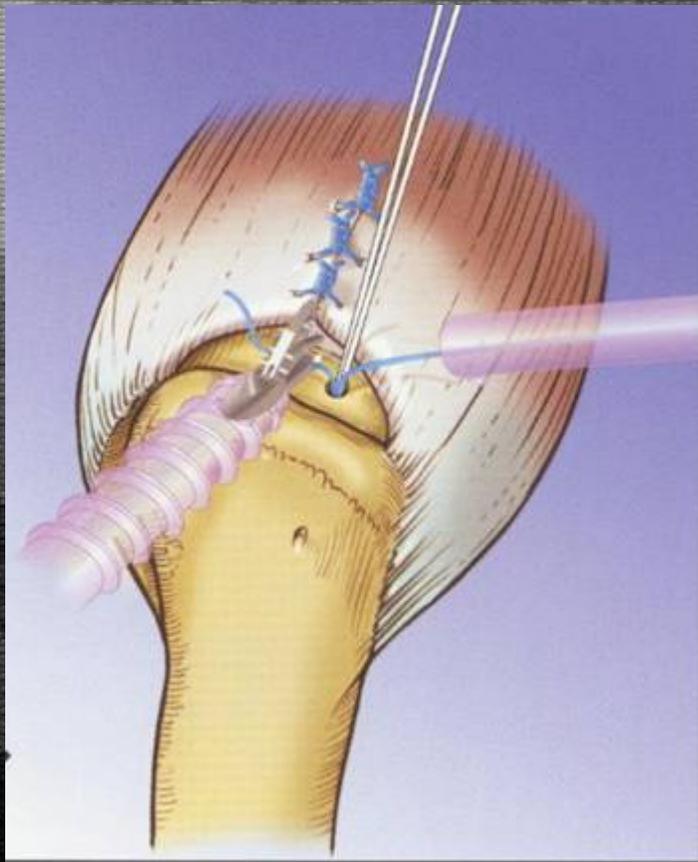
Arthroscopic Cuff Repair



Arthroscopic Cuff Repair

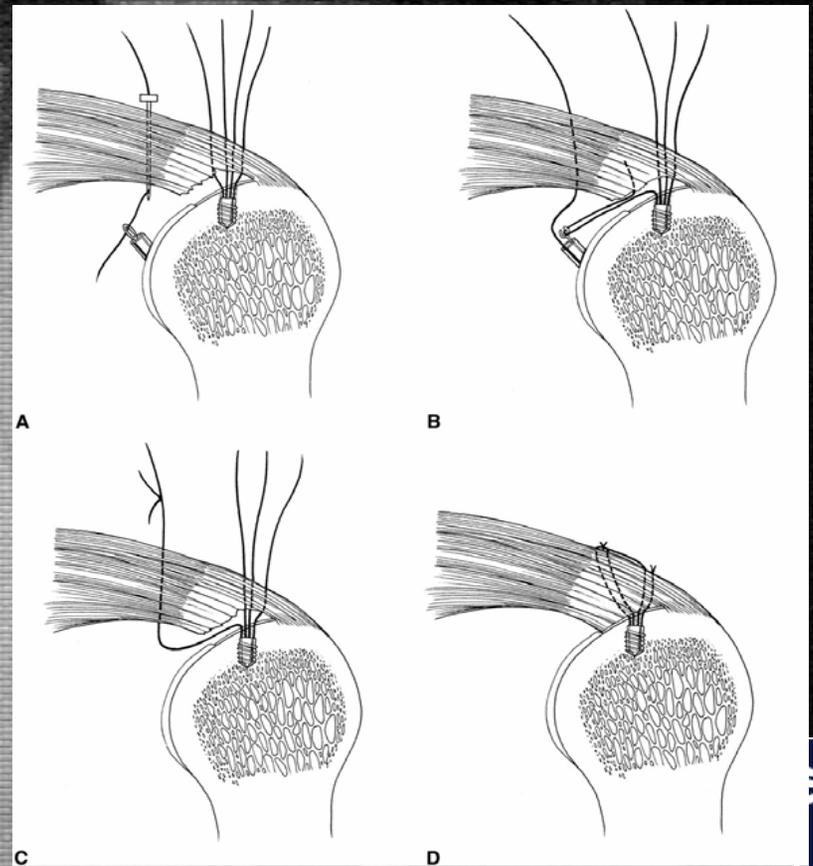


Arthroscopic Cuff Repair



Arthroscopic Repair of Partial Tears

- For selected partial tears
- Repairs only the torn portion of the tendon



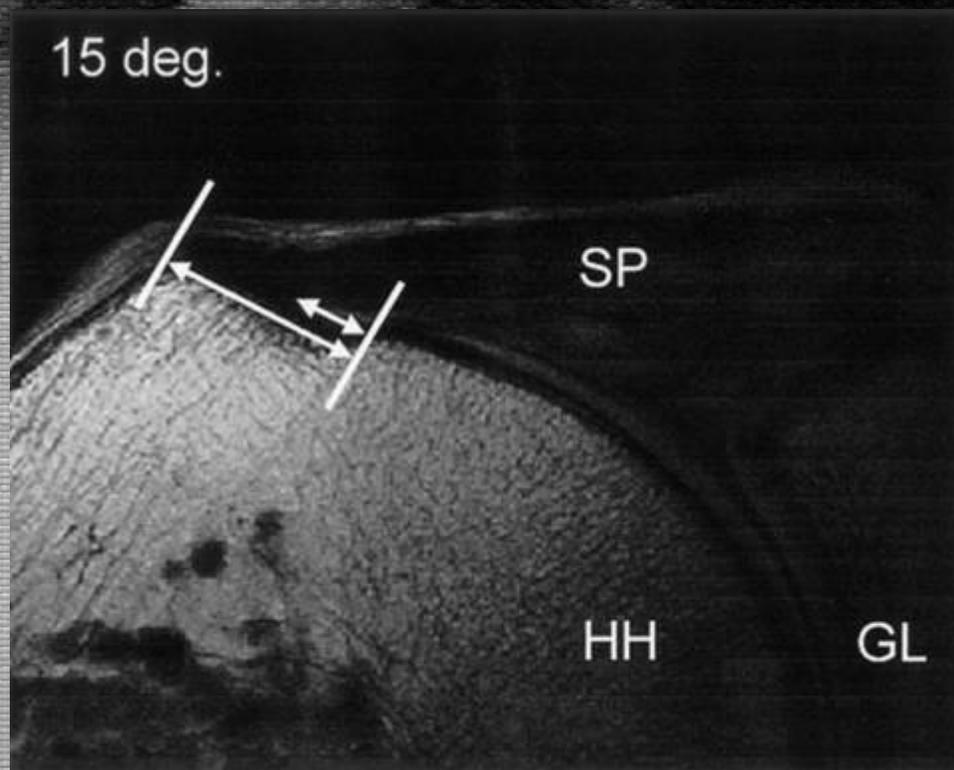
Mini-open Cuff Repair

- Arthroscopic joint and tendon evaluation
- Arthroscopic bone spur removal
- Cuff repaired through 3 cm skin incision
- Deltoid fibers are split, not detached
- Cuff repaired with “tendon gripping” sutures
- *Double row repair* of tendon to bone using anchors and bone tunnels



Mini-open Cuff Repair

- Gold standard
- Allows double row repair
- Suture anchors *with* bone tunnels provide strongest repair with best restoration of RC footprint (Andrews AJSM, 2003)



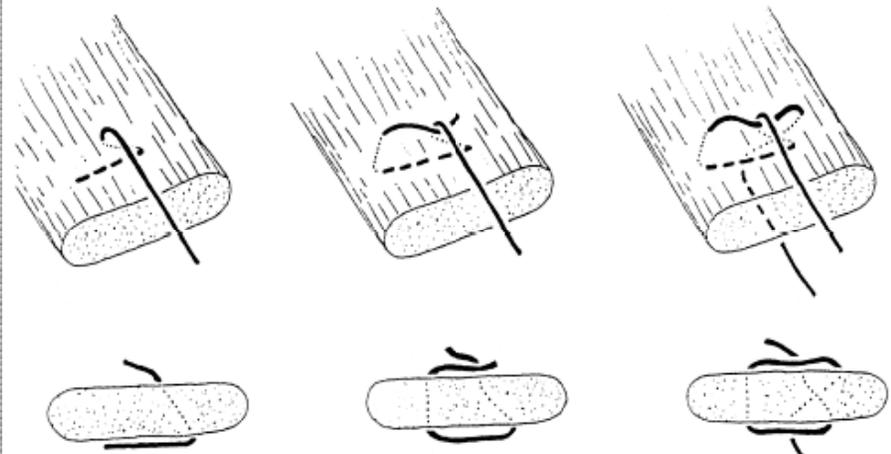
Suture Fixation Techniques

- Holding strength with open suture placement techniques was superior
 - JBJS, 2002

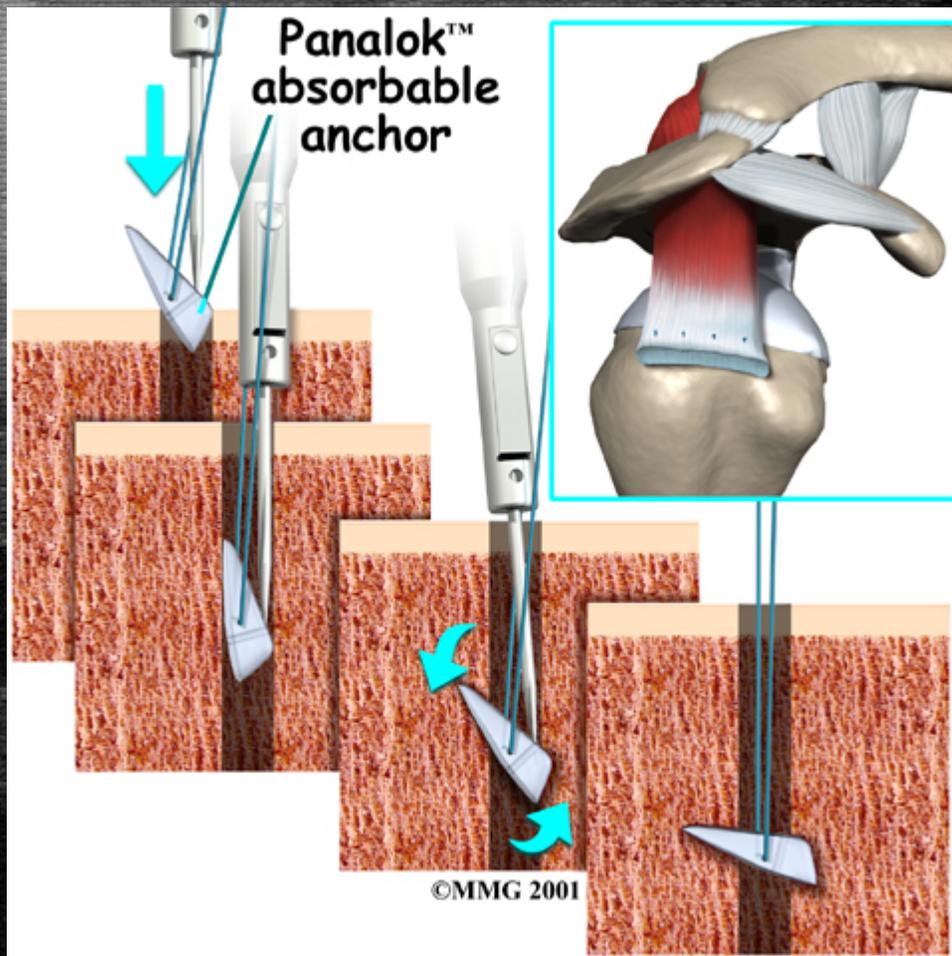
MECHANICAL STRENGTH OF ARTHROSCOPIC ROTATOR CUFF REPAIR TECHNIQUES

AN IN VITRO STUDY

BY ALBERTO G. SCHNEEBERGER, MD, ANDREAS VON ROLL, MD,
FABIAN KALBERER, MD, HILAIRE A.C. JACOB, PHD, AND CHRISTIAN GERBER, MD



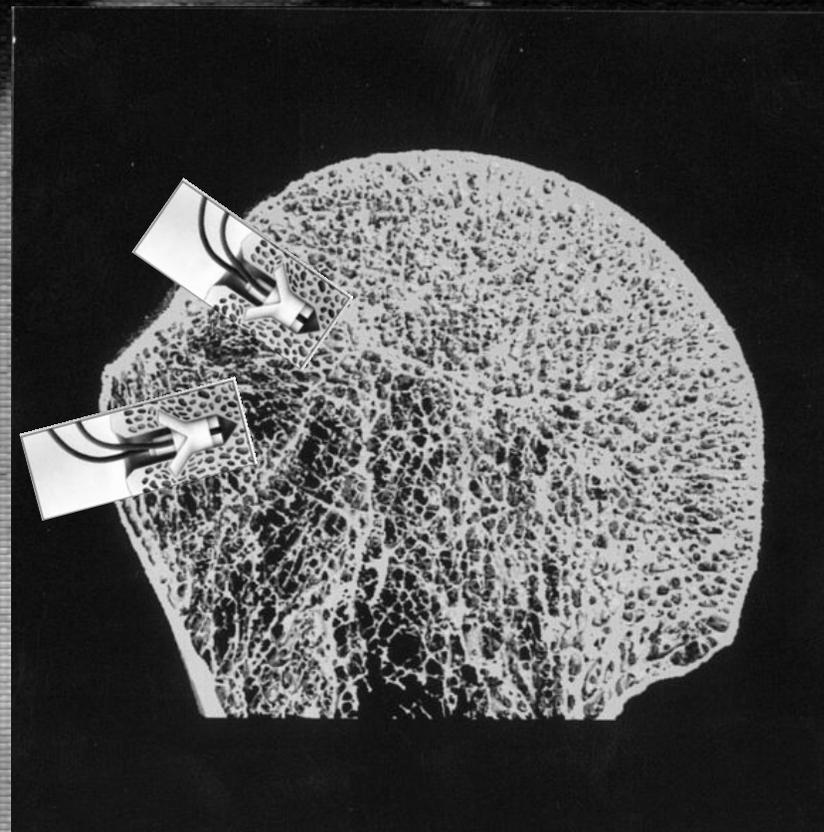
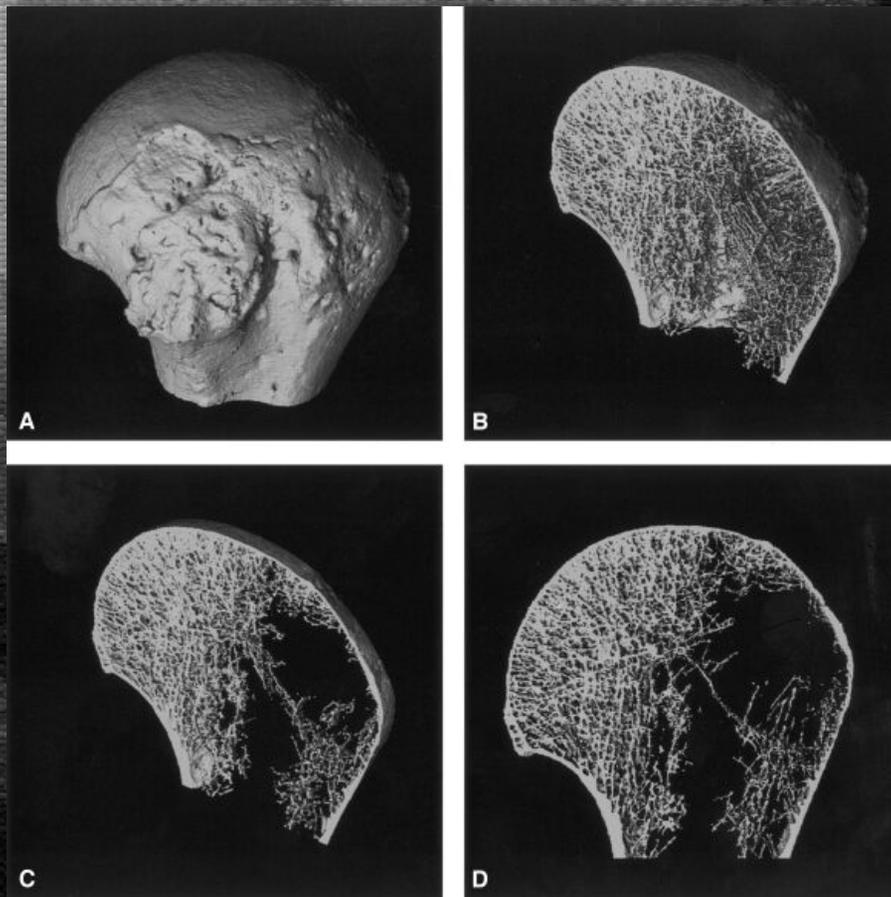
Suture Anchor Fixation



- Dependent on the quality of bone
- Anchors have a limited pull-out strength from bone

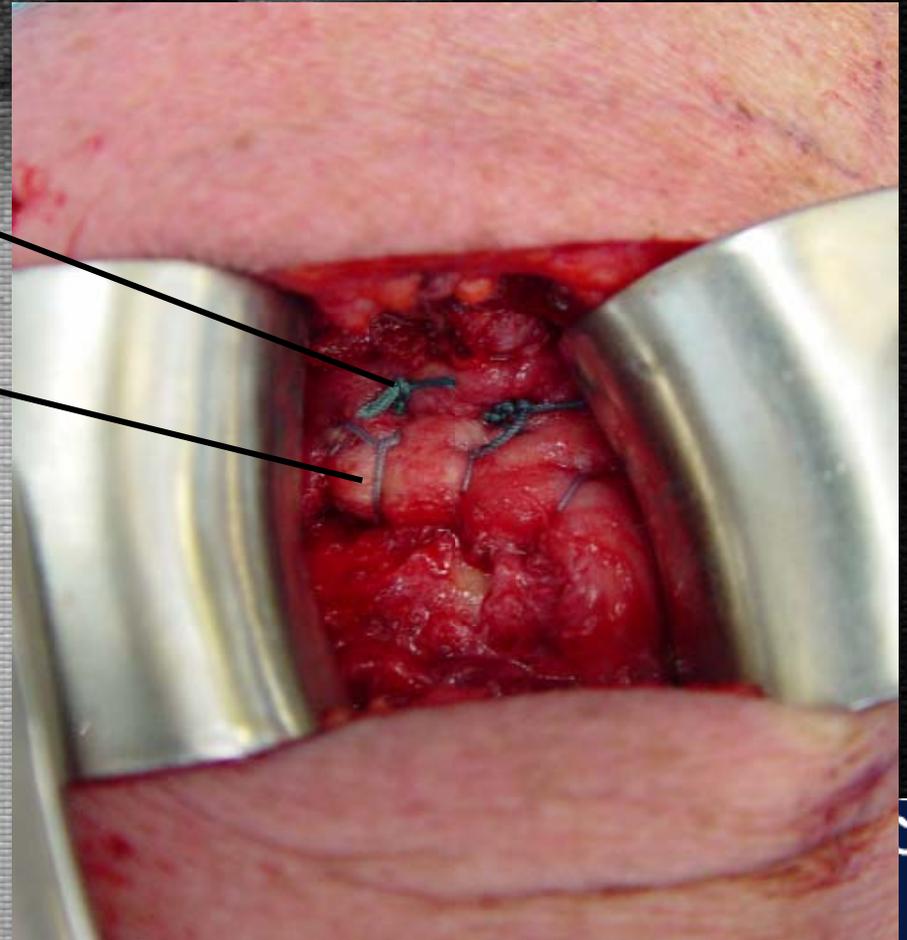
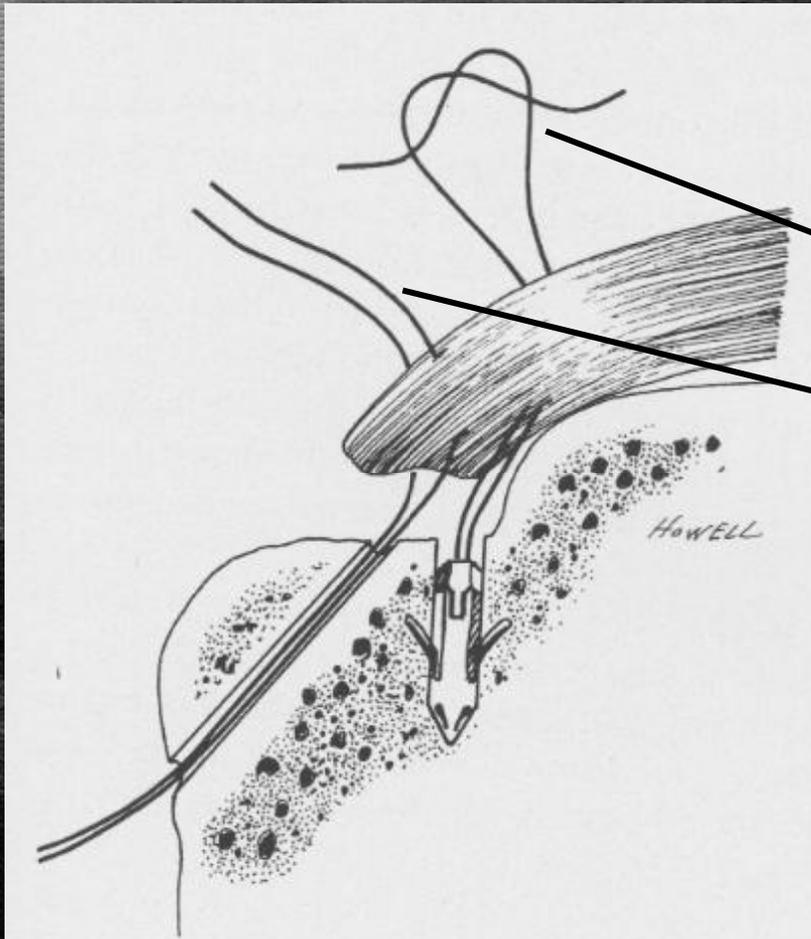


Suture Anchor Fixation



This osteoporosis is common in older patients, larger chronic tears and may not provide strong tendon repairs

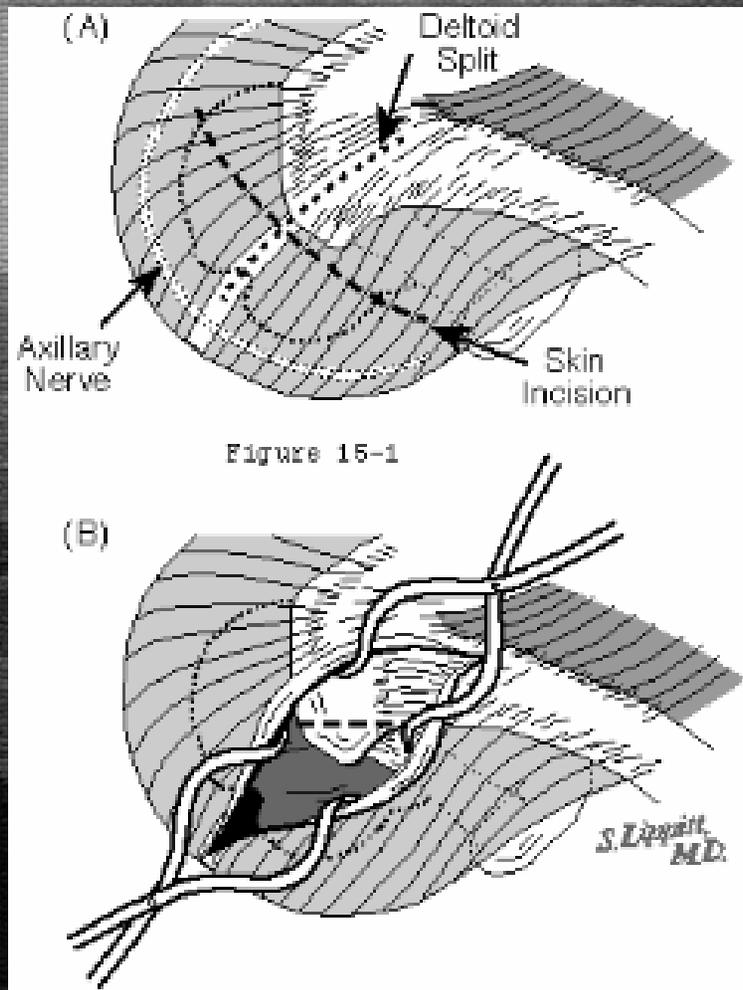
Double Row Cuff Repair



This type of repair through a small incision remains the “gold standard” for rotator cuff repair surgery.



Open Cuff Repair



Open cuff repairs may be appropriate for larger tears and complete rotator cuff avulsions.

Open Cuff Repair



12 weeks post massive
cuff repair



Open Cuff Repair

- 5cm incision
- Deltoid is taken down from acromion
 - Must be securely repaired
- For larger tears



Post-op RC Repair

- Usually 6 weeks of limited arm use regardless of repair method
- Often require 2-4 months of formal physical therapy followed by home exercises
- Can take 12-18 months to reach maximum improvement



Post-op RC Repair

- Same restriction regardless of repair method
- **At 1-6 weeks** Passive motion
 - Passive forward elevation, ER with stick supine, pendulums
 - Avoid internal rotation and AROM until healed
- AROM of elbow/wrist and hand



Post-op RC Repair

- **At 6 weeks** begin AROM and advanced stretching
- **At 8-12 weeks** begin Theraband PREs depending on tear size
- **At 4-6 months** begin progressive resistance and dynamic strengthening



Rotator Cuff Repair Results

- Good to excellent
 - 85% - 95%
- Good-excellent pain relief
 - 78%
- Risk of rerupture
 - Large (2+ tendon tears)
 - 40%
 - Smaller tears
 - 10-20%
 - Severely retracted tears
 - 66%



This man is 7 weeks following an arthroscopic cuff repair.



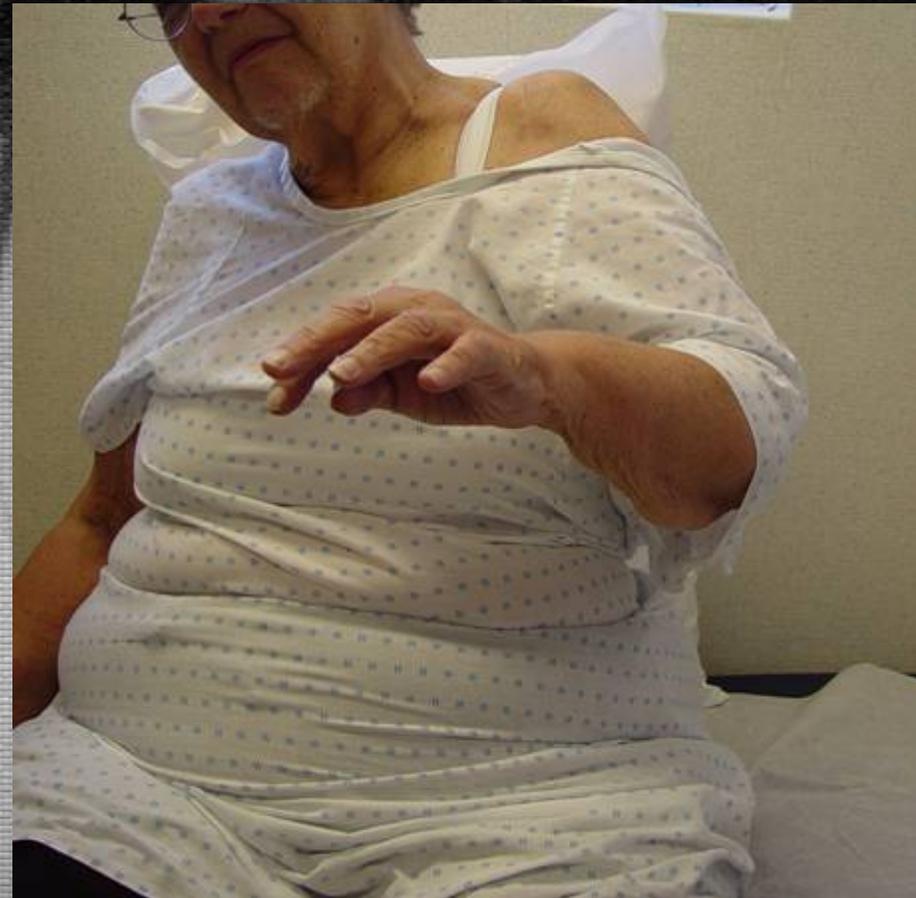
Partial Repairs

- Massive retracted cuff tears
- Insufficient tendon to repair to bone
- Repair as much as possible
- Margin convergence restores some function
- Provides good pain relief
- Unpredictable functional recovery



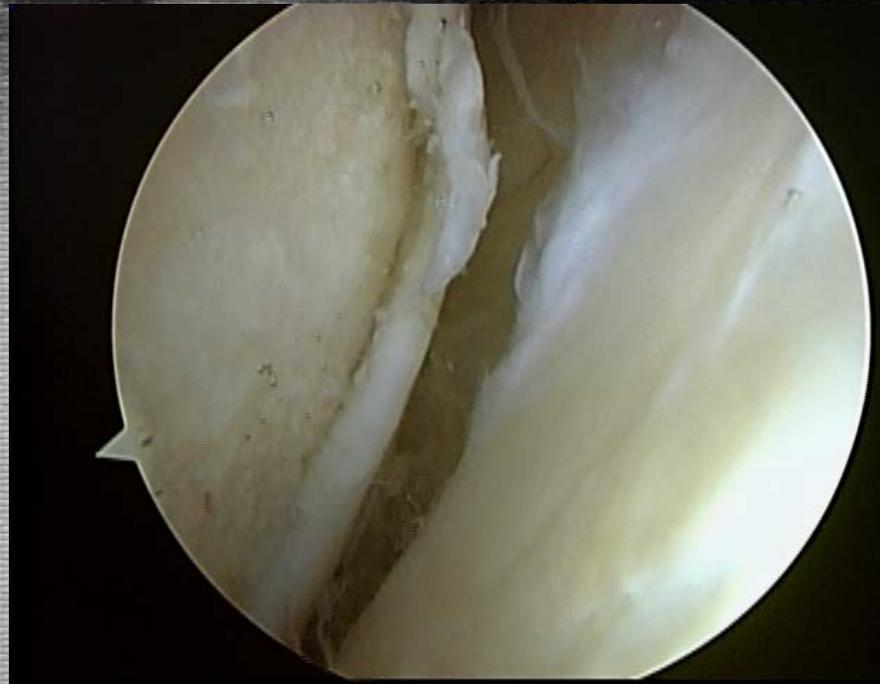
Unsatisfactory Results

- Associated with retears
- Loss of function
- Often have good pain relief
 - This patient has return her repair but is happy since she no longer has pain. Her motion before and after surgery are the same.



Factors Affecting Outcomes

- Tear size (most important)
 - Affects recovery of strength (85-90% recovery)
- Age (>65)
- Pre-op function (inability to abduct > 100°)
- Larger tears and chronic retracted tears are more likely to rerupture



Recurrent Tears

- Number of tendons
 - 1 tendon 33%
 - 2 tendons 30-56%
 - 3 tendons 50%
- Muscle Atrophy
 - Increasing degrees of atrophy lead to increasing rates of rerupture
- Cuffs with no noticeable atrophy
 - 20% rerupture

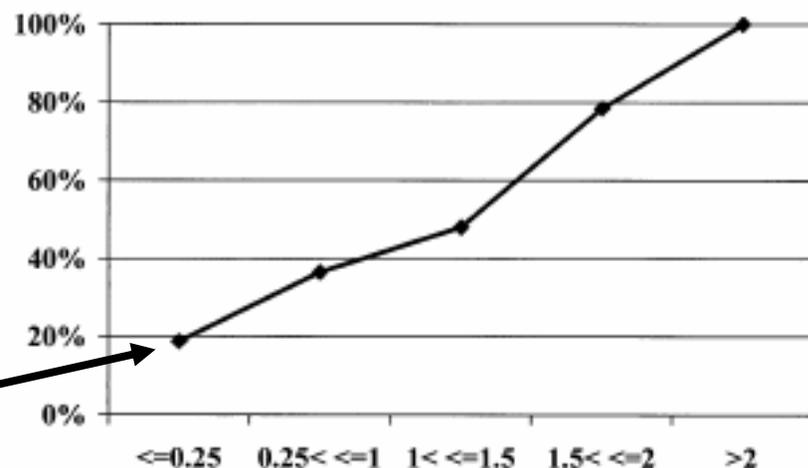
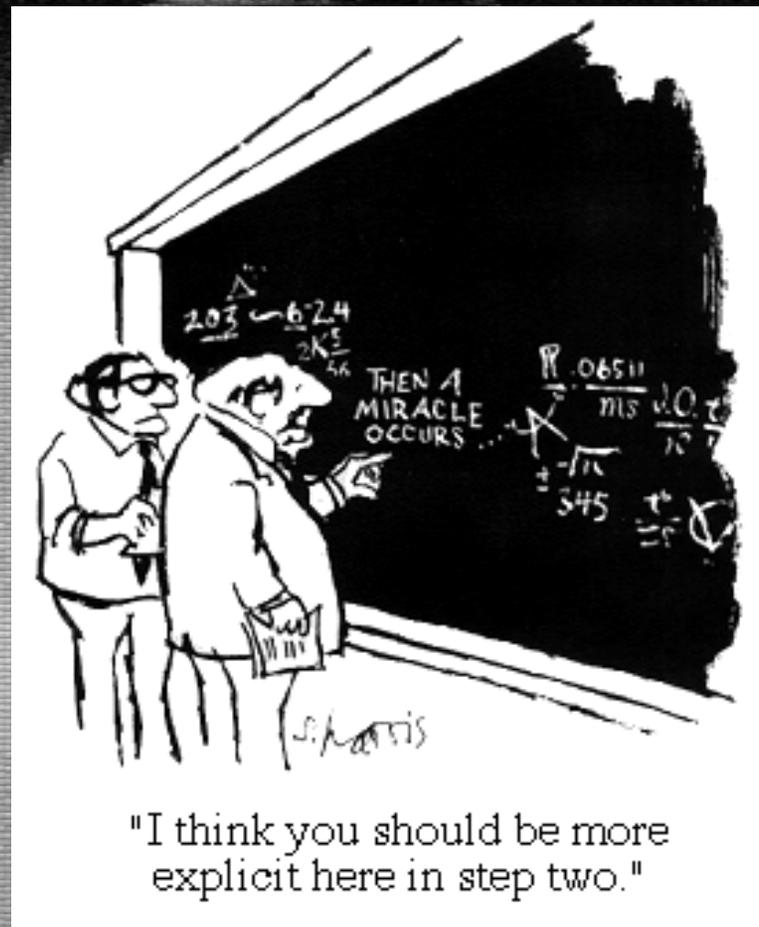


Figure 3 Percentage of cuffs with tear recurrence according to preoperative GFDI.

Complications of Cuff Repair

- Rerupture
- Stiffness
- Infection
- Deltoid detachment
- Nerve injury
 - Weakness, numbness



Arthroscopy Without Repair

- Arthroscopic cuff debridement & limited acromioplasty
- Smaller tears get better pain relief
- No improvement with overhead activity and strength
- Beneficial in older low demand patients



Open Surgery Without Repair

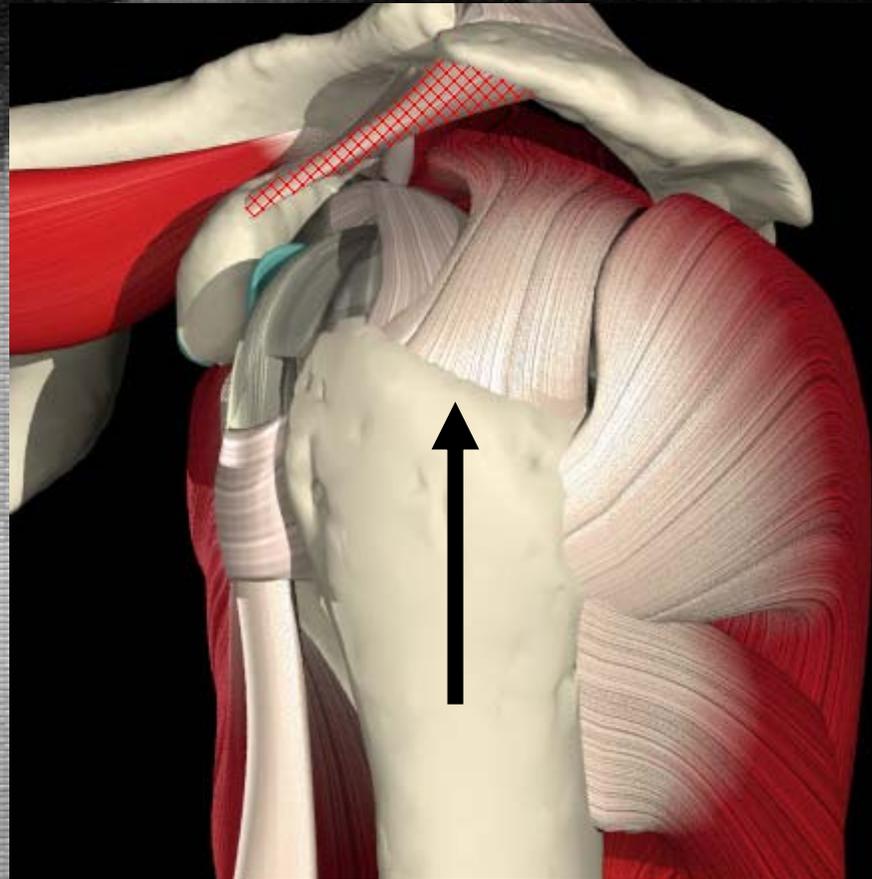
- Open cuff debridement
- Better results with intact biceps, deltoid and no prior surgery
- 50-80% Improved comfort and function
- Preserve the CA arch
 - Avoids humeral head escape



Why Preserve the CA Arch?



If the CA arch is disrupted, the head of the humerus escapes up through the defect and pain and limited motion result.



Biceps Tenotomy

- Indicated in older low demand patients with irreparable cuff tears
- Unconcerned about biceps bulge
- Relieves pain from the impinged or dislocated biceps
- Minimally invasive, palliative, minimal rehab



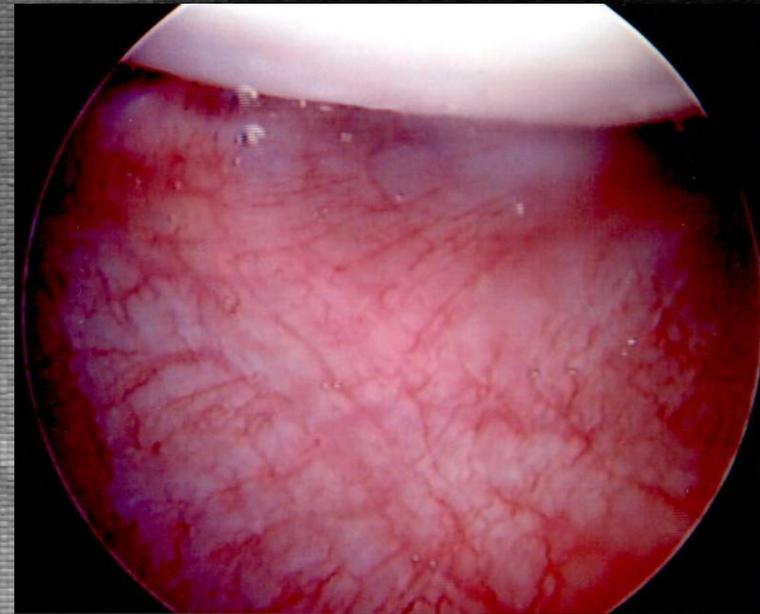
The Stiff Shoulder

- Not associated with cuff tears alone
- Consider
 - Adhesive capsulitis / Frozen shoulder
 - Shoulder arthritis
 - Missed shoulder dislocation
 - Fracture or post traumatic deformity



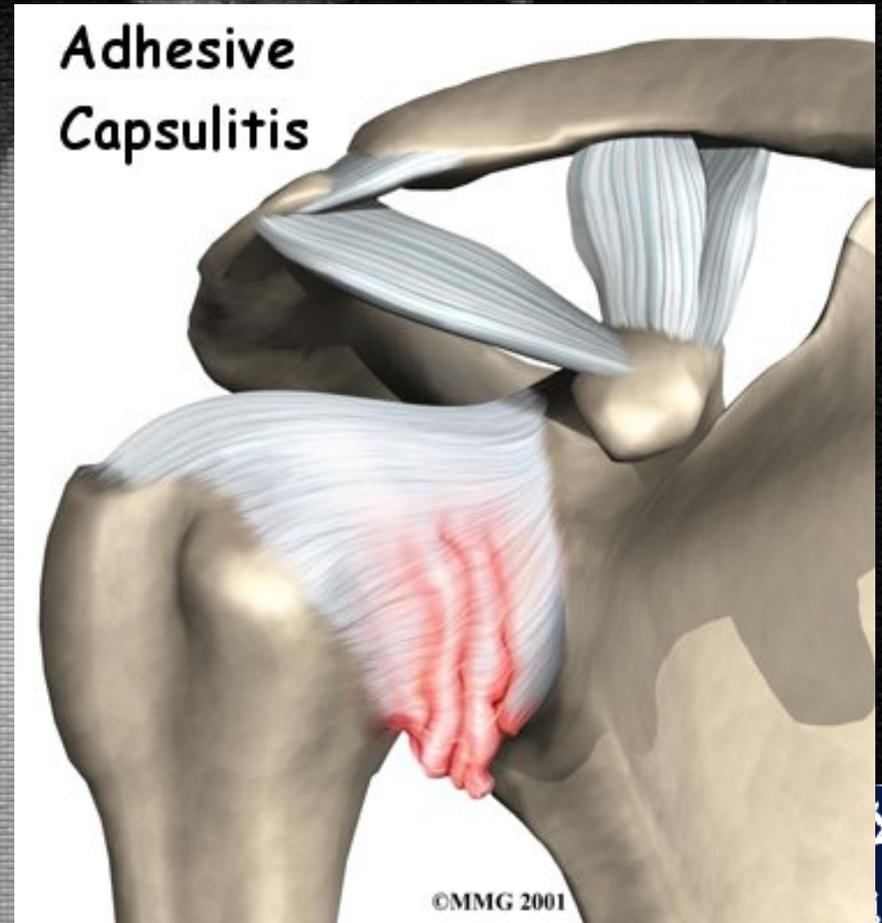
The Stiff Shoulder

- Frozen Shoulder = Adhesive Capsulitis
- Cause is Unknown
 - May be autoimmune
 - May occur after injury, fracture or surgery
 - Related to intense inflammation causing pain and decreased use of the shoulder leading to stiffness



The Stiff Shoulder

- Reduced motion even with help lifting the arm
 - As if the motion is “blocked”
- Pain at night and with daily activities
- X-rays and MRI usually normal



Shoulder Stiffness

- Not associated with cuff tears alone
- Full active and/or passive motion is present even if painful
- Consider
 - Adhesive capsulitis / Frozen shoulder
 - Glenohumeral arthritis
 - Missed posterior dislocation
 - Fracture or post traumatic deformity



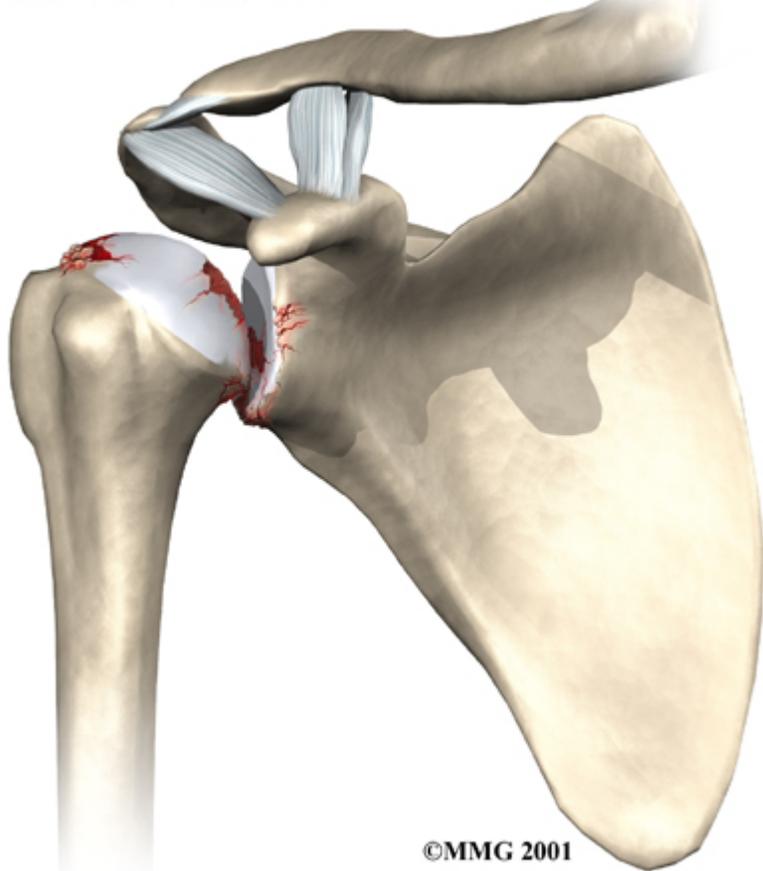
Frozen Shoulder

- Recovery is slow – May take many months
- Anti-inflammatory meds and stretching exercises
- May benefit from cortisone injections
- Surgical treatment may help and involves arthroscopy to remove the scarred joint capsule



Shoulder Replacement

Osteoarthritis



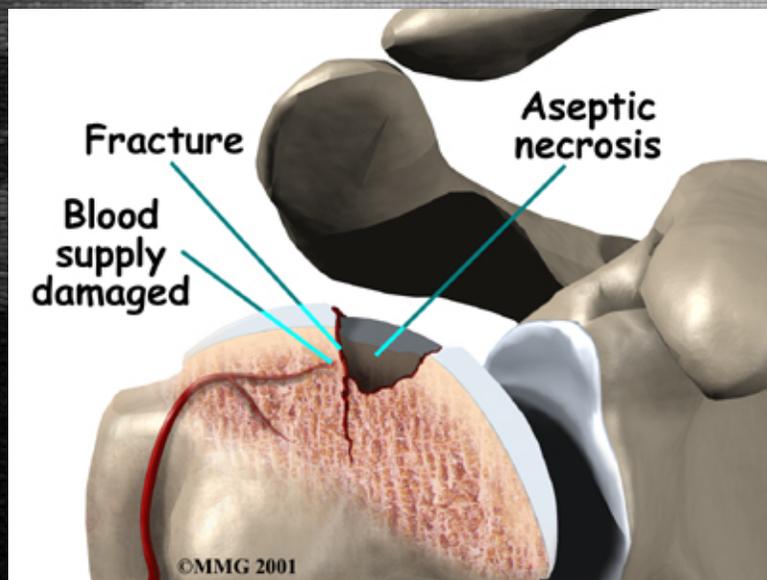
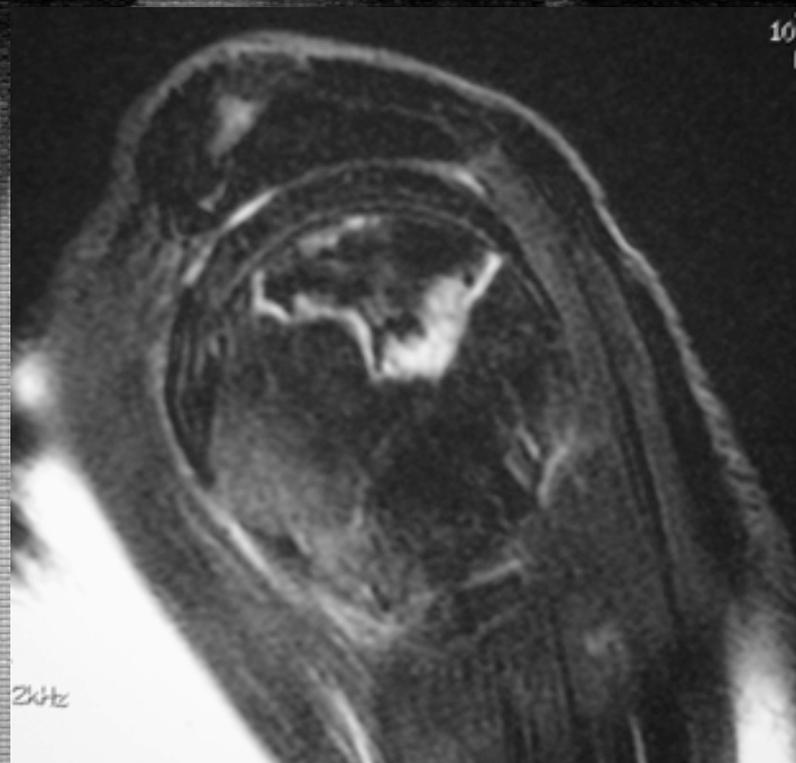
©MMG 2001

- Arthritis
 - Wear and tear
 - Multiple dislocations
 - Rheumatoid arthritis



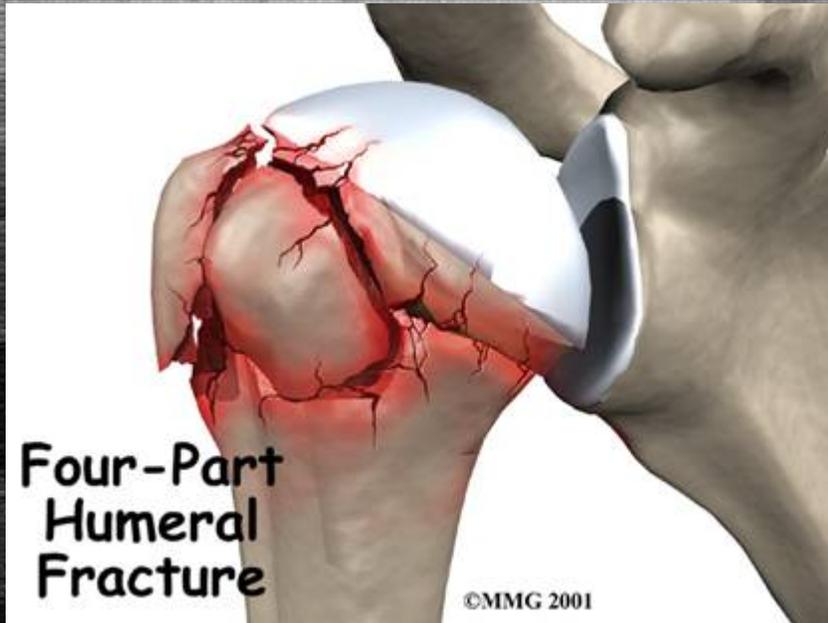
Shoulder Replacement

- Osteonecrosis / Avascular Necrosis
 - Post Trauma
 - Steroid or Alcohol

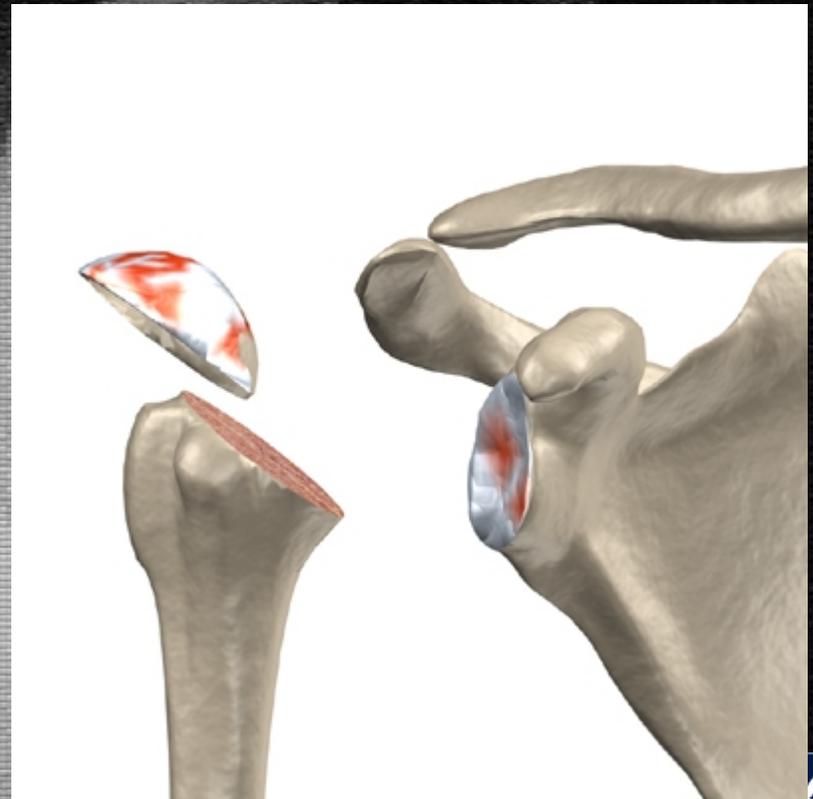
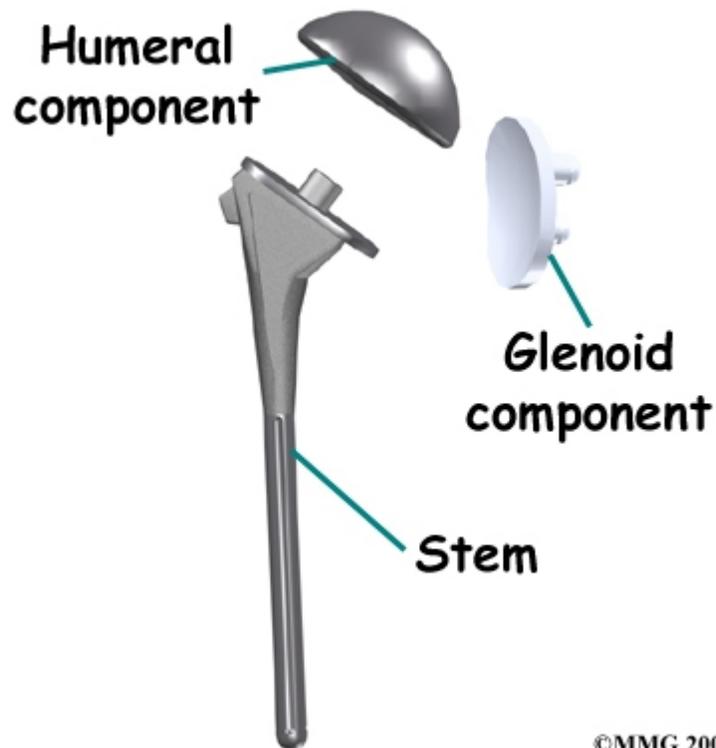


Shoulder Replacement

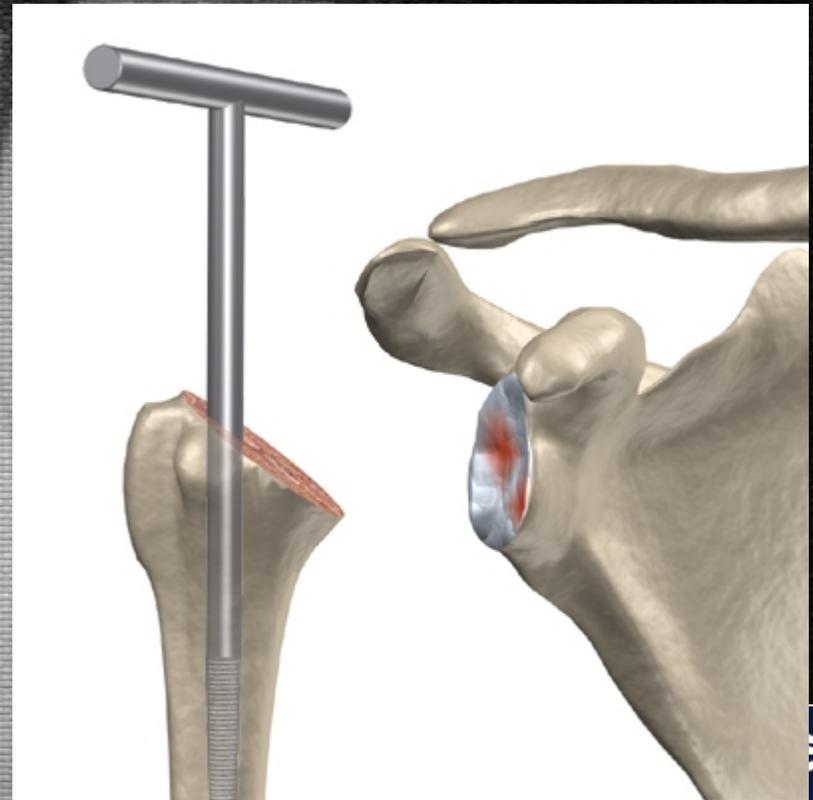
- Fractures



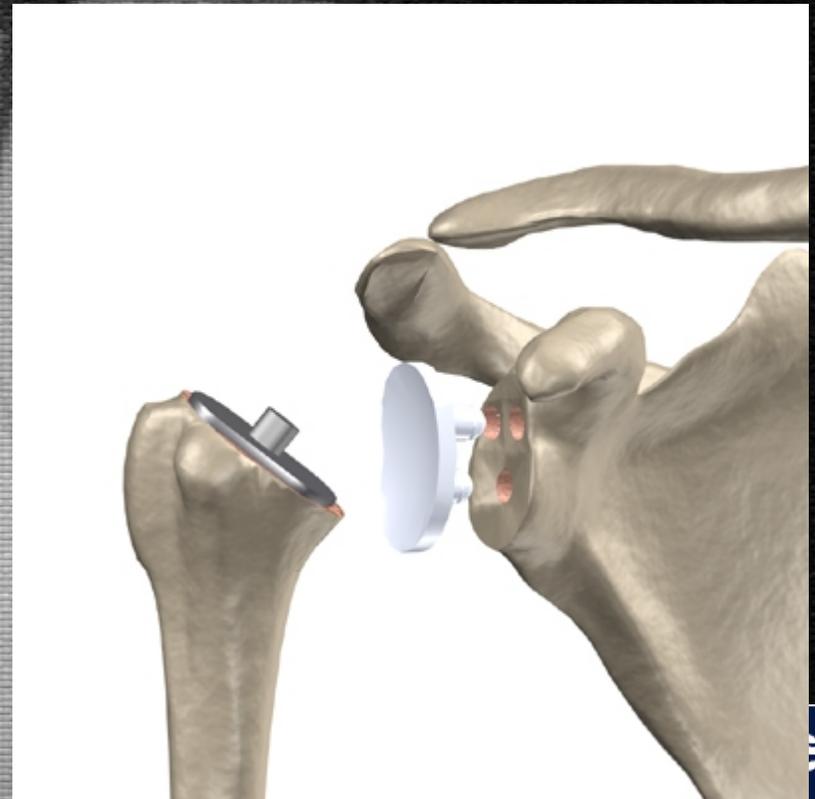
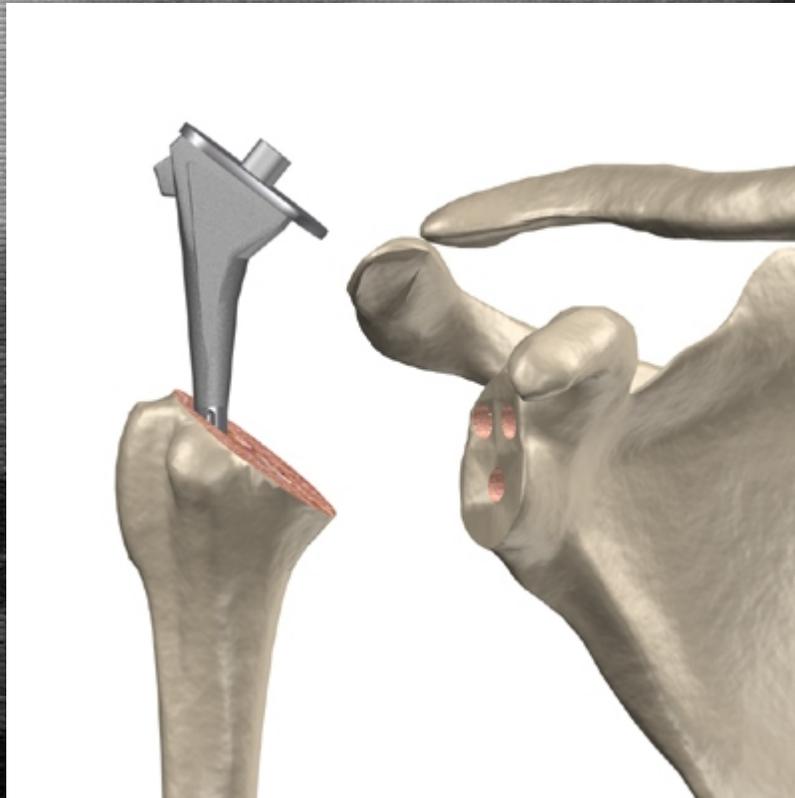
Shoulder Replacement



Shoulder Replacement



Shoulder Replacement



Shoulder Replacement



Shoulder Replacement



Arthritic Humeral Head

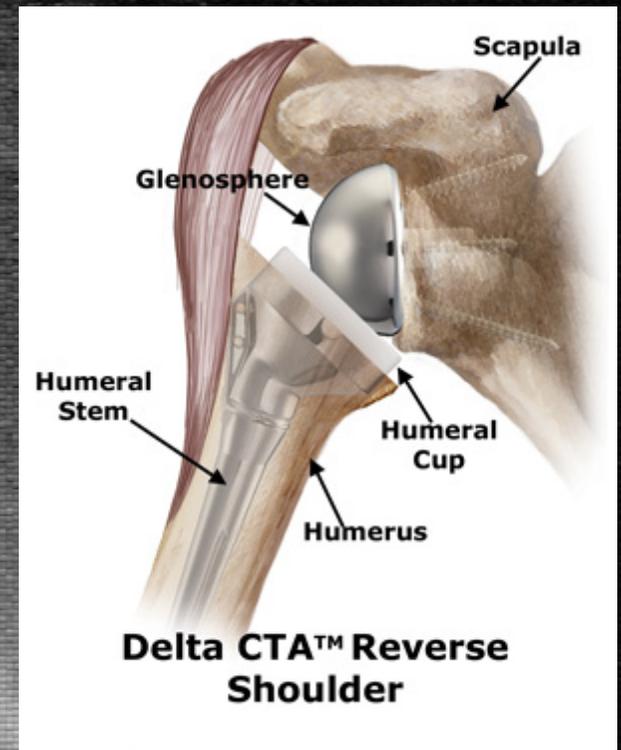
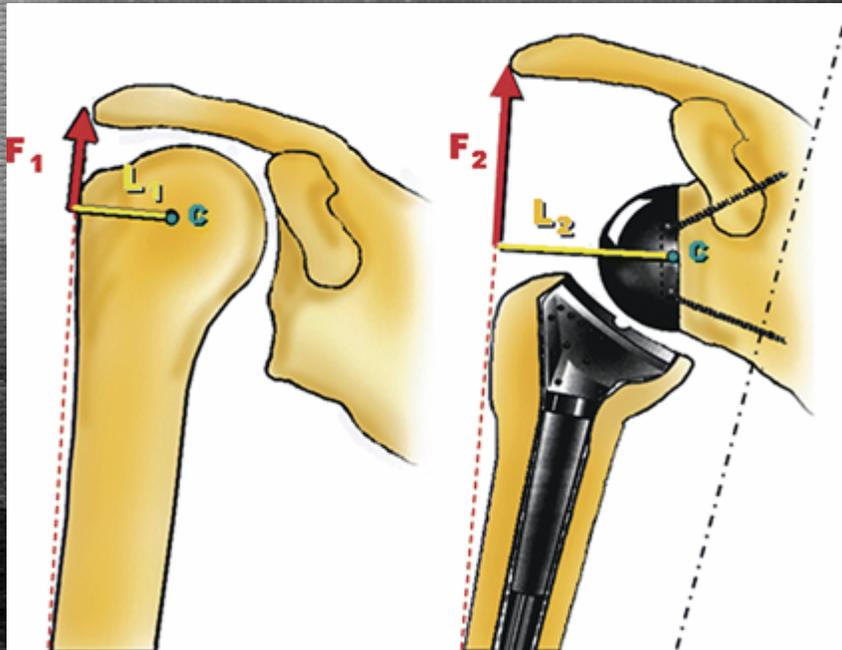


Partial Shoulder Replacements

- Chronic arthritis with an irreparable rotator cuff tear
- Must be able to elevate the arm
- Must have intact and functioning deltoid
- Hemiarthroplasty is useful in relieving pain



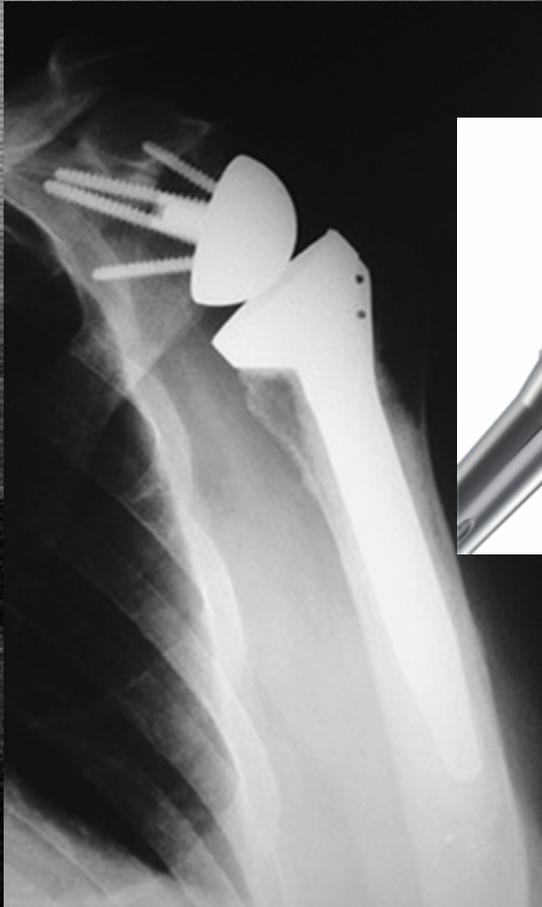
Reverse Shoulder Replacements



Reverse shoulder replacements are helpful when treating arthritis associated with irreparable rotator cuff tears in patients unable to lift the arm due to tendon tears.

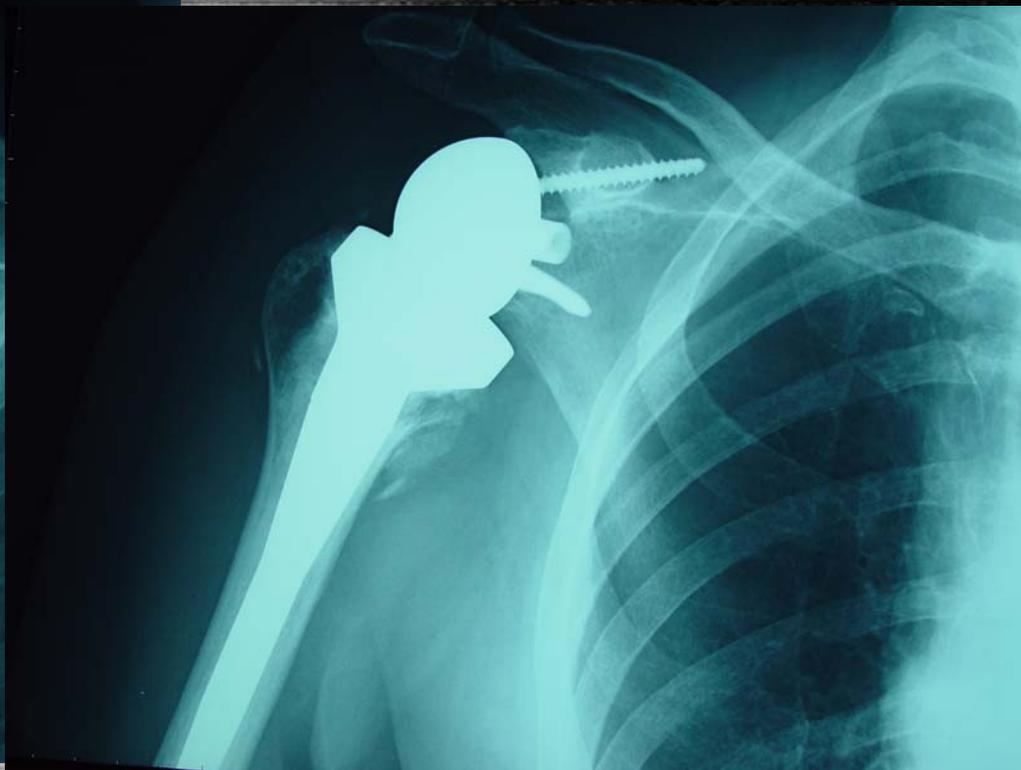
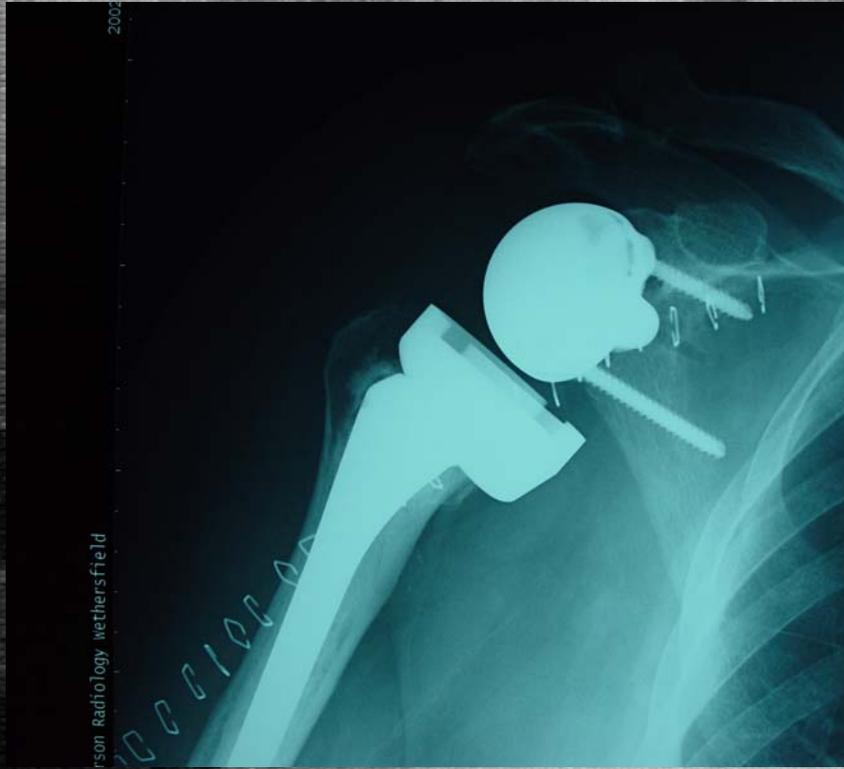


Reverse Shoulder Replacements



Standard Shoulder Replacement

Reverse Shoulder Replacement



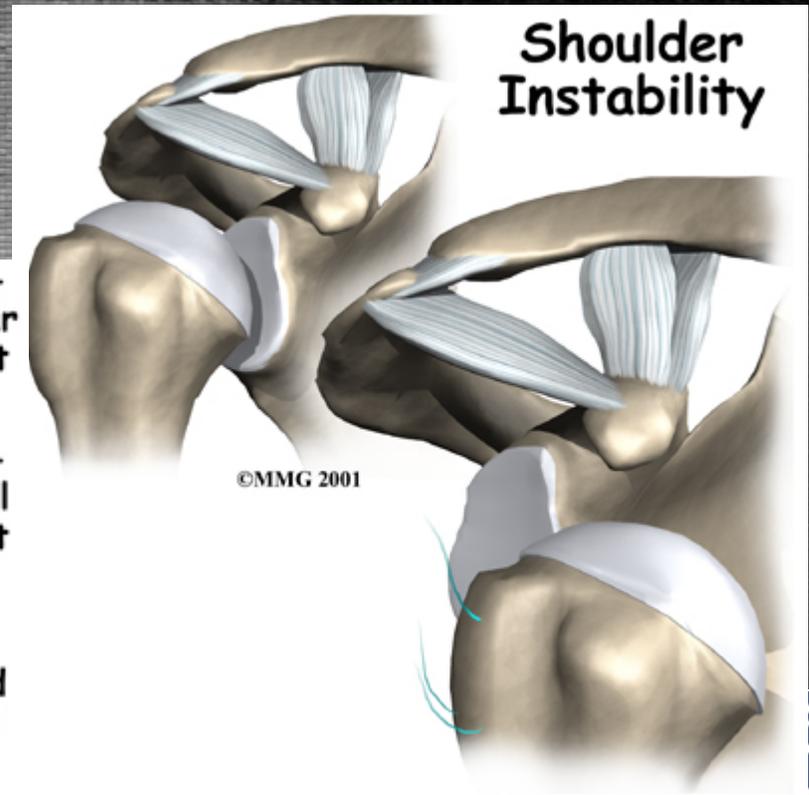
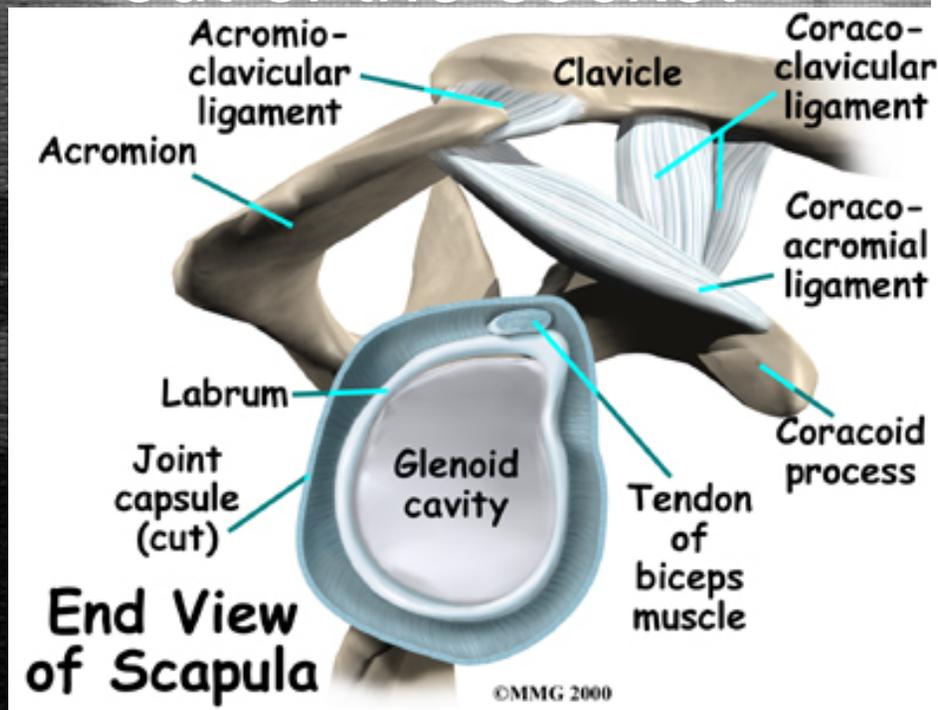
Shoulder Instability

- Shoulder joint is too loose and is able to slide around too much in the socket
- Dislocation
 - Head of humerus slips completely out of the socket
- Instability without dislocation
 - Causes pain and apprehension due to excessive motion



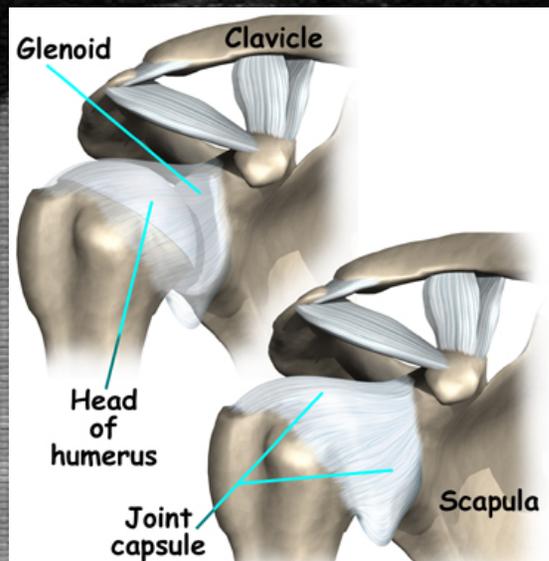
Shoulder Dislocation

- Head of humerus slips completely out of the socket

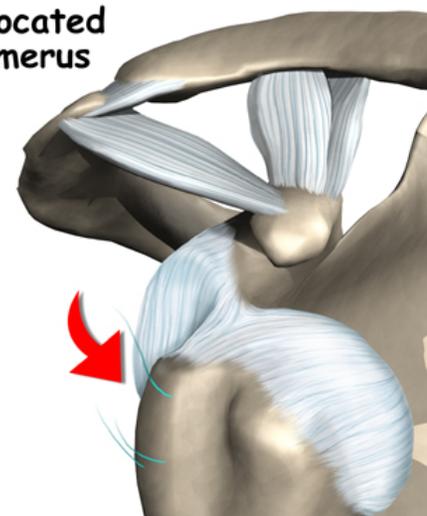


Shoulder Dislocation

- May be due to a lax shoulder capsule and ligaments
- May be due to significant trauma



Dislocated Humerus

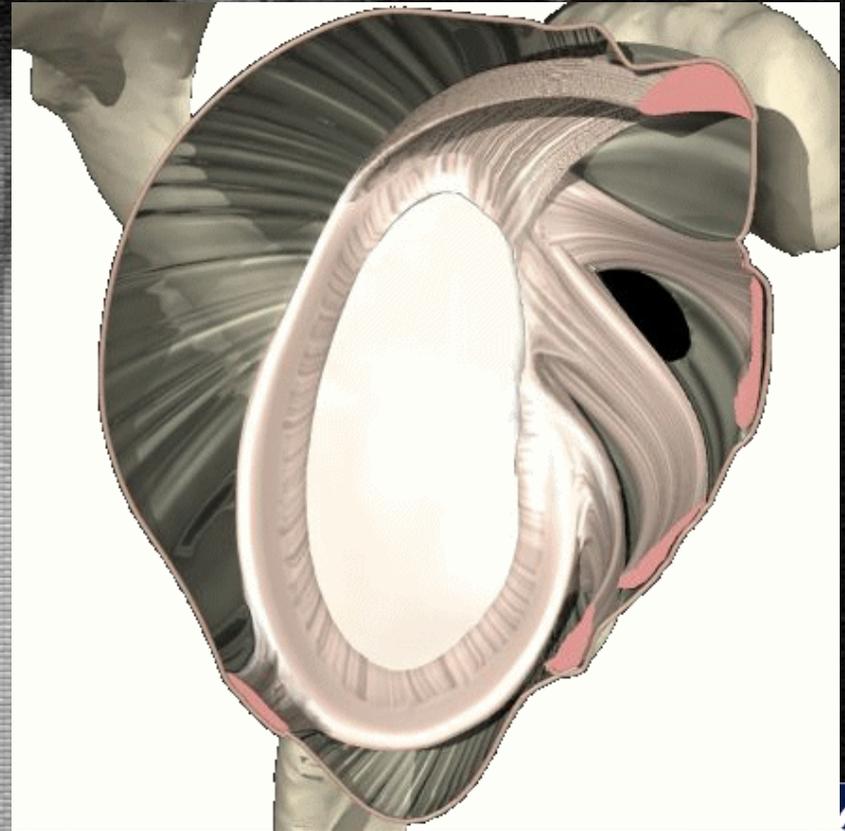


©MMG 2000



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC

Shoulder Dislocation



- As the result of a shoulder dislocation, the labrum and the ligaments are torn and stretched.



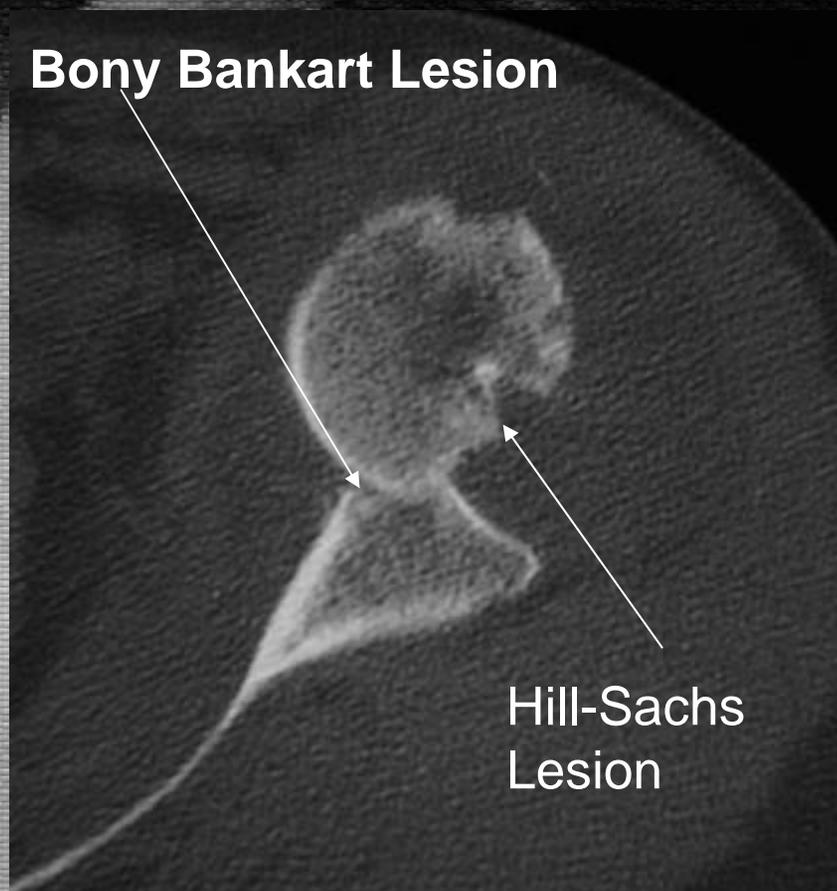
Shoulder Dislocation

- Nonsurgical treatment for initial dislocation
 - 3-4 weeks immobilization
 - Arm in External Rotation
 - Followed by therapy
 - Study
 - 0% recurrence in ER group v. 30% recurrence in IR group (JSES 2003)



Shoulder Dislocation

- Can lead to fractures and joint damage
- Repeated dislocations can lead to eventual arthritis



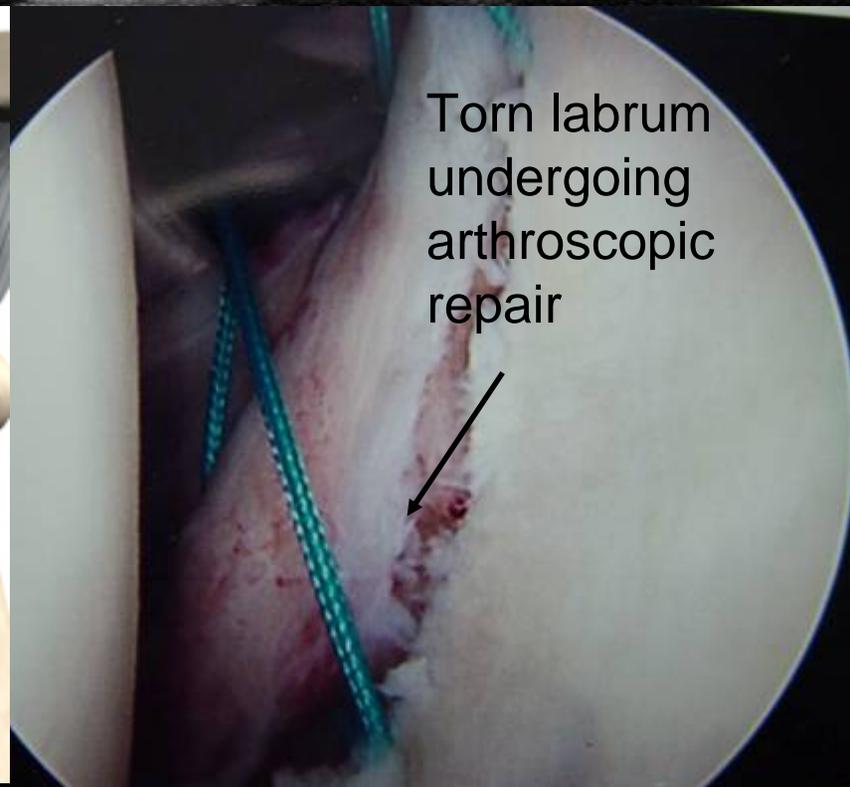
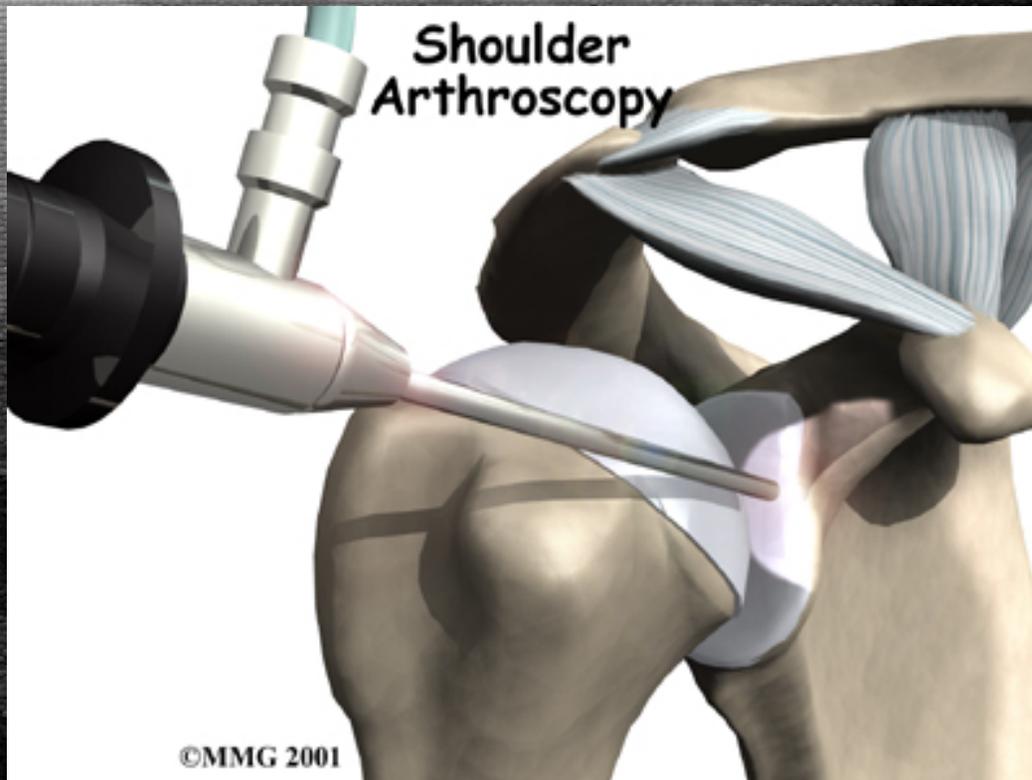
CT Scan of Chronic Dislocation

Shoulder Dislocations

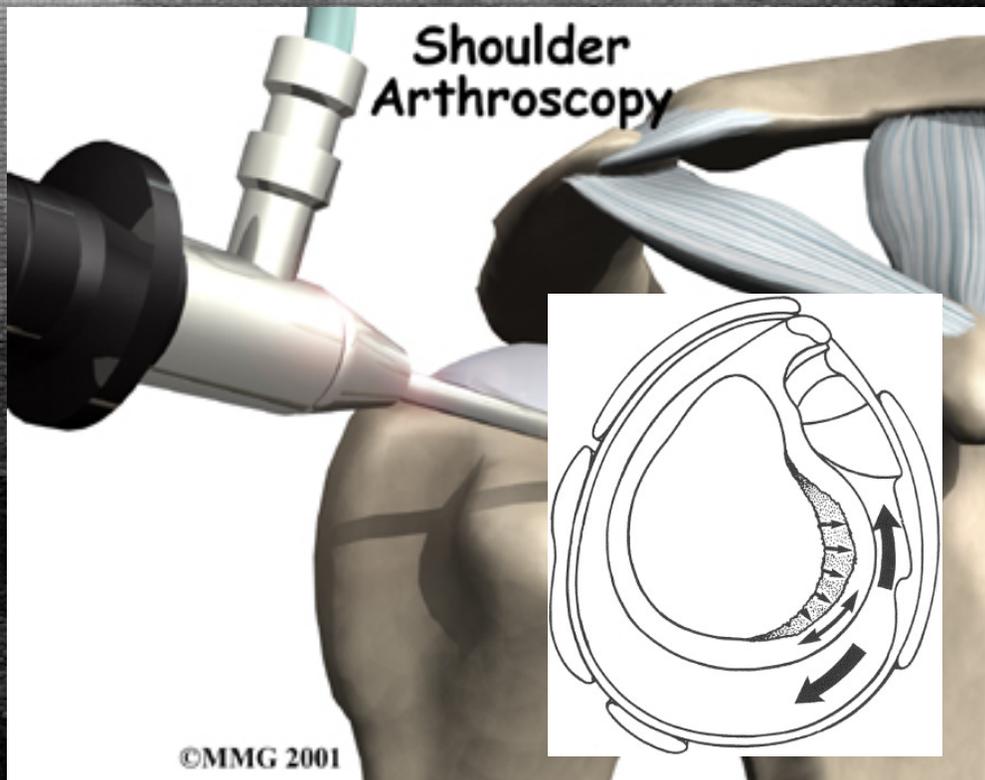
- Cause tearing of the ligaments and cartilage that normally stabilize the shoulder
- Shoulder may need to be manually put back into socket



Shoulder Dislocations



Shoulder Dislocations

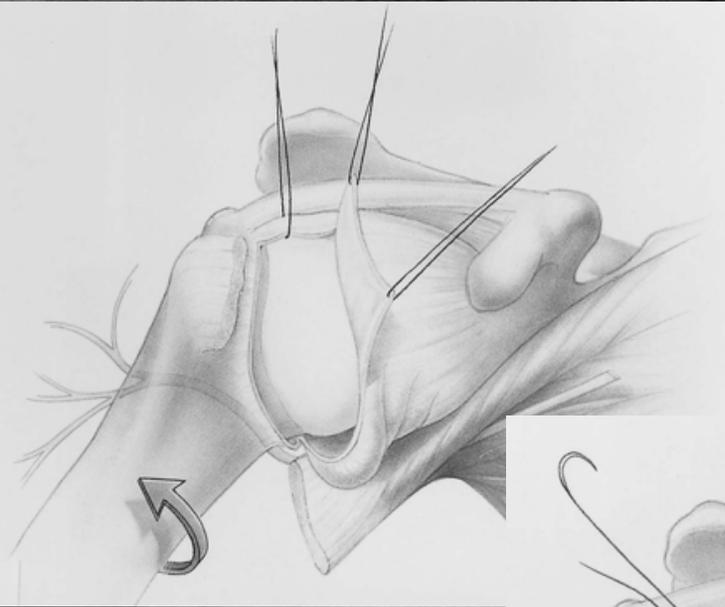


Shoulder Instability

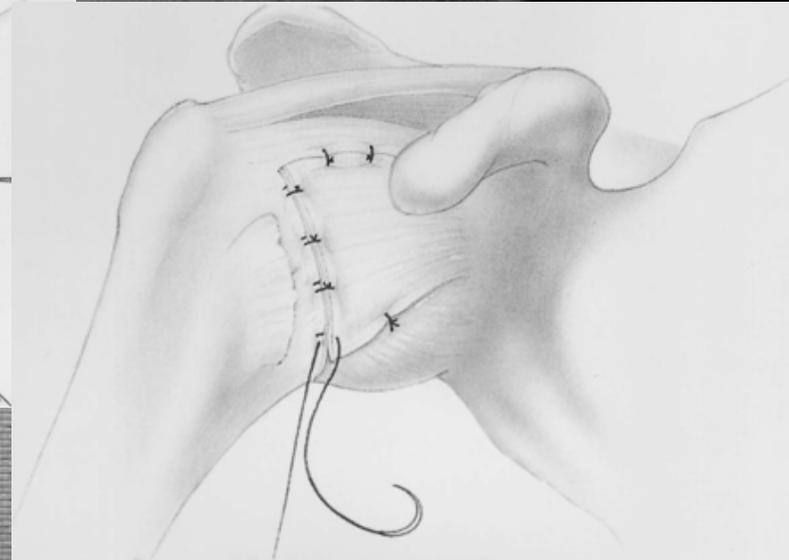
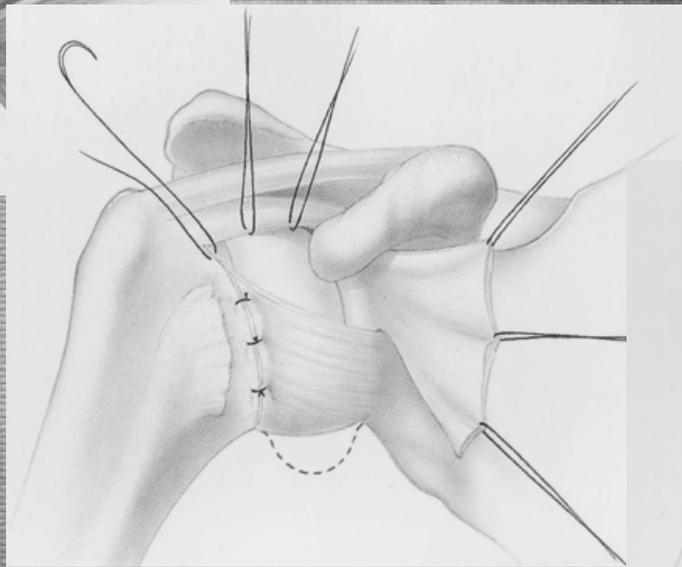
- Early results of arthroscopic repair are encouraging
- Long-term results are less satisfactory
- Gold Standard
 - Open Bankart repair (cartilage repair)
 - Capsular Shift



Shoulder Instability



A capsular shift performed for multidirectional instability: the lax shoulder capsule is cut and sutured in such a way so as to reduce the volume of the shoulder joint to increase stability.



Arthroscopic Compared with Open Repairs for Recurrent Anterior Shoulder Instability. A Systematic Review and Meta-Analysis of the Literature

Tim R. Lenters, Amy K. Franta, Fredric M. Wolf, Seth S. Leopold and Frederick A. Matsen, III
J. Bone Joint Surg. Am. 89:244-254, 2007. doi:10.2106/JBJS.E.01139

This information is current as of March 26, 2007

- “In conclusion, the available evidence indicates that recurrence rates are higher after use of arthroscopic techniques, even those involving suture anchors. While return to work and/or sports was better after open repairs, Rowe scores were better following arthroscopic repairs.”
- Rowe score represents more motion not a better result.



Complications of Surgery

- Always part of pre-op discussion
- Nerve damage
 - Weakness, numbness
- Bleeding
- Infection
- Tendon rupture
- Stiffness
- Continued pain and impairment
- Stretched repair and recurrent instability



Thank You



www.canlic.com

Be careful out there.



CONNECTICUT
CENTER FOR
ORTHOPEDIC
SURGERY, LLC