

Shoulder Impingement and Rotator Cuff, AC and SC joint pathology

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Chief Complaint

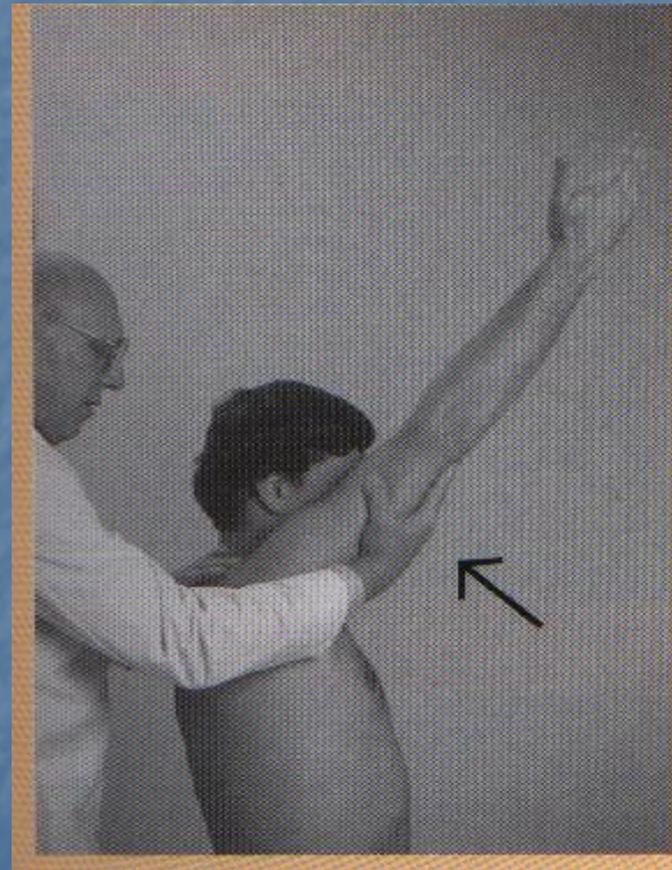
- Pain at night; can't sleep on shoulder
 - Rotator cuff tear
- Pain localized to top of shoulder
 - Arthritis, AC joint separation
- Pain in deltoid region; radiates down lateral arm
 - Bursitis
- Tingling sensation; aggravated by lifting arm
 - Rotator cuff tear

Patient Age

- Young patient
 - Instability, AC joint separation, dislocation
- Middle-aged patient
 - Impingement syndrome, RCT, adhesive capsulitis (female)
- Older patient
 - RCT, degenerative arthritis, adhesive capsulitis

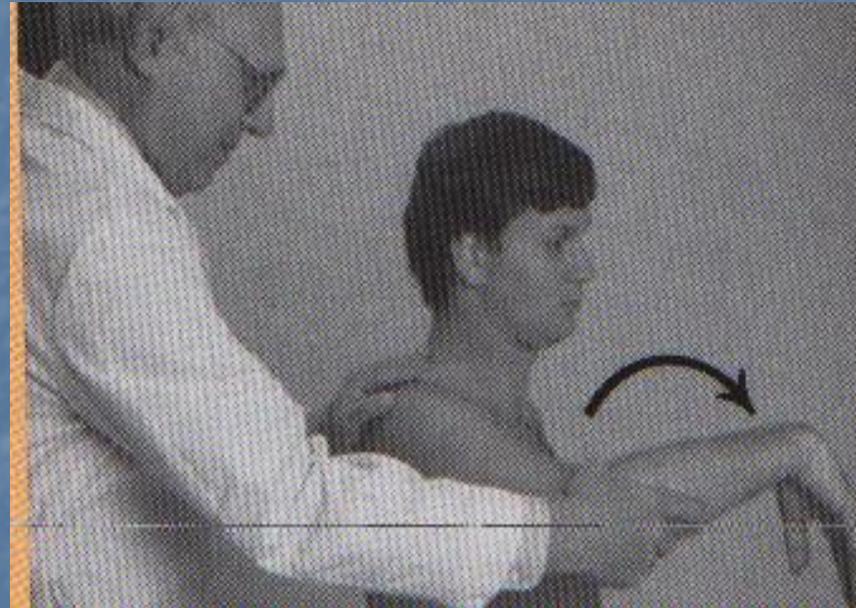
Neer Impingement Sign

- Patient seated
- Forcibly flex arm to overhead position
- Pain => humerus impinges against CA arch

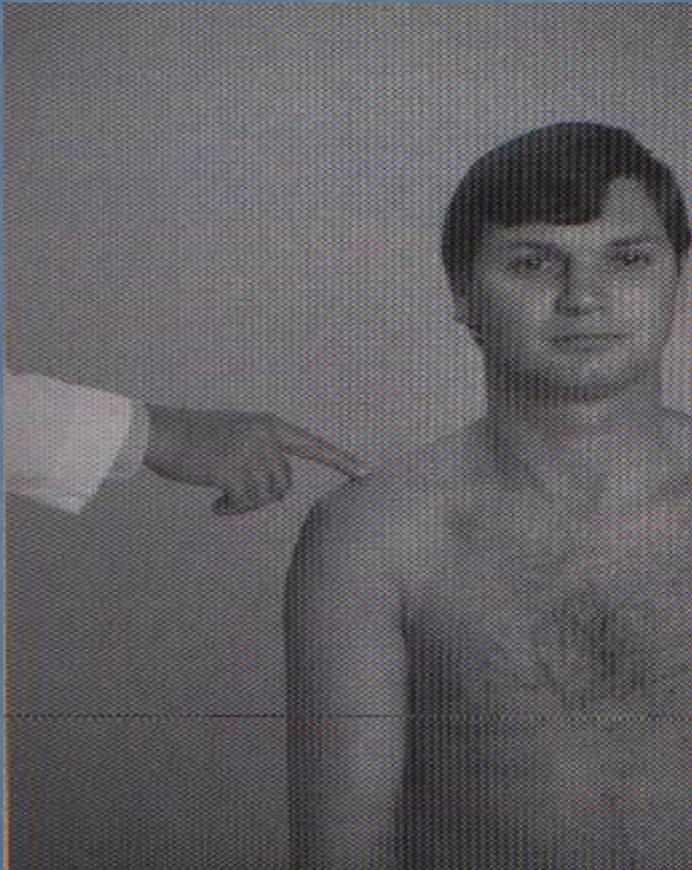


Hawkin's impingement sign

- Throwing position
- Flex forward 30 deg
- Forcibly int. rotate
- Pain => impingement of supraspinatous against CA ligament



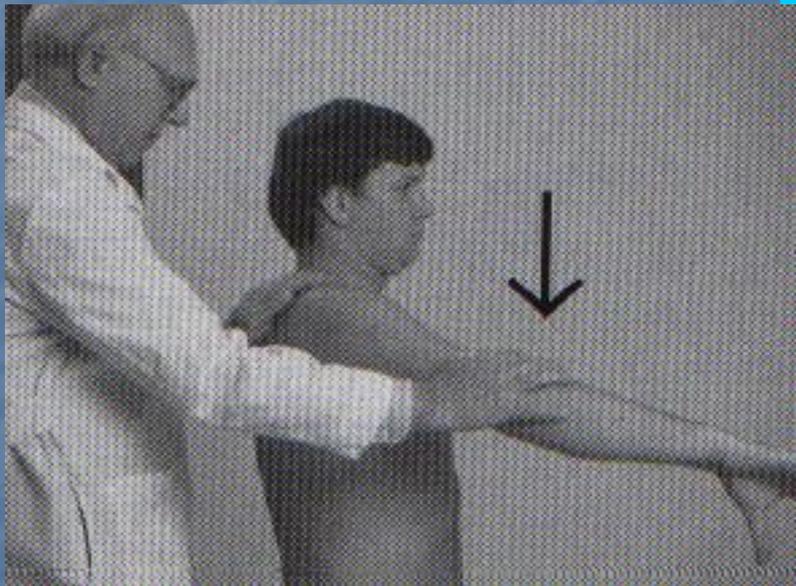
Acromioclavicular joint



- Palpate *posterior margin* of AC joint
- Exaggerated w/ cross arm adduction

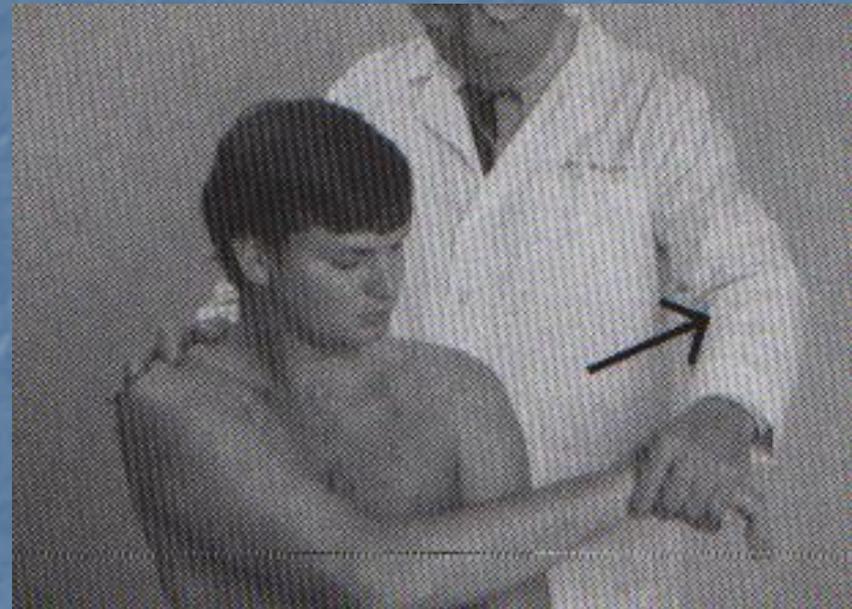
Supraspinatus strength test

- 90 deg abduction
- 30 deg forward flexion
- Thumbs down
- Push down as patient resists
- Pain => RCT



Crossed arm adduction

- Arm across chest as far as comfortably possible
- Restricted => tight posterior capsule
- AC joint pain



Subacromial/Subdeltoid bursae

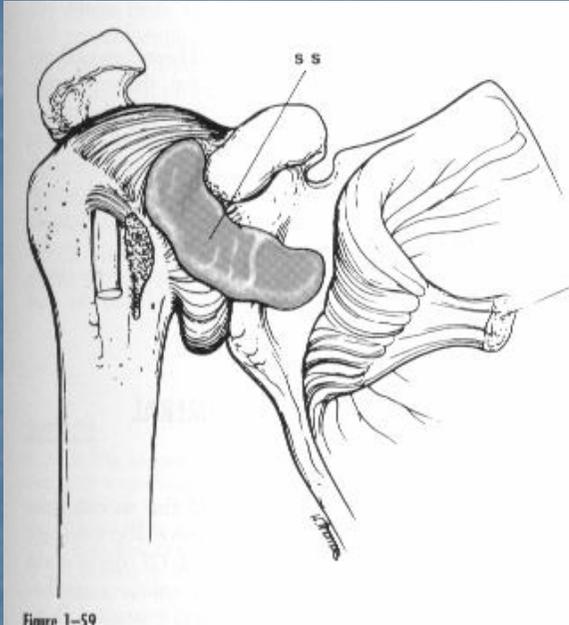
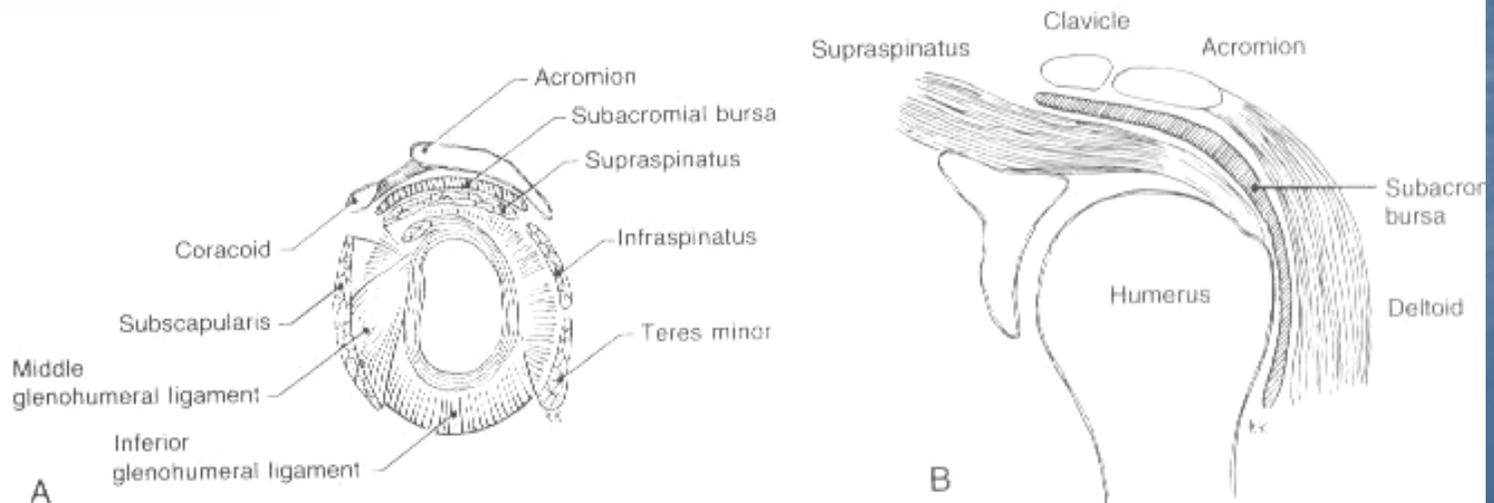


Figure 1-59

Subscapularis
bursa

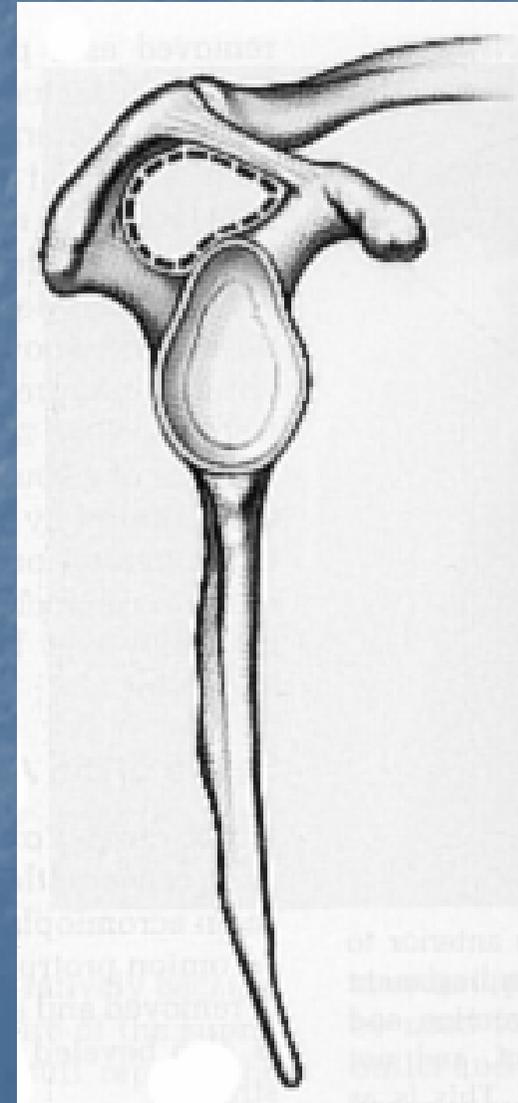


Subacromial Impingement Syndrome

- Spectrum of disease: bursitis, tendonitis, tendonosis, RCT (failure).
- DD: pain (acute/chronic) (ant./post.)
- Signs/Tests: Neer's, Hawkins', lidocaine injection, Yergason's (Biceps).
- Xrays: superior humeral sublux., "eyebrow" sign, subacromial spurring.

"Supraspinatus Outlet"

- Space between the anterior acromion, coracoacromial ligament, and acromioclavicular joint
 - Supraspinatus muscle tendon
 - Narrowing causes impingement

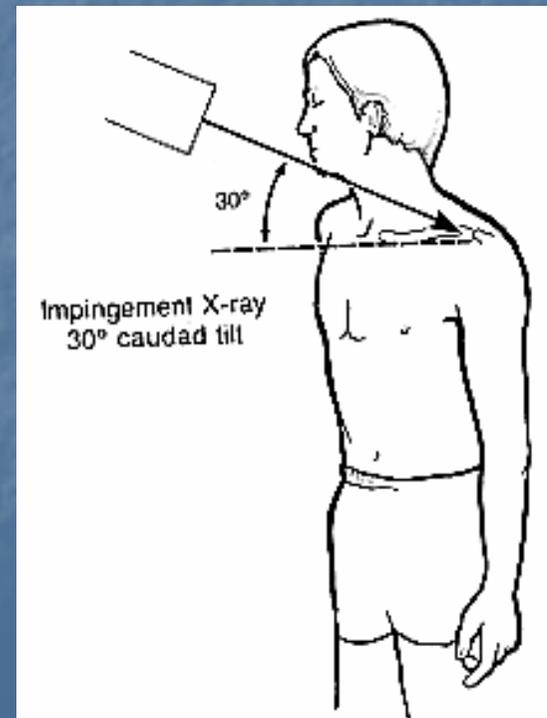
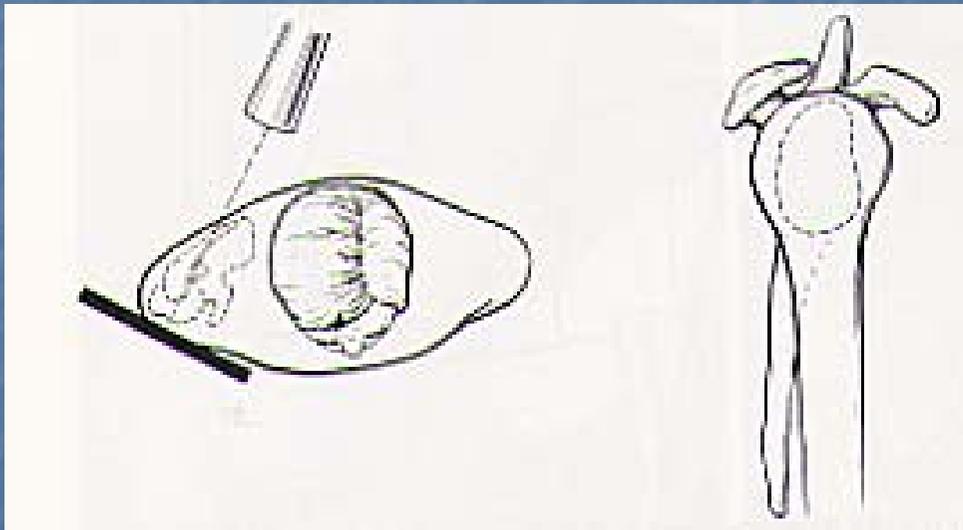


Athletic Impingement

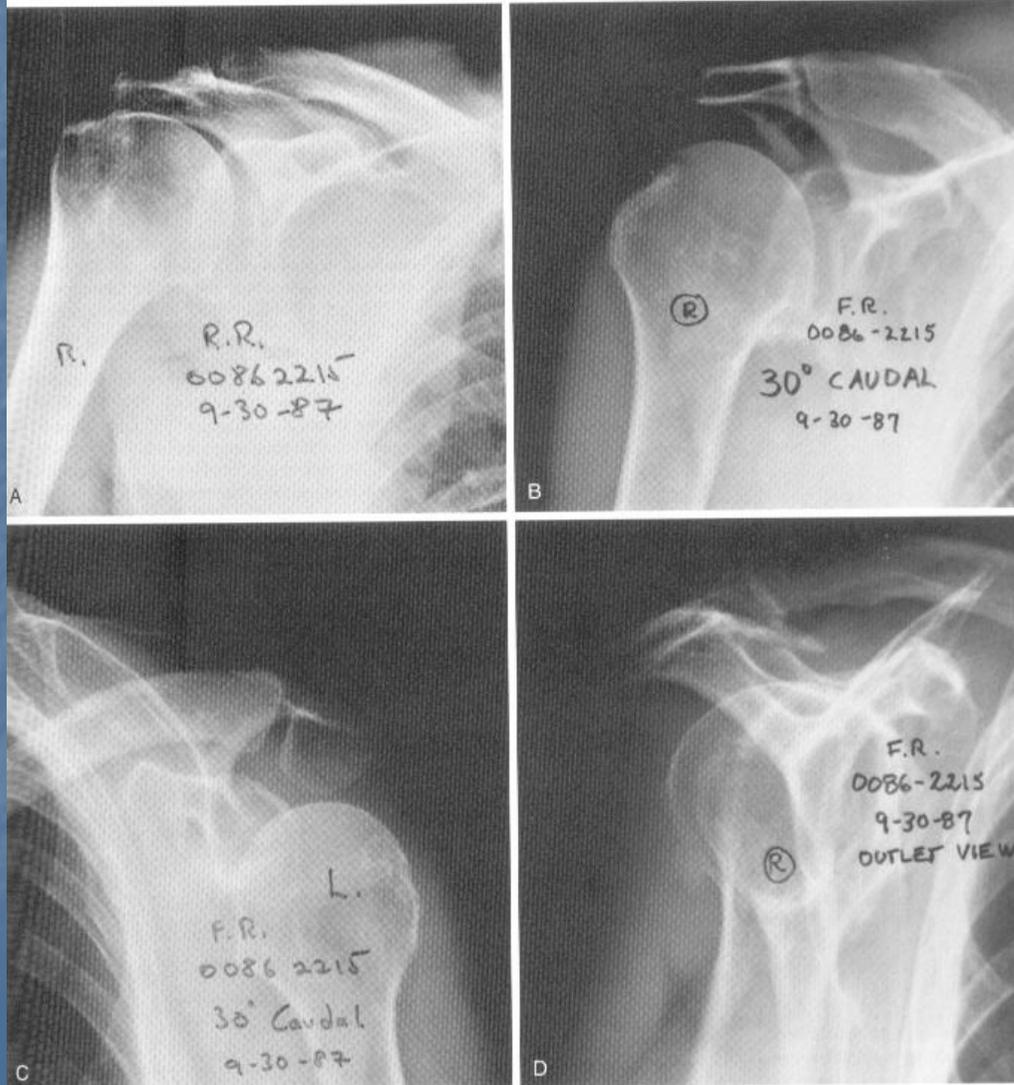
- In younger athletes, the impingement may be related to eccentric overload and microtrauma to the cuff or to subtle glenohumeral instability
- This may lead to secondary CA ligament impingement

Impingement Views

- Radiographic Assessment
 - Outlet view: lateral with 10° caudal angle
 - AP with 30° caudal tilt



Views for Impingement



30* caudal
tilt view

Supraspinatus
Outlet view

Pathology of Outlet Impingement (Neer)

(Also known as primary impingement)

- Stage I: Edema and Hemorrhage
- Stage II: Fibrosis and Tendonitis
- Stage III: Bone Spurs and Tendon Rupture

Bursitis (Stage I Impingement)

- Edema and hemorrhage from overuse
- Overuse of arm above horizon or injury
- Impingement signs, negative xrays
- Subacromial injection relieves pain
- Reversible with rest
- Nonoperative treatment

Tendonitis (Stage II Impingement)

- Repeated mechanical insults
- Pain is position dependent
- Tenderness with rotation of the arm
- Radiographs help assess impingement
- May result from subluxation, stenosis, SLAP
 - Tear of CHL, Subscap insertion
- Seldom an isolated lesion

RC Tendinopathy

- Metaplasia of tenocytes to Chondrocyte-like cells
- Calcium deposition in a hypovascular bed
- Codman; degeneration – necrosis – Ca^{++}
- Precalcific stage; Formative phase, Resorptive phase; postcalcific stage.

Evolution

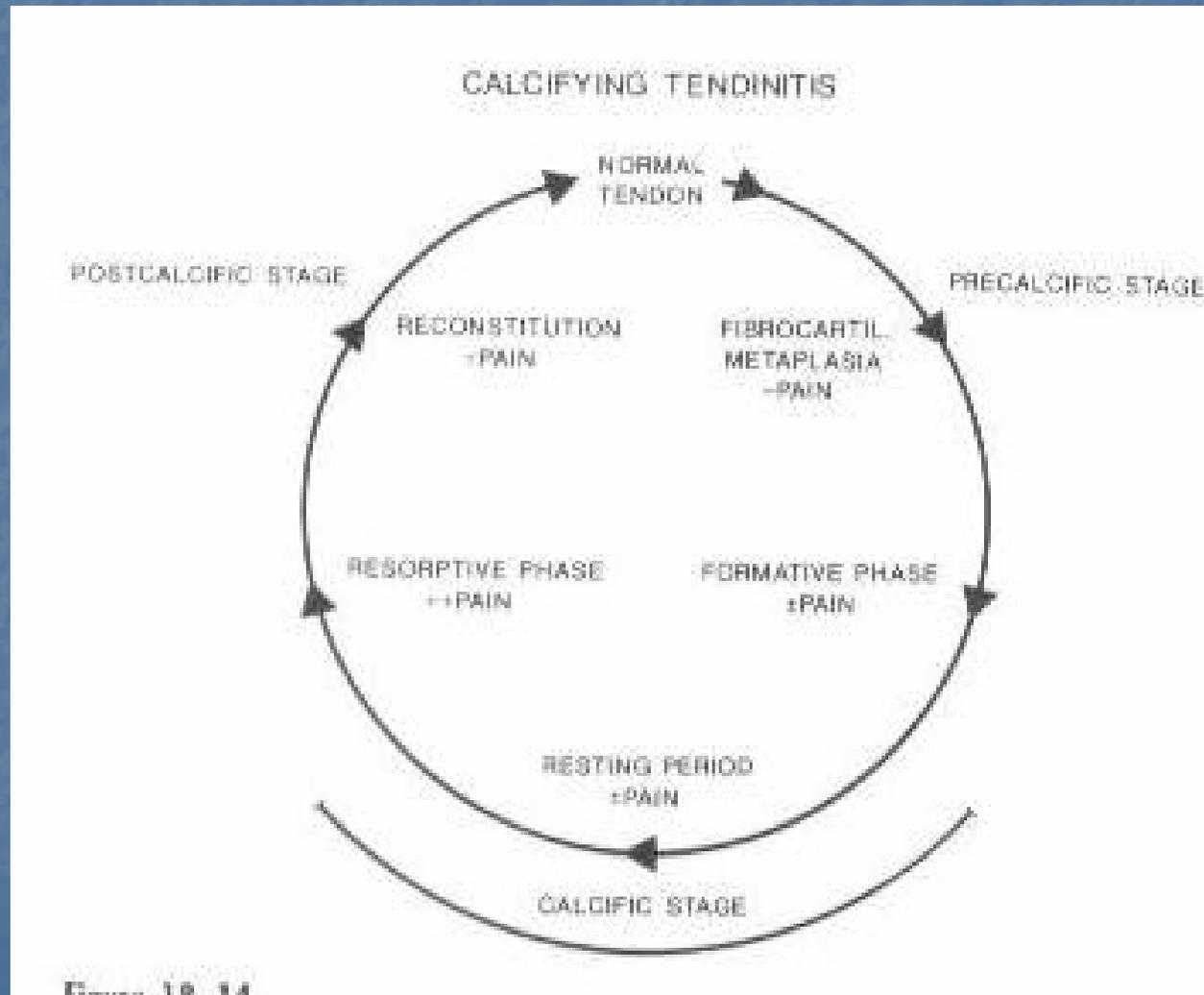


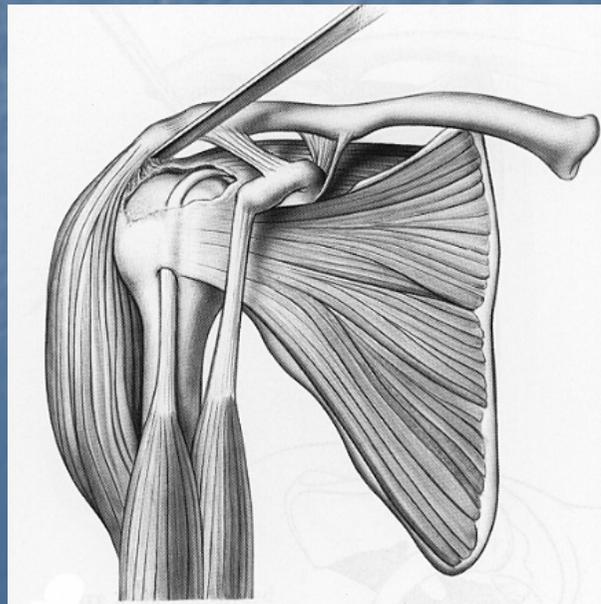
Figure 16-14

Treatment of Calcifying tendonopathy

- Nonoperative: rest, NSAIDS, stretching, PROM, steroid injection.
- Extracorporeal Shock Wave Rx.
- Needle aspiration & lavage (Harmon 79% good; DePalma 61%)
- Operative: Arthroscopic lavage & debridement; Open excision & repair; assess need for acromioplasty.

Rupture of the Rotator Cuff (Stage III Impingement)

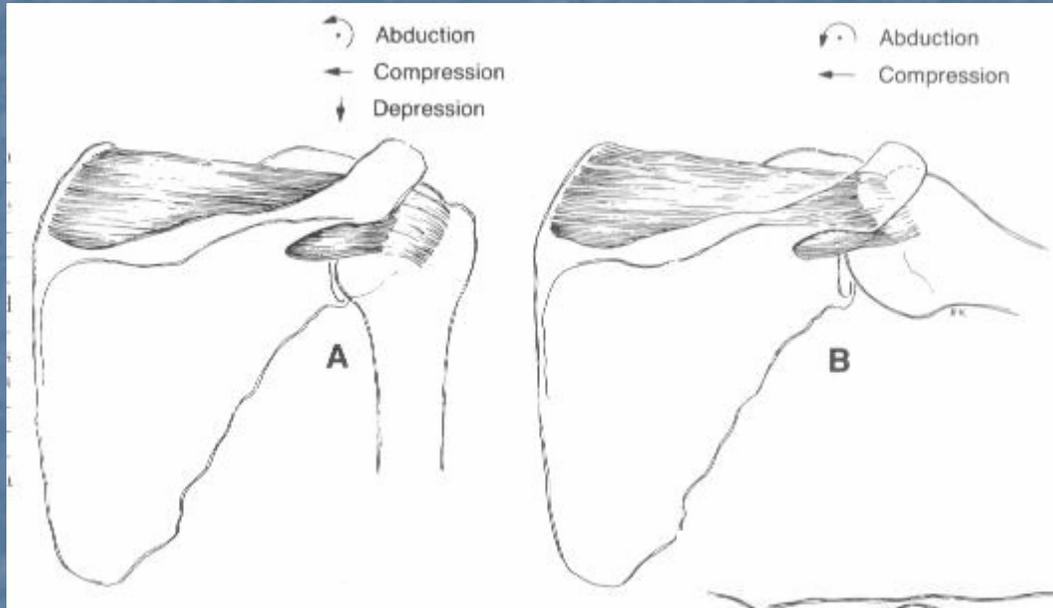
- End stage result of prolonged impingement
- Occasionally secondary to trauma
- Expected to progress if not treated



Rotator Cuff

- Tenuous vascularity:
 - Axillary artery
 - Branches of the anterior and posterior humeral circumflex
 - Watershed or “critical” zone implicated
- Balanced force couples
- Balanced static restraints
- Rhythmic scapulohumeral motion/mechanics

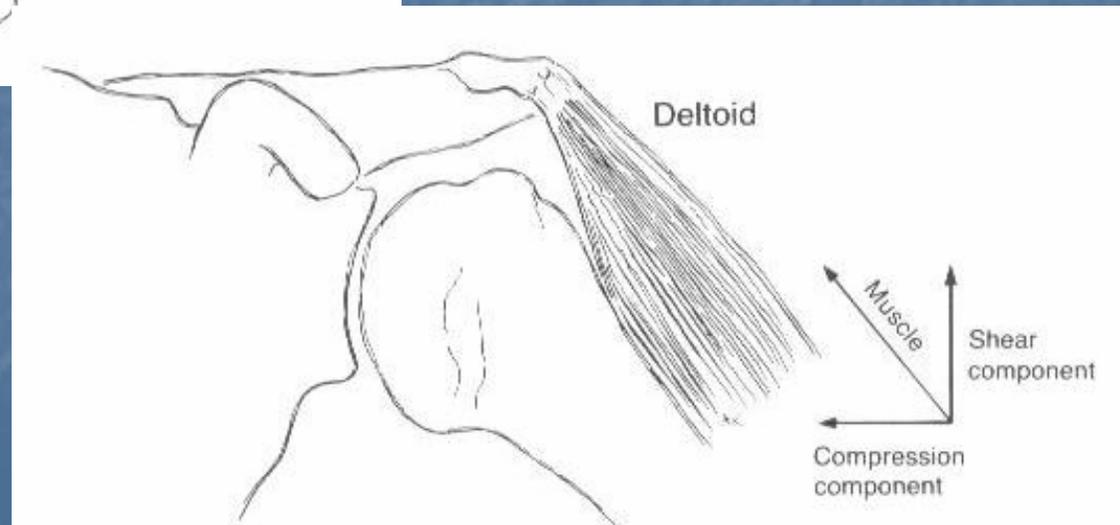
Muscle Forces



Supraspinatus:
“compression”

Allows deltoids pull to keep the fulcrum at the glenohumeral interface, and not displace superiorly

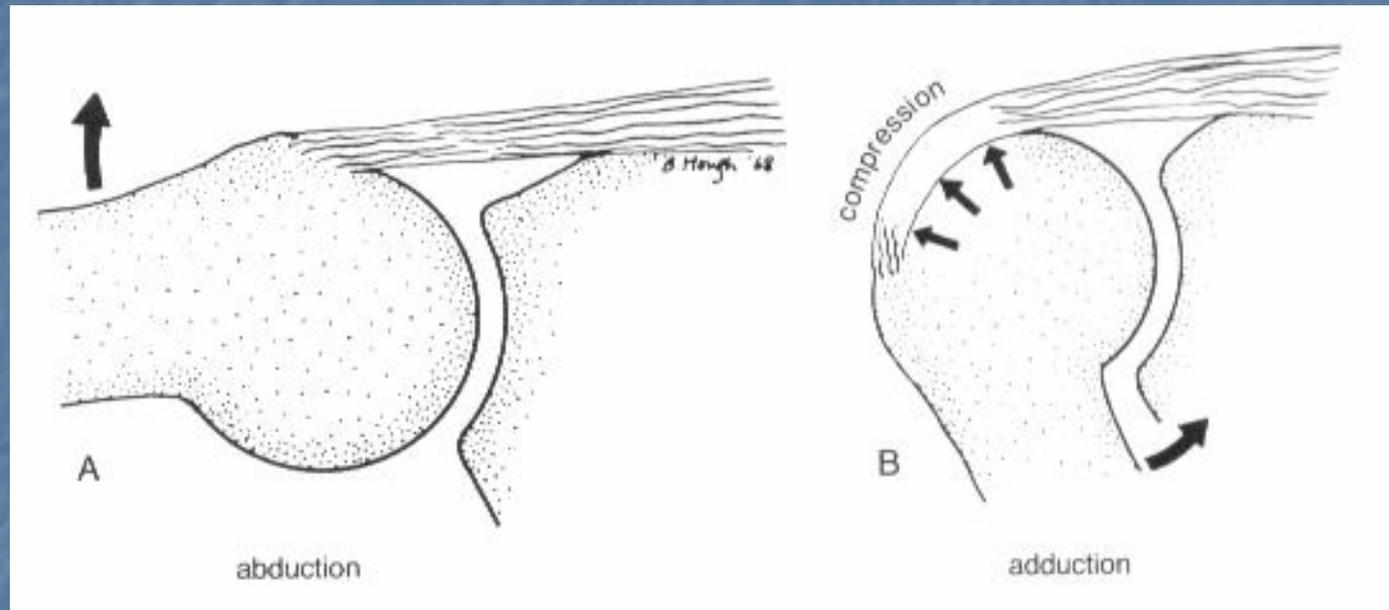
Deltoid:
“shearing”



Cuff dynamics

- Infraspinatus is the primary depressor of the head, in addition to the biceps

Vascular Impingement



Progression of a RCT

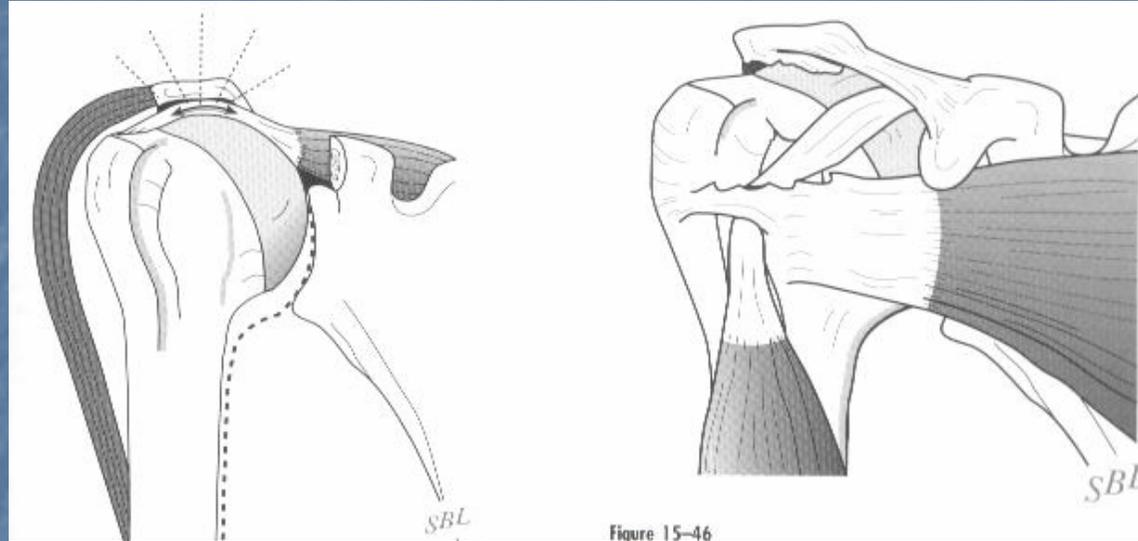
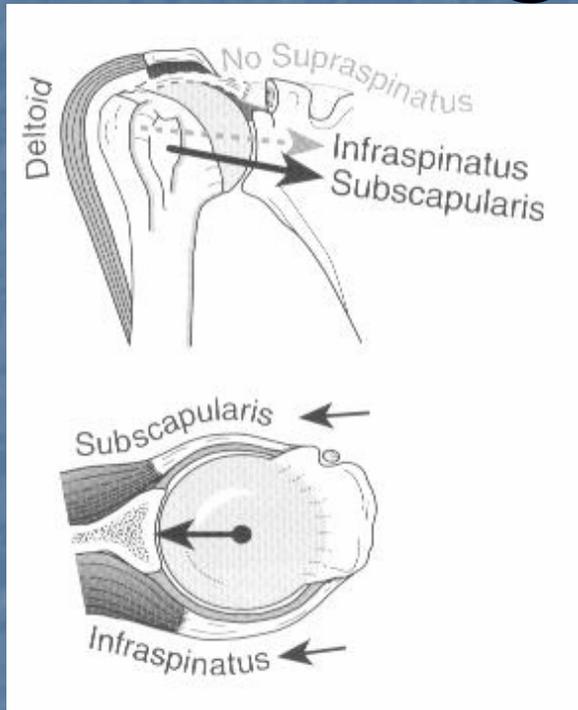
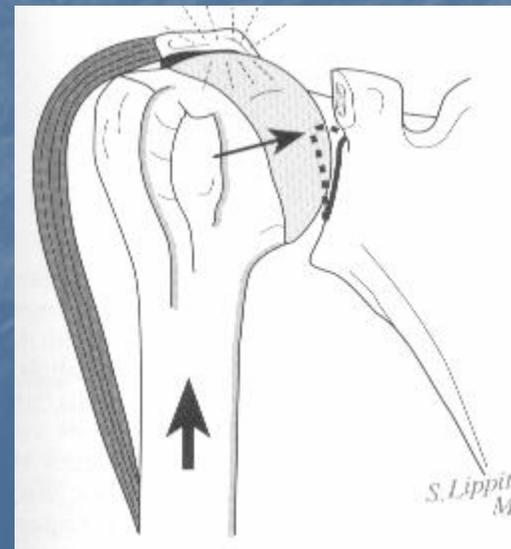


Figure 15-46



Treatment of RCT

- Prevention: appropriate training regimens that increase stress on the shoulder gradually
 - Also appropriate stretching and strengthening regimens
 - SAID principle (specific adaptation to imposed demand)
 - Good warm up
 - Internal rotation stretching to avoid posterior capsular tightness

Treatment of RCT

- Nonoperative treatment
 - Modification of activity
 - NSAIDs
 - Ice
 - Ultrasound (believed to increase local vascular response)
 - Stretching
 - ? Injections
 - Strengthening (especially the external rotators)

Operative Treatment

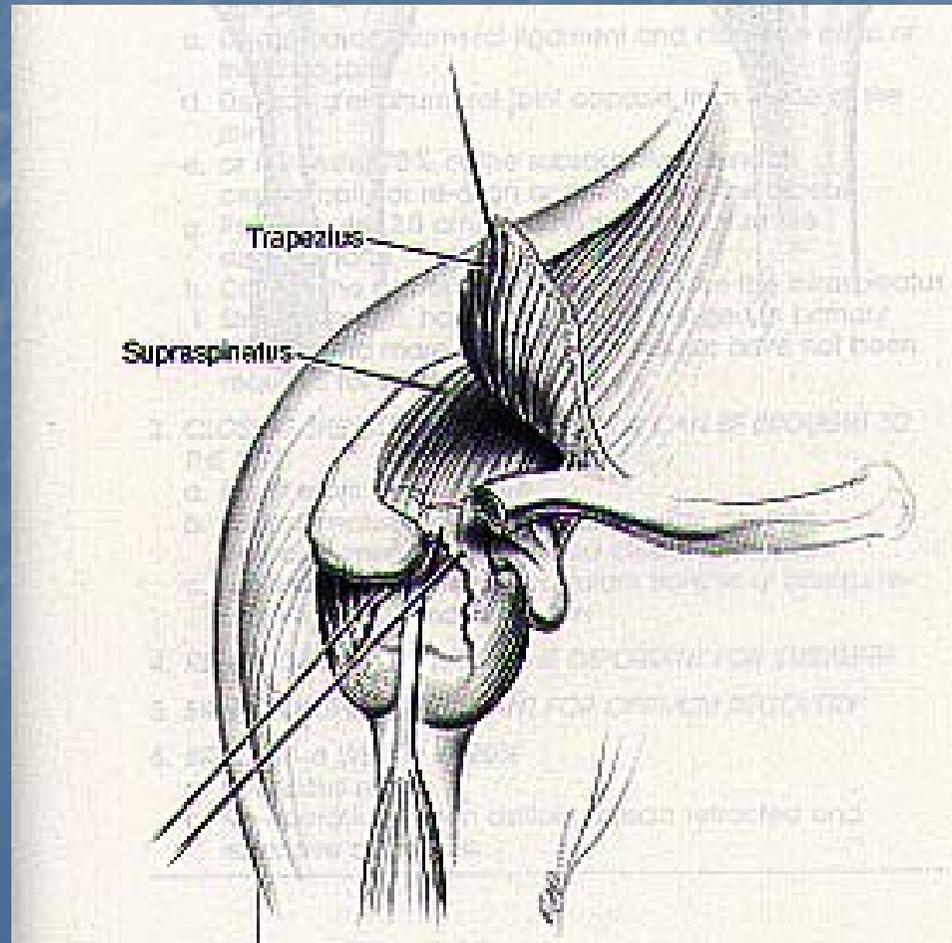
- Subacromial decompression
 - Anterior acromioplasty (controversial)
- Rotator cuff repair
 - Side to side margin convergence with tendon to bone repair
- Biceps Tenodesis

Rupture of the Rotator Cuff

- Four Major Objectives of Surgery
 - Closure of the cuff defect
 - Eliminate cuff impingement
 - Preserve origin of the deltoid
 - Prevent post-op adhesions
- Debridement alone insufficient

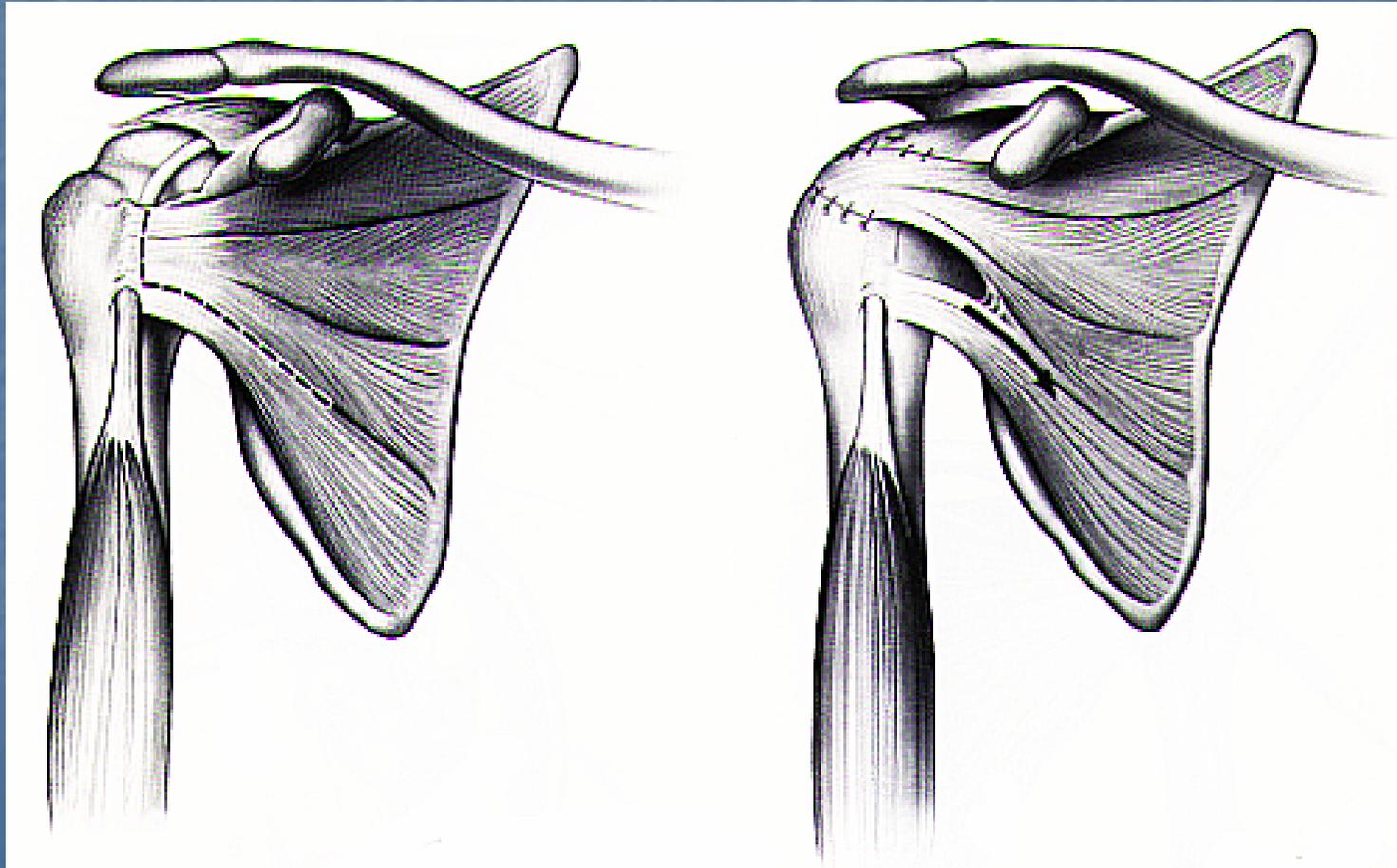
Delayed Rupture of the Rotator Cuff

- Supraspinatus advancement



Delayed Rupture of the Rotator Cuff

- Subscapularis advancement



- If tear involves less than 50% of the cuff then most authors recommend debridement and decompression
- If greater than 50%, then decompression and repair is indicated
- If massive, then debridement may be all that is possible
 - Retraction
 - Evaluate for muscle atrophy (MRI)

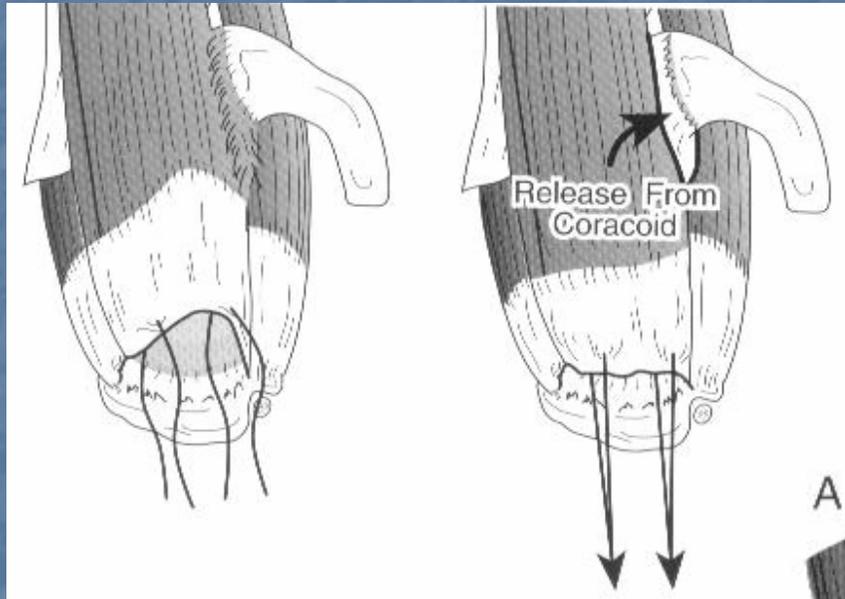
Surgical expectations

- Rotator cuff surgery treats pain, but does not typically improve function
- Post op rehab regimens for repaired rotator cuff emphasizes PASSIVE range of motion for at least 6 weeks

Treatment of RCT

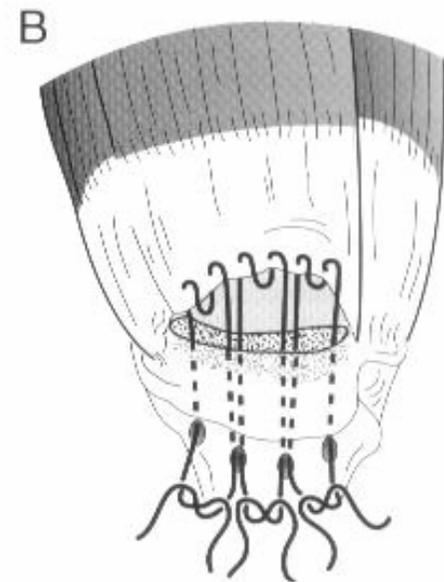
- Partial thickness: nonoperative w/ rest, behavior modification, stretching & strengthening; scope acromioplasty w/ or w/o debridement; open acromioplasty & debridement.
- Full thickness: scope vs. open RC repair w/ acromioplasty; assess need for osseous augmentation.

RC repair



Release adhesions:
labrum, coracoid

Osseous suture
technique



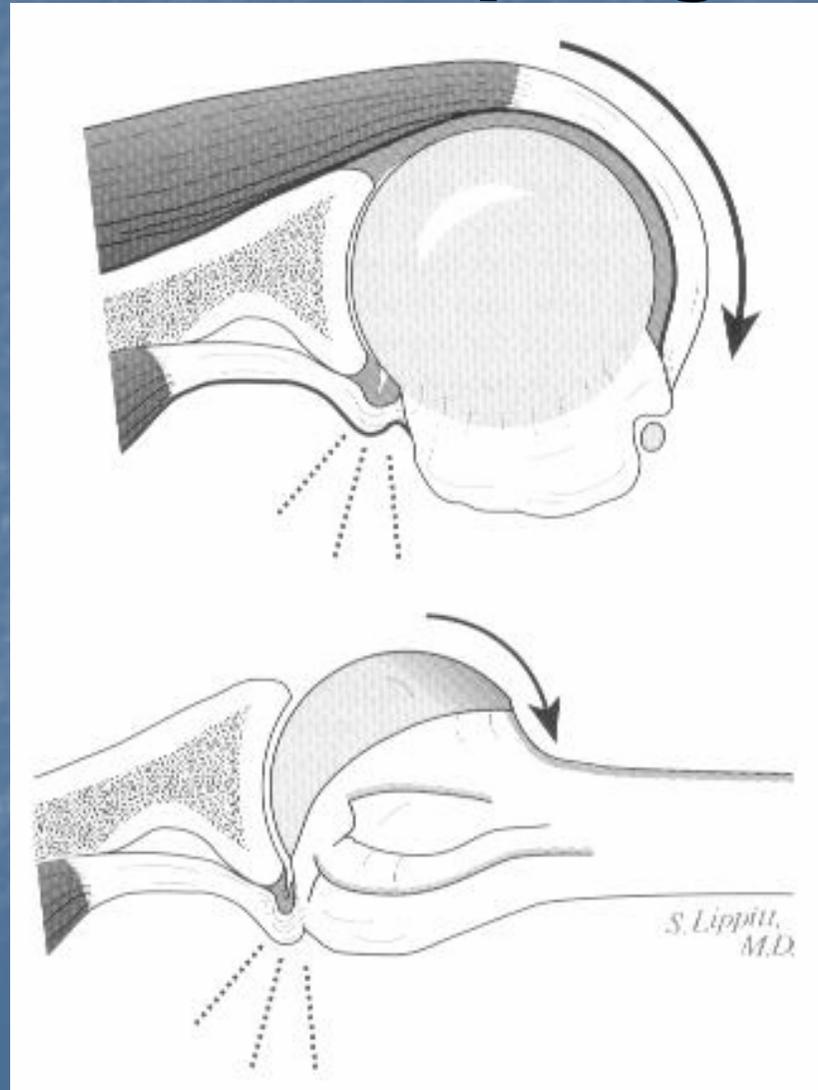
Outlet impingement

- In older athletes
 - Tendinopathy followed by acromial changes and compression of the cuff under the CA arch
- In younger athletes
 - Subtle glenohumeral laxity leading to muscle imbalance and subacromial space impingement

Internal Impingement (Walch and Davidson)

- Impingement of the rotator cuff and posterior labrum under the posterosuperior glenoid rim by the greater tuberosity during late cocking and early acceleration phase of throwing
- Subtle anterior translation of the humeral head may contribute

Internal Impingement

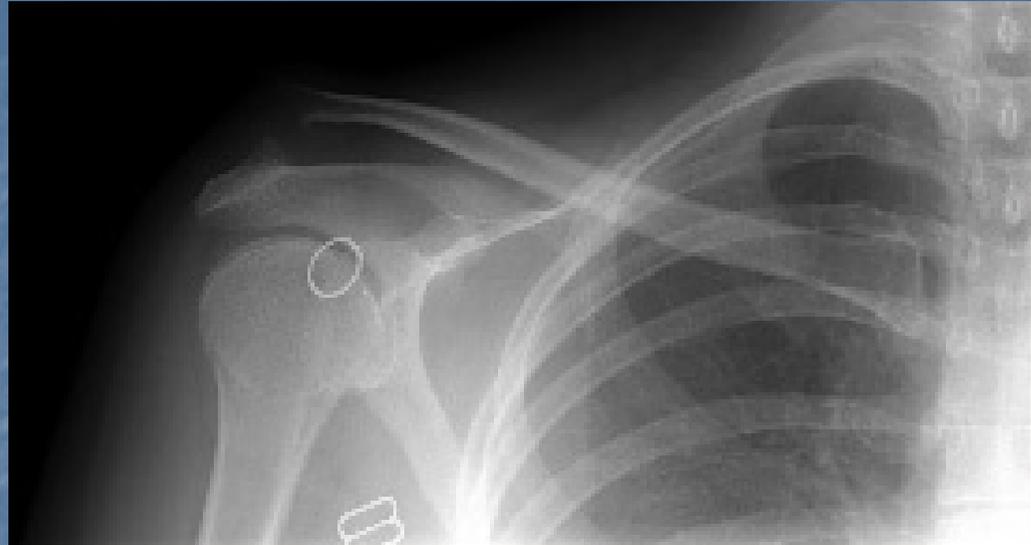


- Internal impingement
 - Controversial: debridement vs. anterior stabilization
- Biceps tenosynovitis if >25-50% may need tenodesis

Acromioclavicular Joint



AC Joint



- Diarthrodial joint between medial facet of acromion and the lateral (distal) clavicle.
- Contains intra-articular disk of variable size.
- Thin capsule stabilized by ligaments on all sides:
 - AC ligaments control horizontal (anteroposterior) displacement
 - Superior AC ligament most important

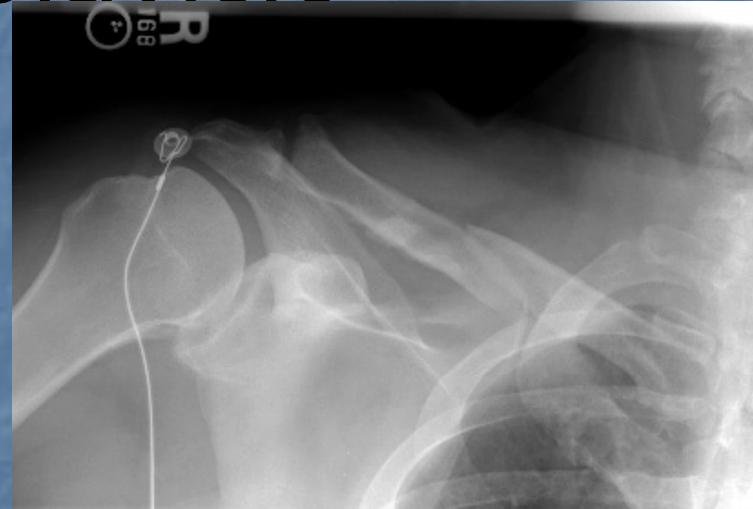
Distal Clavicle

- Coracoclavicular ligaments
 - “Suspensory ligaments of the upper extremity”
 - Two components:
 - Trapezoid
 - Conoid
 - Stronger than AC ligaments
 - Provide vertical stability to AC joint



Radiographic Evaluation of the Clavicle

- Anteroposterior View



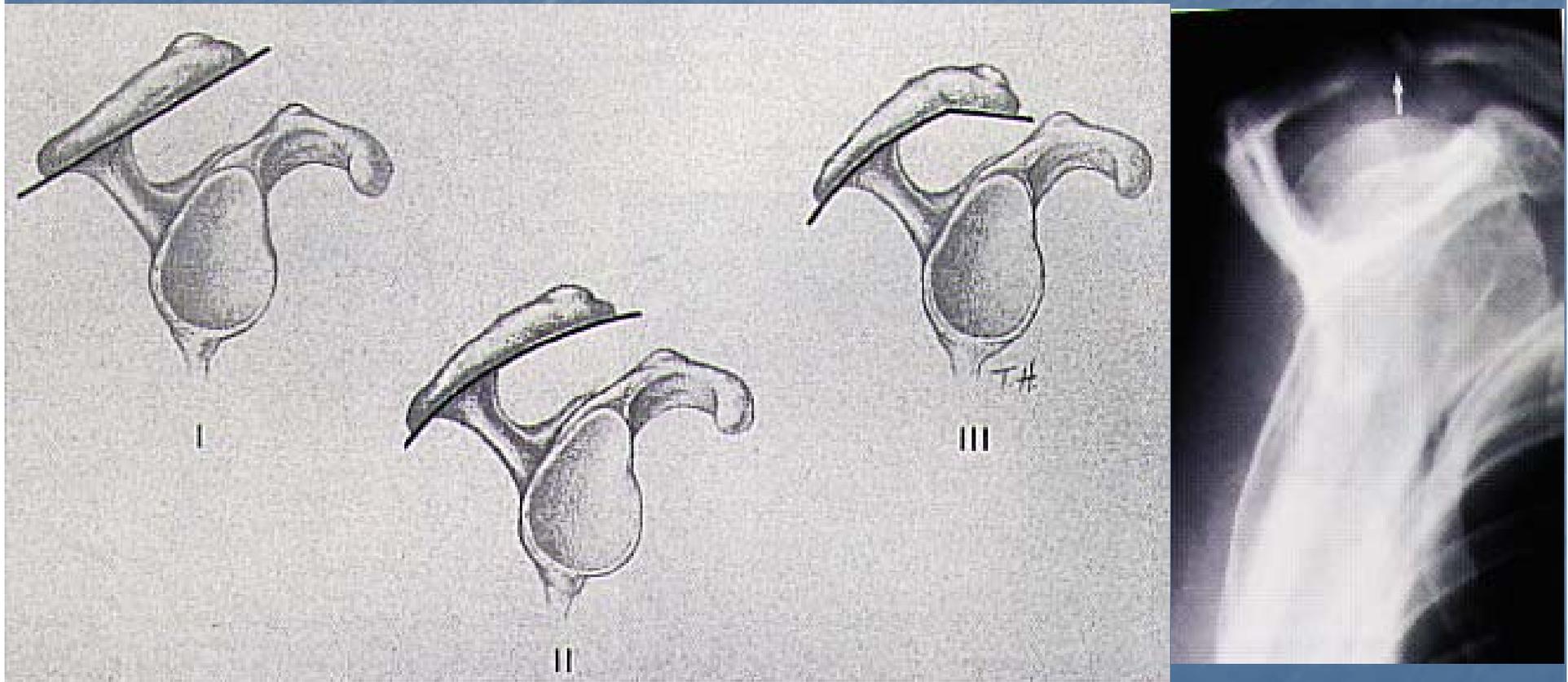
- 30-degree Cephalic Tilt View



Radiographic Evaluation of the Acromioclavicular Joint

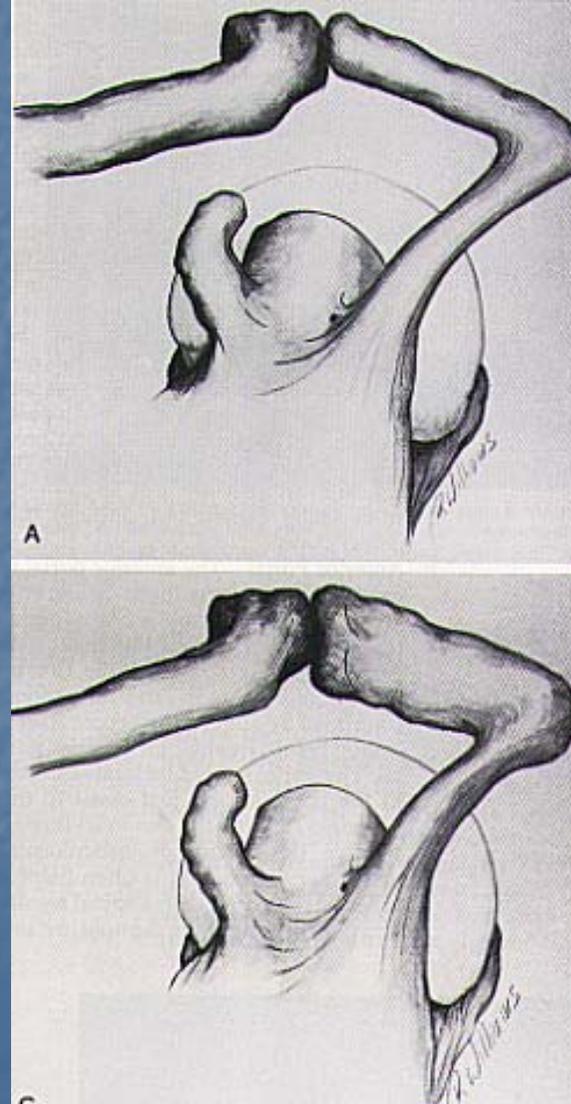
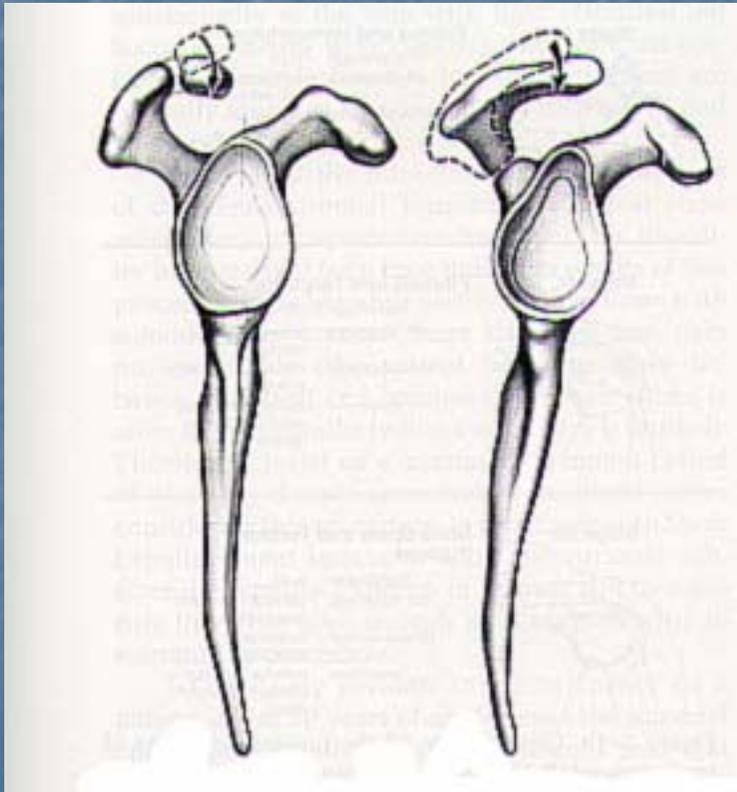
- Proper exposure of the AC joint requires one-third to one-half the x-ray penetration of routine shoulder views
- Initial Views:
 - Anteroposterior view
 - Zanca view (15 degree cephalic tilt)
- Other views:
 - Axillary: demonstrates anterior-posterior displacement
 - Stress views: not generally relevant for treatment decisions.

Acromion Pathology



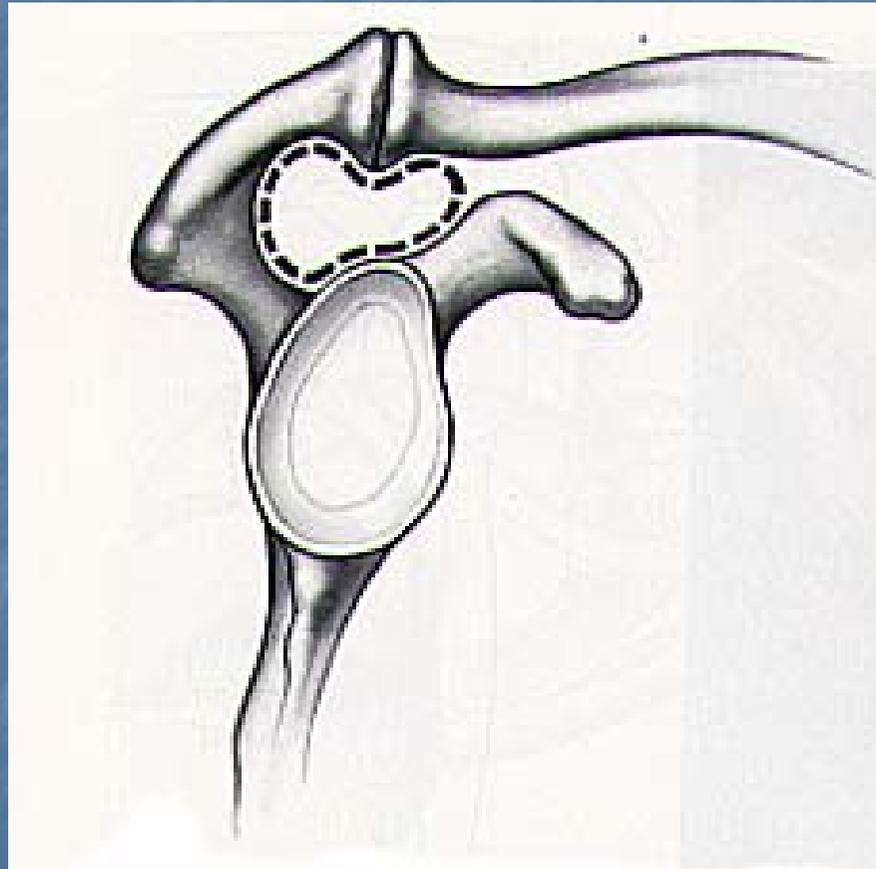
Acromion Pathology

Os Acromionale



Acromion
Thickness

Acromioclavicular Pathology



Acromioclavicular Joint Pathology

- Distal Clavicle Osteolysis
- Degenerative Joint Disease
- Acromioclavicular Separation

Acromioclavicular Joint Pathology

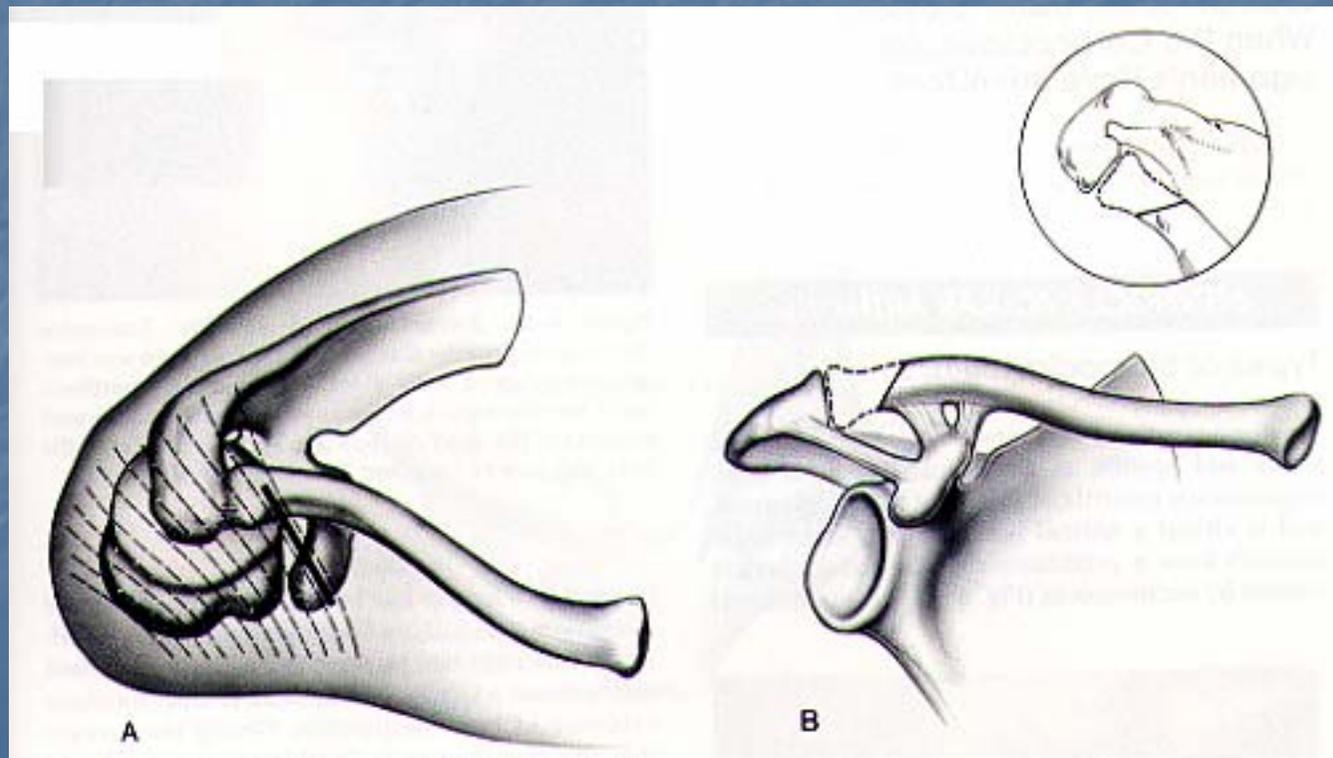
- Distal Clavicle Osteolysis
 - Common in weight lifters
 - Localized pain, aching, weakness
 - Pain with flexion, adduction across chest
 - XRay: osteolysis, osteopenia, tapering
 - Activity modification, rest, NSAIDs
 - Distal clavicle resection

Acromioclavicular Joint Pathology

- Degenerative Joint Disease
 - Isolated or with impingement syndrome
 - Pain with cross-chest adduction
 - Diagnosis assisted by injection, bone scan
 - Distal clavicle resection curative

Acromioclavicular Joint Pathology

- Distal Clavicle Resection



Classification For Acromioclavicular Joint Injuries

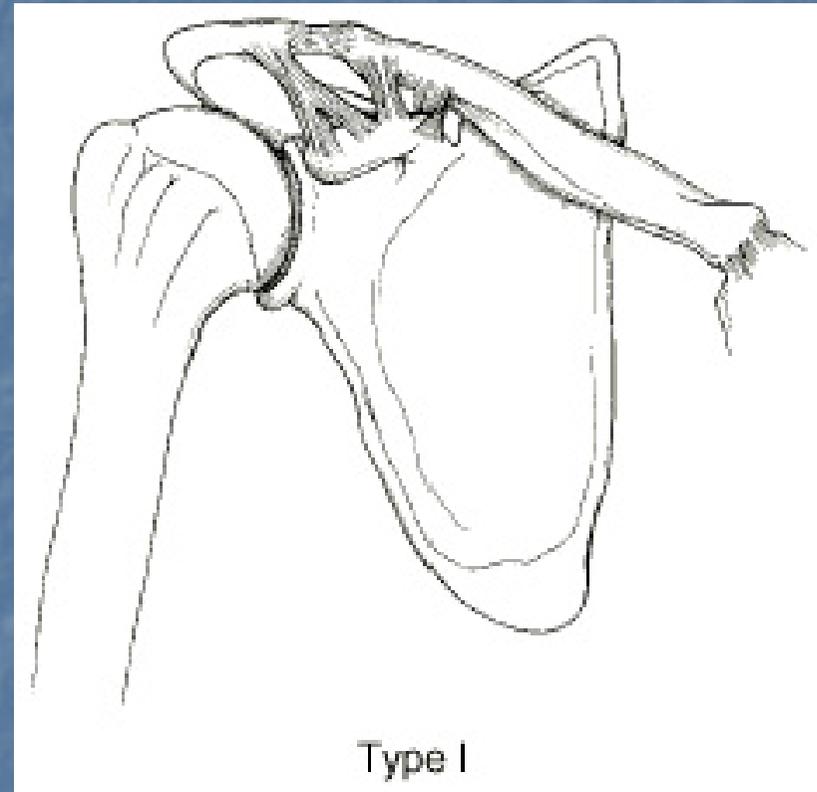
- Initially classified by both Allman and Tossy et al. into three types (I, II, and III).
- Rockwood later added types IV, V, and VI, so that now six types are recognized.
- Classified depending on the degree and direction of displacement of the distal clavicle.

Allman FL Jr. Fractures and ligamentous injuries of the clavicle and its articulation. *JBJS* 49A: 774-784, 1967.

Rockwood CA Jr and Young DC. Disorders of the acromioclavicular joint, In Rockwood CA, Matsen FA III: *The Shoulder*, Philadelphia, WB Saunders, 1990, pp. 413-476.

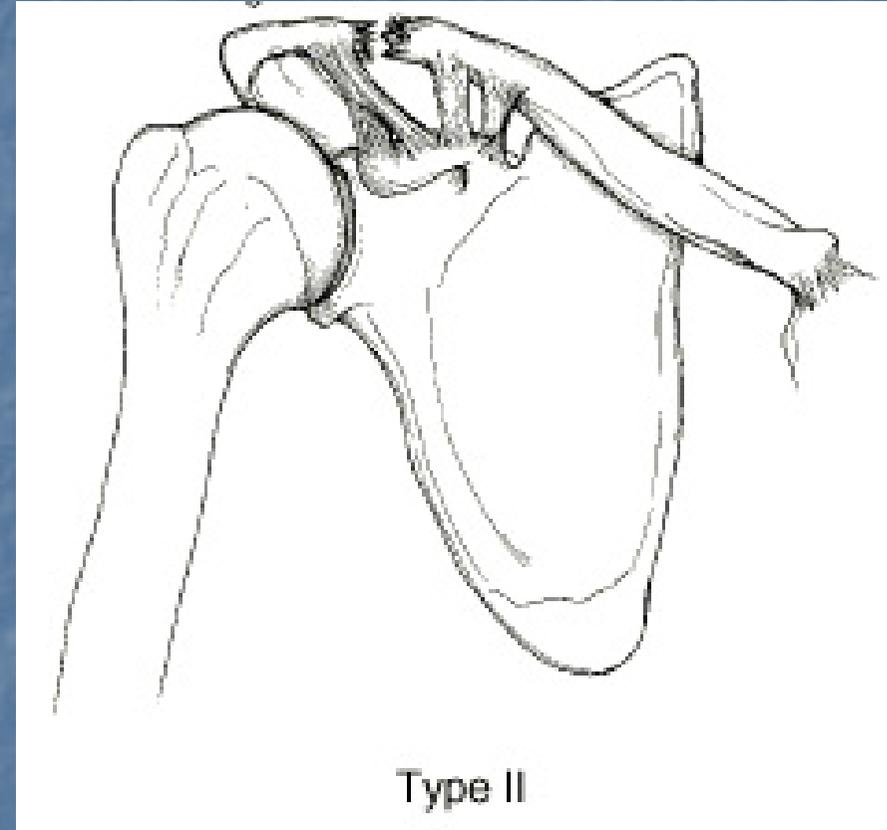
Type I

- Sprain of acromioclavicular ligament
- AC joint intact
- Coracoclavicular ligaments intact
- Deltoid and trapezius muscles intact



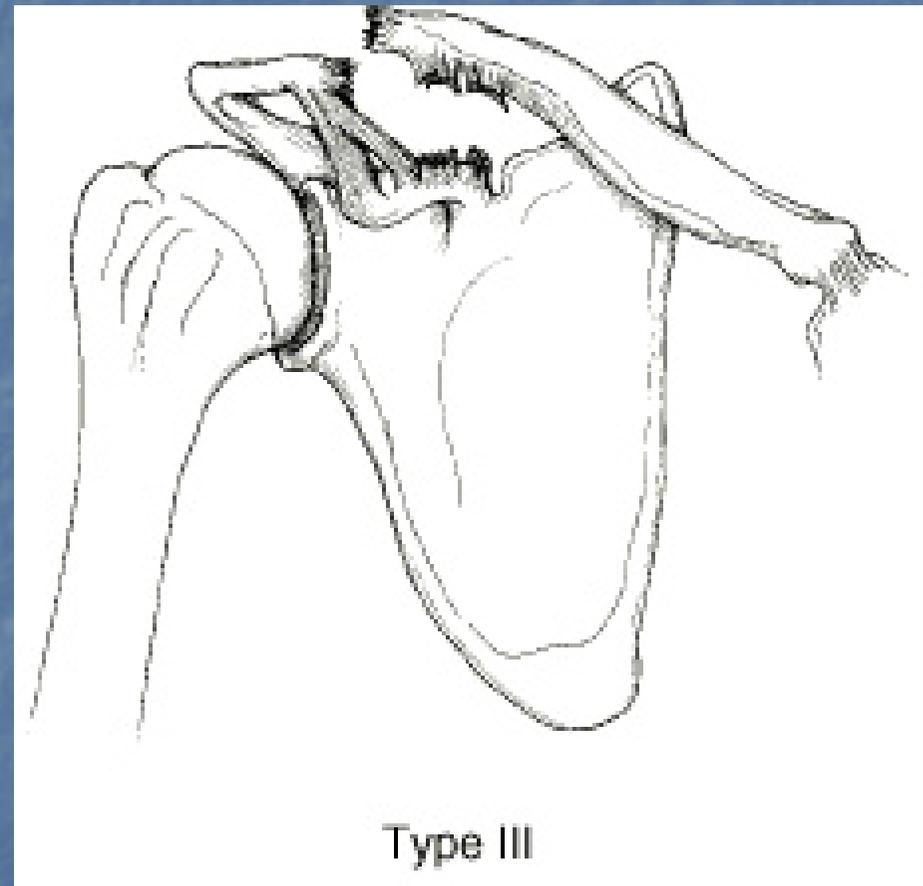
Type II

- AC joint disrupted
- < 50% Vertical displacement
- Sprain of the coracoclavicular ligaments
- CC ligaments intact
- Deltoid and trapezius muscles intact



Type III

- AC ligaments and CC ligaments all disrupted
- AC joint dislocated and the shoulder complex displaced inferiorly
- CC interspace greater than the normal shoulder(25-100%)
- Deltoid and trapezius muscles usually detached from the distal clavicle



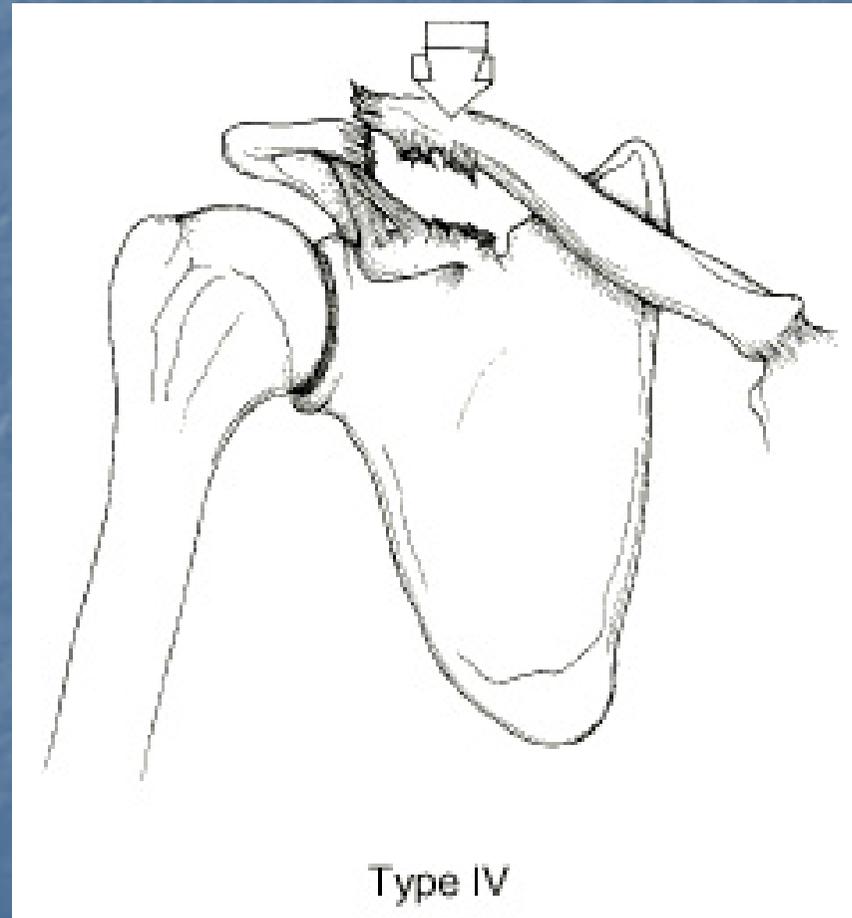
From Nuber GW and Bowen MK, JAAOS, 5:11, 1997

Type III Variants

- “Pseudodislocation” through an intact periosteal sleeve
- Physeal injury
- Coracoid process fracture

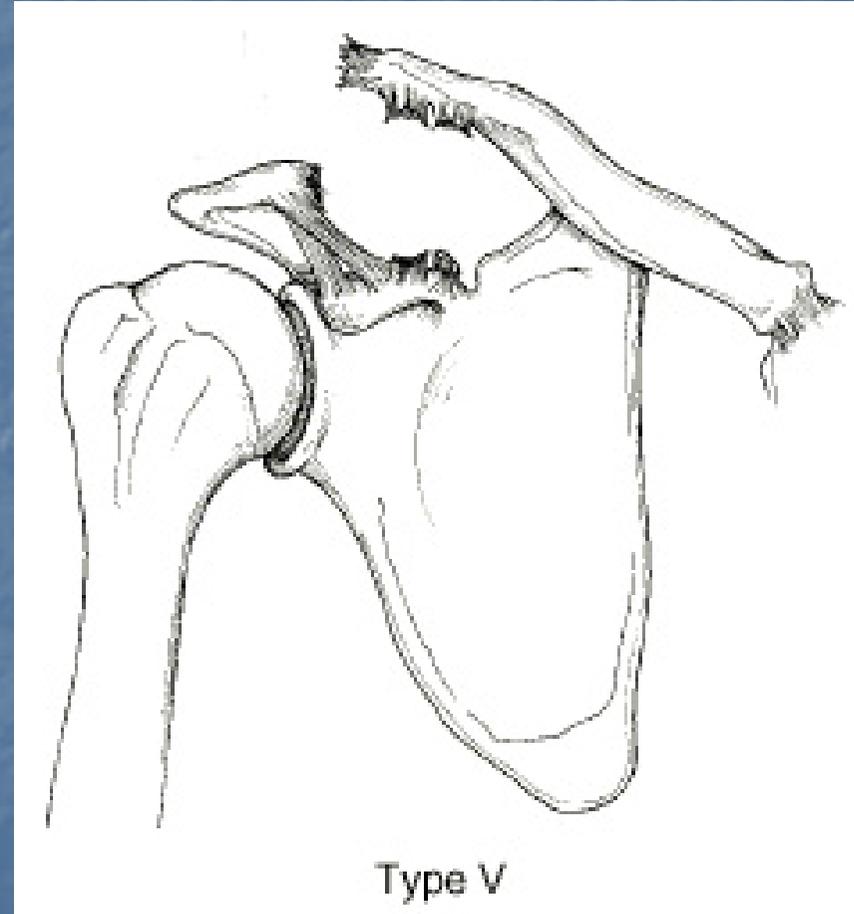
Type IV

- AC and CC ligaments disrupted
- AC joint dislocated and clavicle displaced posteriorly into or through the trapezius muscle
- Deltoid and trapezius muscles detached from the distal clavicle

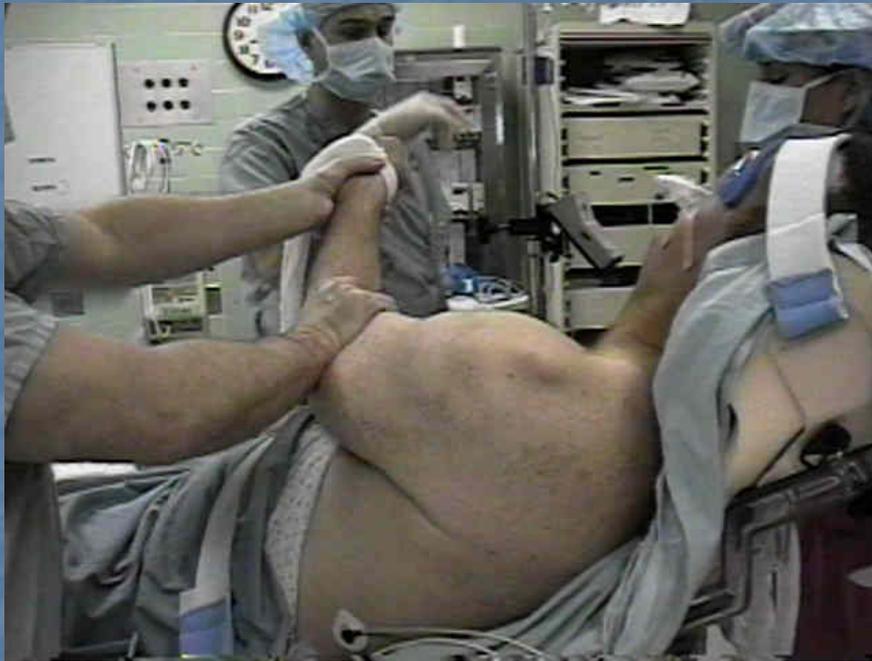


Type V

- AC ligaments disrupted
- CC ligaments disrupted
- AC joint dislocated and gross disparity between the clavicle and the scapula (100-300%)
- Deltoid and trapezius muscles detached from the distal half of clavicle

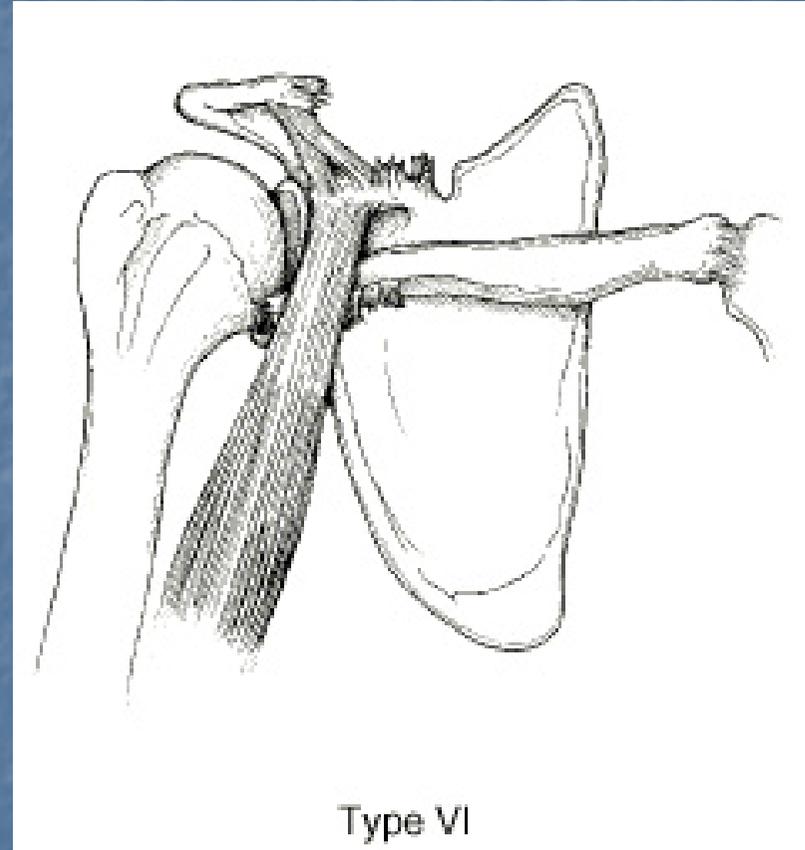


Type V



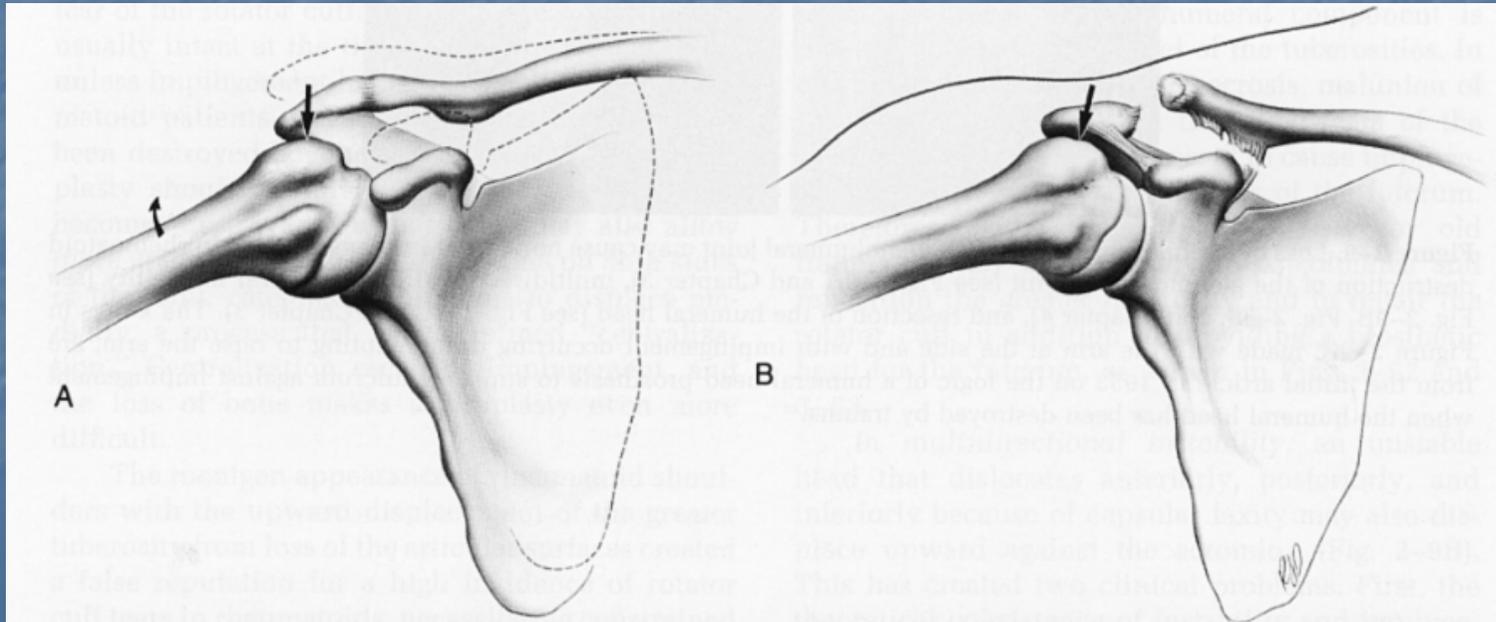
Type VI

- AC joint dislocated and clavicle displaced inferior to the acromion or the coracoid process
- AC and CC ligaments disrupted
- Deltoid and trapezius muscles detached from the distal clavicle



Acromioclavicular Joint Pathology

- Acromioclavicular separation
 - Non-outlet impingement
 - Loss of normal scapular rotation



Treatment Options For Types I - II Acromioclavicular Joint Injuries

- Nonoperative: Ice and protection until pain subsides (7 to 10 days).
- Return to sports as pain allows (1-2 weeks)
- No apparent benefit to the use of specialized braces.

- Type II operative treatment
 - Generally reserved only for the patient with chronic pain.
 - Treatment is resection of the distal clavicle and reconstruction of the coracoclavicular ligaments.

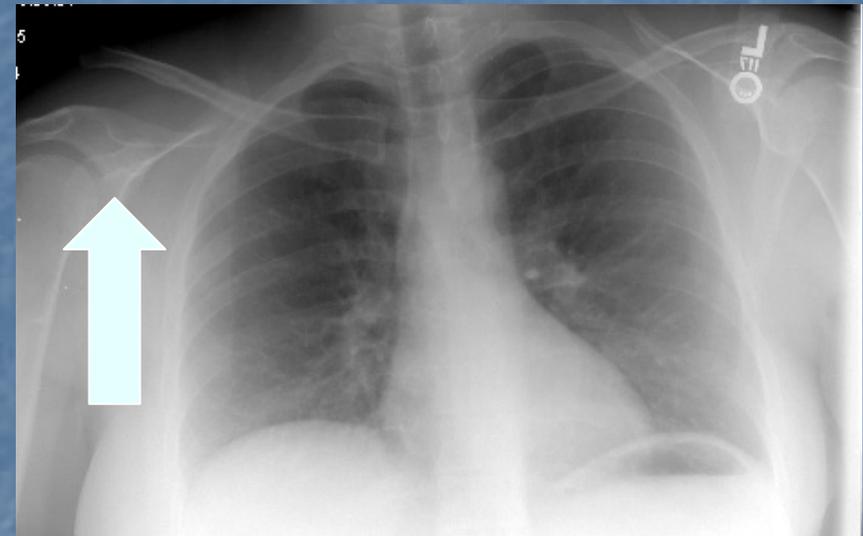
Treatment Options For Type III- VI Acromioclavicular Joint Injuries

- Nonoperative treatment
 - Closed reduction and application of a sling and harness to maintain reduction of the clavicle
 - Short-term sling and early range of motion
- Operative treatment
 - Primary AC joint fixation
 - Primary CC ligament fixation
 - Excision of the distal clavicle
 - Dynamic muscle transfers

- Type III Injuries: Need for acute surgical treatment remains very controversial.
- Most surgeons recommend conservative treatment except in the throwing athlete or overhead worker.
- Repair generally avoided in contact athletes because of the risk of reinjury.

Indications for Acute Surgical Treatment of Acromioclavicular Injuries

- Type III injuries in highly active patients
- Type IV, V, and VI injuries



Surgical Options for AC Joint Instability

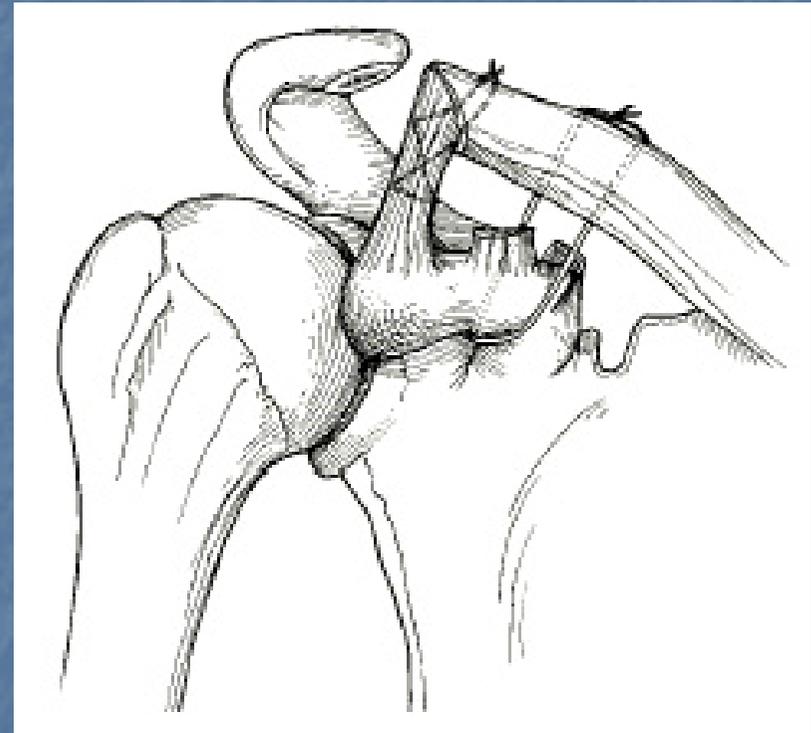
- Distal Clavicle Excision with CC ligament reconstruction
- Primary Coracoclavicular Fixation
- Coracoid process transfer to distal transfer (Dynamic muscle transfer)
- Primary AC joint fixation

Acute Fixation w/ Rockwood Screw:



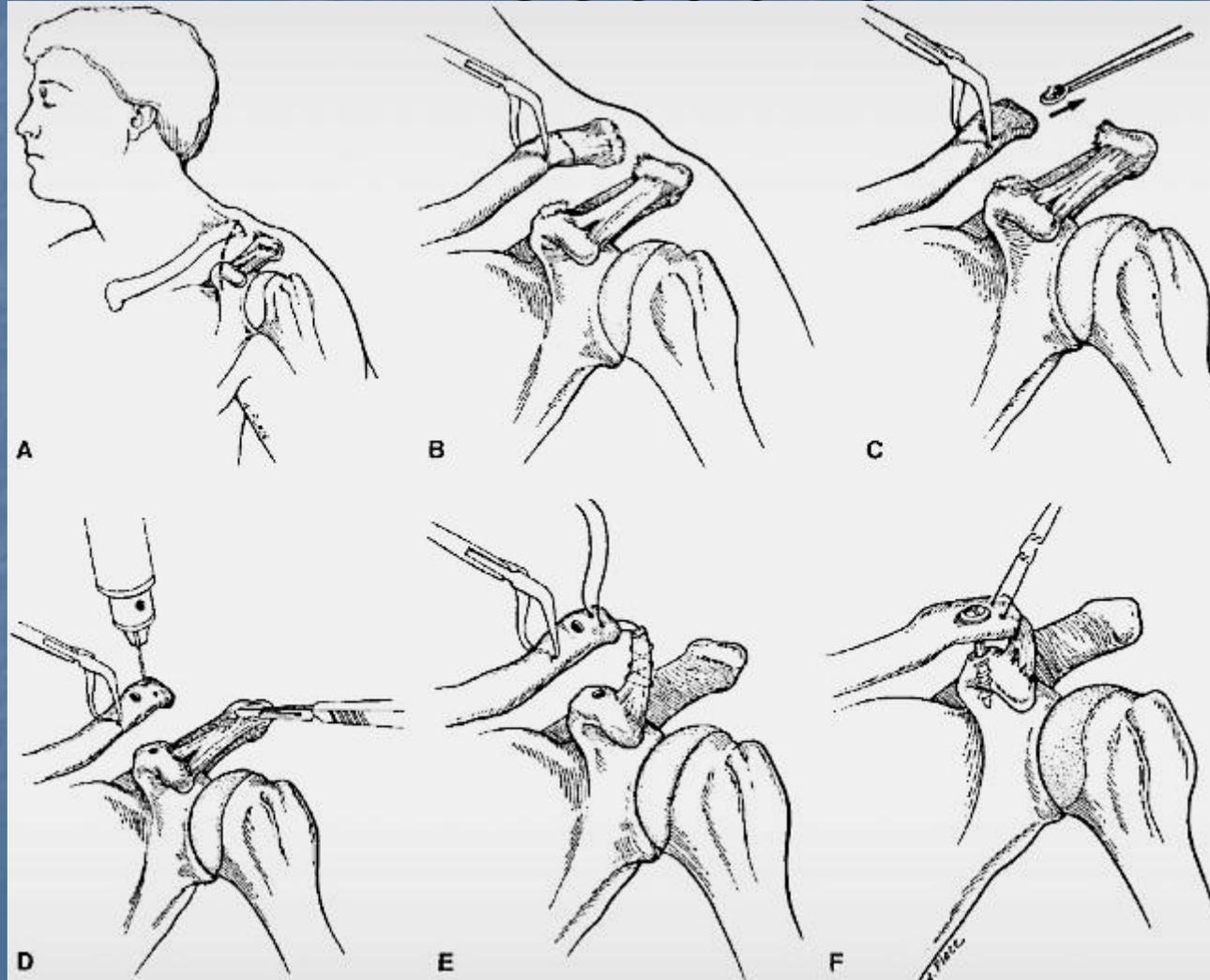
Weaver-Dunn Procedure

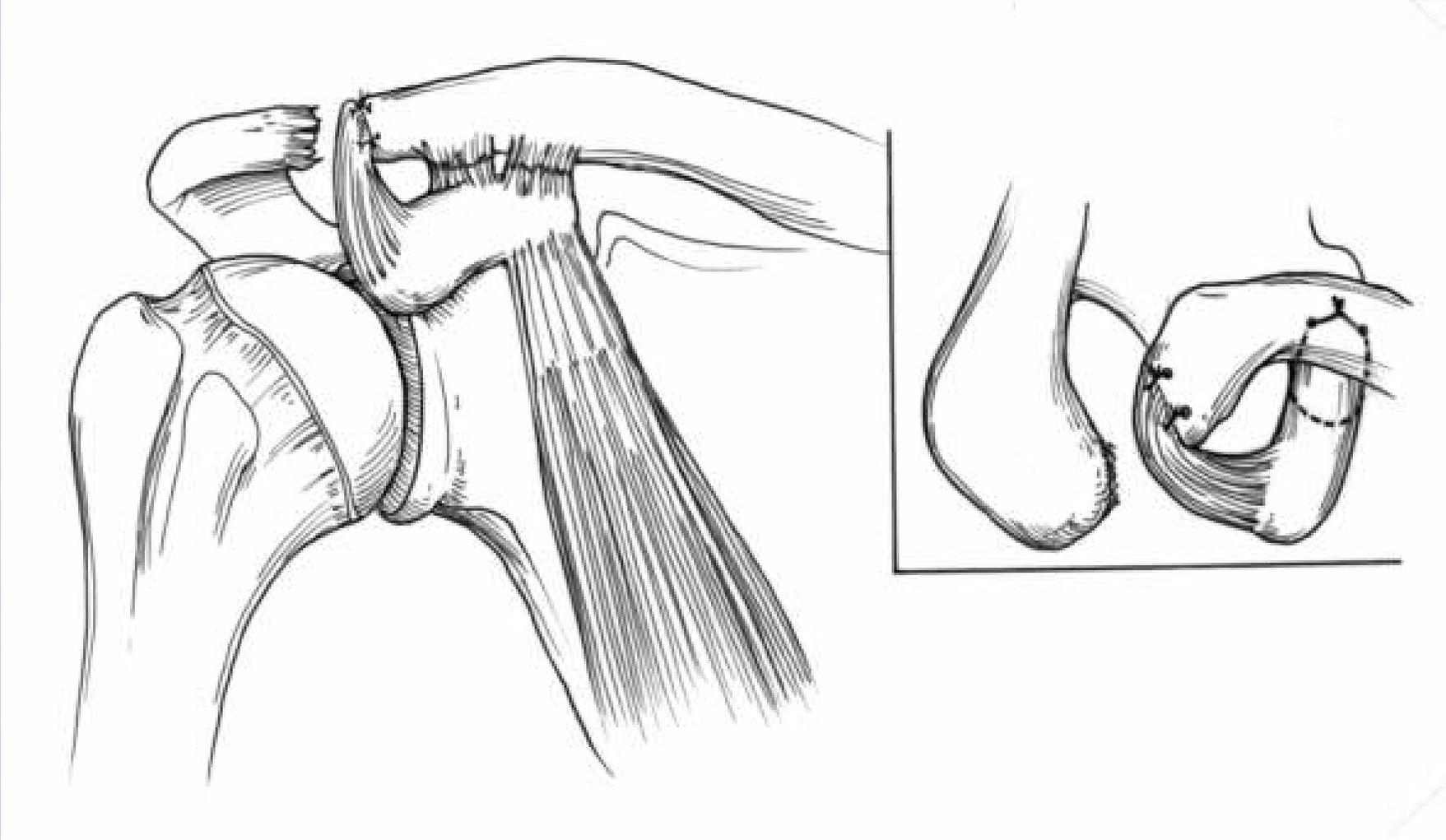
- The distal clavicle is excised.
- The CA ligament is transferred to the distal clavicle.
- The CC ligaments are repaired and/or augmented with a coracoclavicular screw or suture.
- Repair of deltotrapezial fascia



From Nuber GW and Bowen MK, JAAOS, 5:11, 1997

Modified Weaver Dunn Procedure





Indications for Late Surgical Treatment of Acromioclavicular Injuries

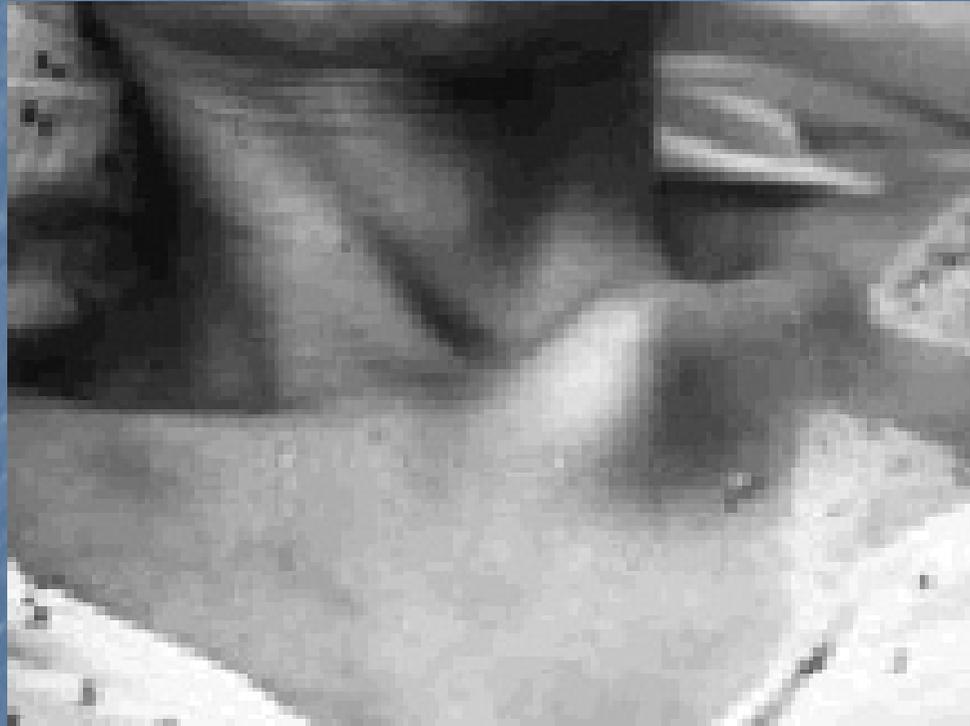
- Pain
- Weakness
- Deformity

Techniques for Late Surgical Treatment of Acromioclavicular Injuries

- Reduction of AC joint and repair of AC and CC ligaments
- Resection of distal clavicle and reconstruction of CC ligaments (Weaver-Dunn Procedure)

Sternoclavicular Joint Pathology

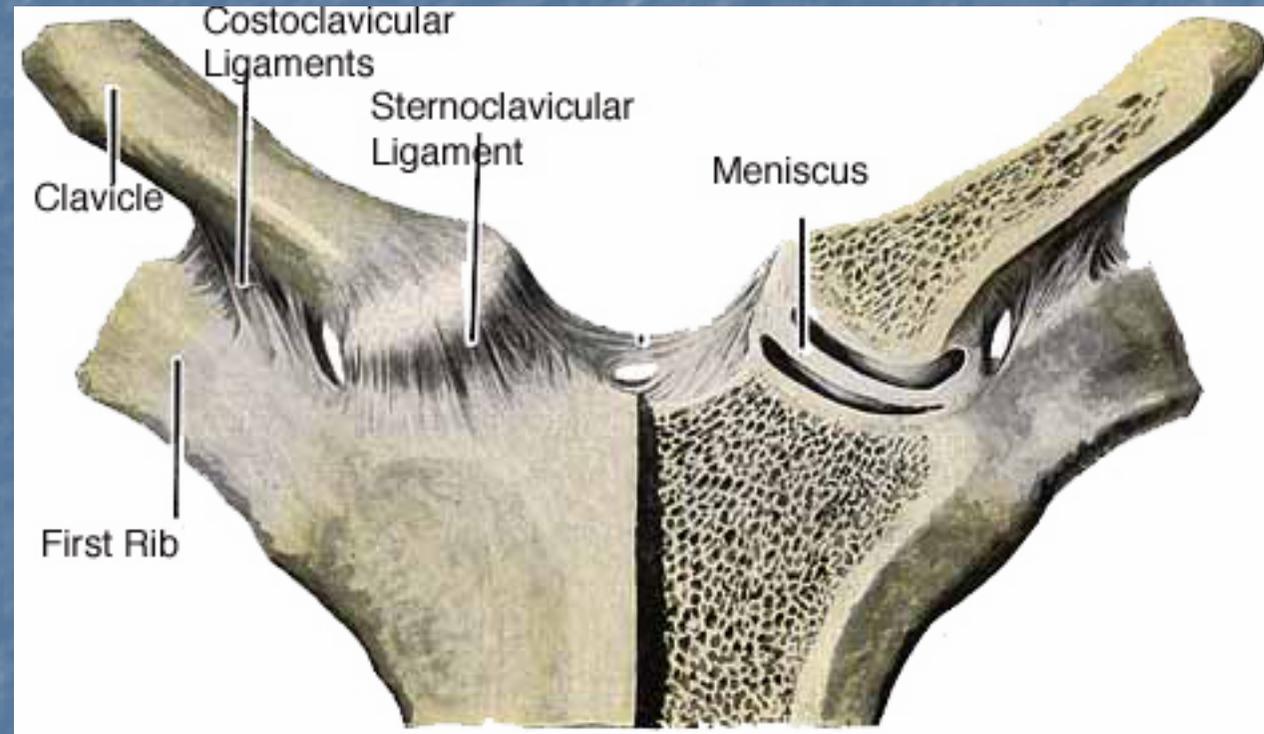
Sternoclavicular Joint



From Wirth MA and Rockwood CA, JAAOS, 4:268, 1996

The Anatomy of the Sternoclavicular Joint

- Diarthrodial Joint
- "Saddle shaped"
- Poor congruence
- Intra-articular disc ligament. Divides SC joint into two separate joint spaces.
- Costoclavicular ligament- (rhomboid ligament) Short and strong and consist of an anterior and posterior fasciculus



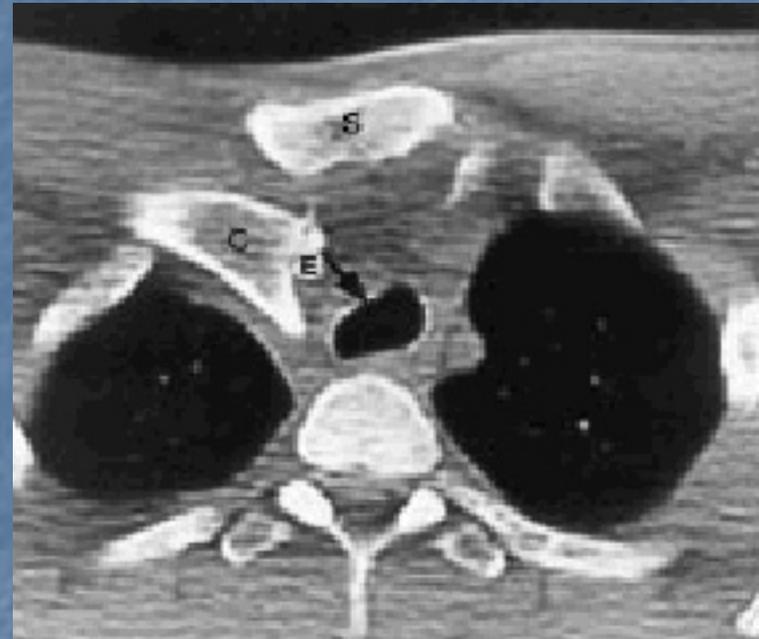
- Interclavicular ligament- Connects the superomedial aspects of each clavicle with the capsular ligaments and the upper sternum
- Capsular ligament- Covers the anterior and posterior aspects of the joint and represents thickenings of the joint capsule. The anterior portion of the ligament is heavier and stronger than the posterior portion.

Epiphysis of the Medial Clavicle

- Medial Physis- Last of the ossification centers to appear in the body and the last epiphysis to close.
- Does not ossify until 18th to 20th year
- Does not unite with the clavicle until the 23rd to 25th year

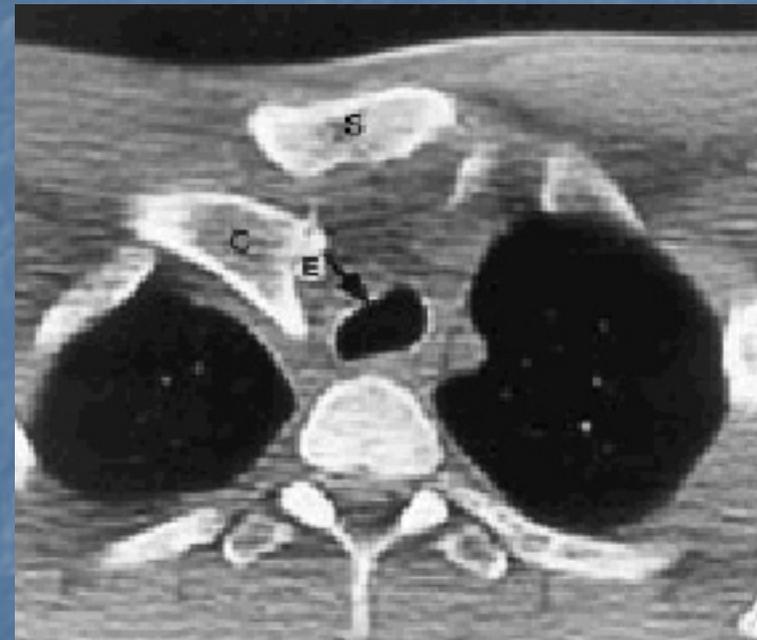
Radiographic Evaluation of the Medial One Third

- X-ray: Cephalic tilt view of 40 to 45 degrees
- CT scan usually indicated to best assess degree and direction of displacement



Injuries Associated with Sternoclavicular Joint Dislocations

- Mediastinal Compression
- Pneumothorax
- Laceration of the superior vena cava
- Tracheal erosion



From Wirth MA and Rockwood CA, JAAOS, 4:268, 1996

Treatment of Anterior Sternoclavicular Dislocations

- Nonoperative treatment
 - Analgesics and immobilization
 - Functional outcome usually good
- Closed reduction
 - Often not successful
 - Direct pressure over the medial end of the clavicle may reduce the joint

Treatment of Posterior Sternoclavicular Dislocations

- Careful examination of the patient is extremely important to rule out vascular compromise.
- Consider CT to rule out mediastinal compression
- Attempt closed reduction - it is often successful and remains stable
- Have CT surgeon immediately available...just in case.

Closed Reduction Techniques

- Abduction traction
- Adduction traction
- "Towel Clip" - anterior force applied to clavicle by percutaneously applied towel clip