

# Evaluation and Treatment of Shoulder Impingement in Overhead Athletes

Capstone Project

Susie Williams, SPT

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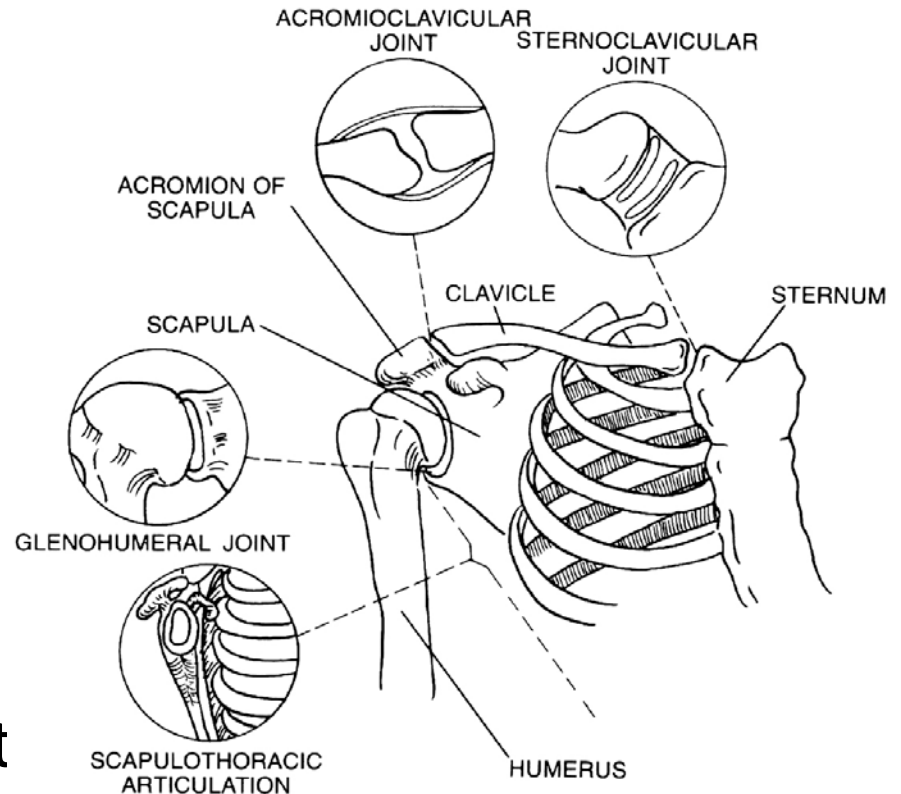
# Learner Objectives

- Upon listening, audience will
  - Improve understanding of the anatomy and physiology of the shoulder joint
  - Explain the pathophysiology of subacromial impingement syndrome in OH athletes
  - Demonstrate a thorough evaluation of a patient with a c/c of pain secondary to shoulder impingement
  - Select outcome measures that will show both patient and clinical significance of improvement
  - Select proper interventions and HEP based on the results of a thorough shoulder examination

- I. Anatomy and Biomechanics
- II. Shoulder Impingement Classifications
- III. PT Examination
- IV. Special Tests
- V. Rehabilitation
- VI. Outcome Measures

# Anatomy of the Shoulder

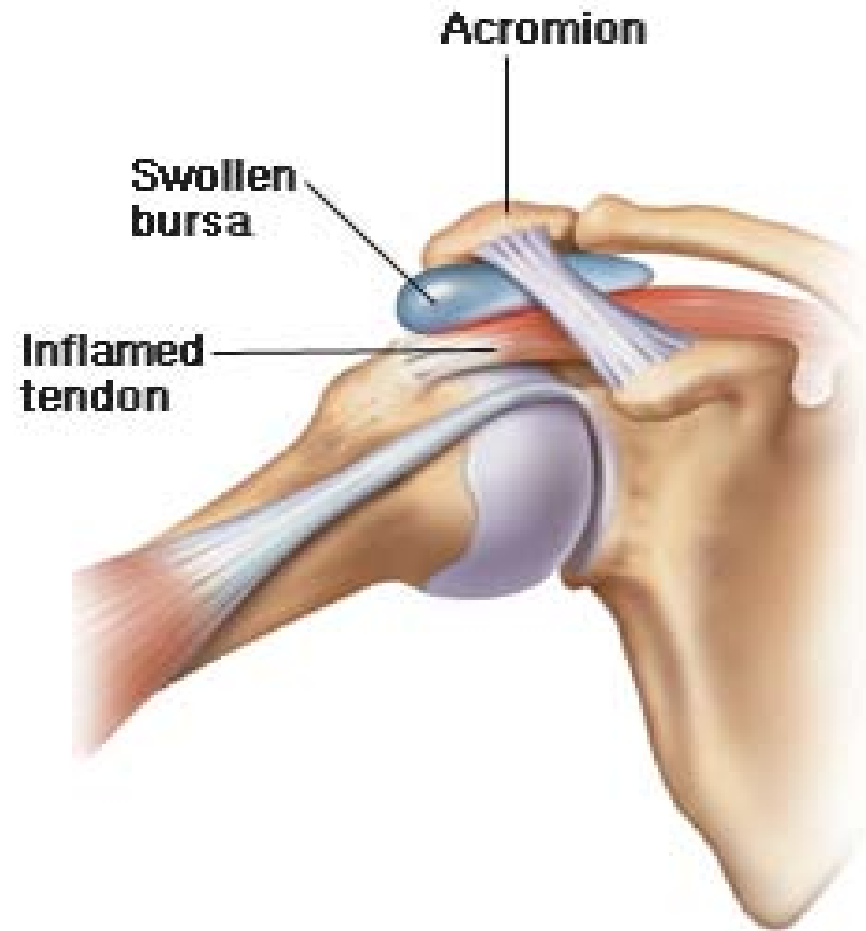
- Four Joints
  - Glenohumeral Joint
    - Most mobile
    - Most unstable
  - Scapulothoracic Joint
    - Not a true joint
  - Sternoclavicular Joint
  - Acromioclavicular Joint



# Bony Landmarks Involved in Impingement

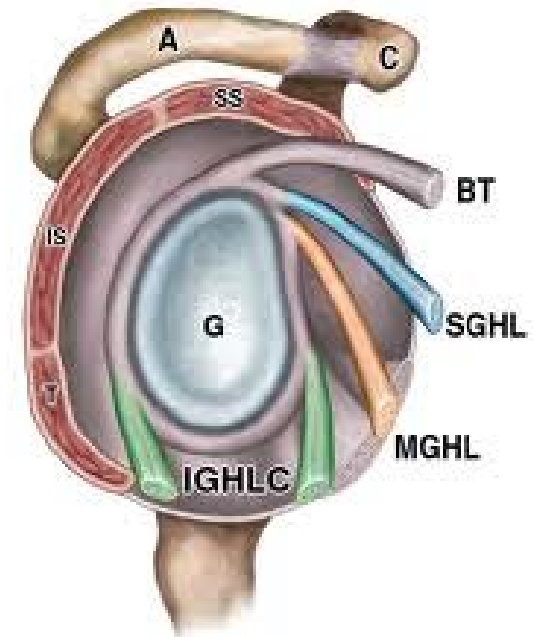
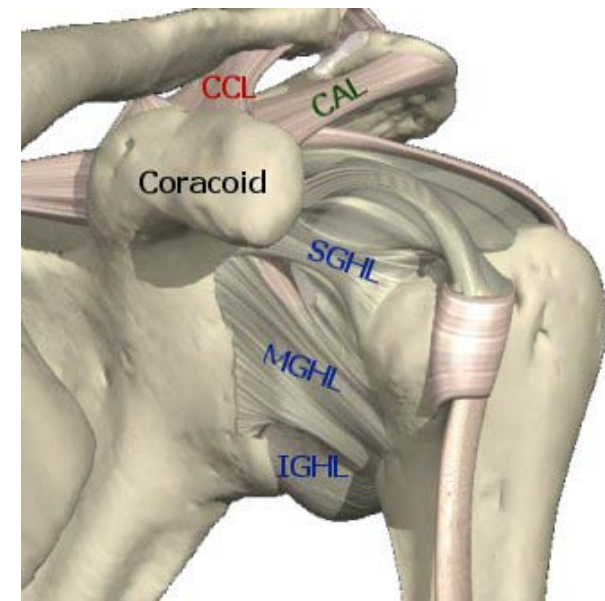


**FIGURE 2.** *An anterior view of the glenohumeral joint articulation.*

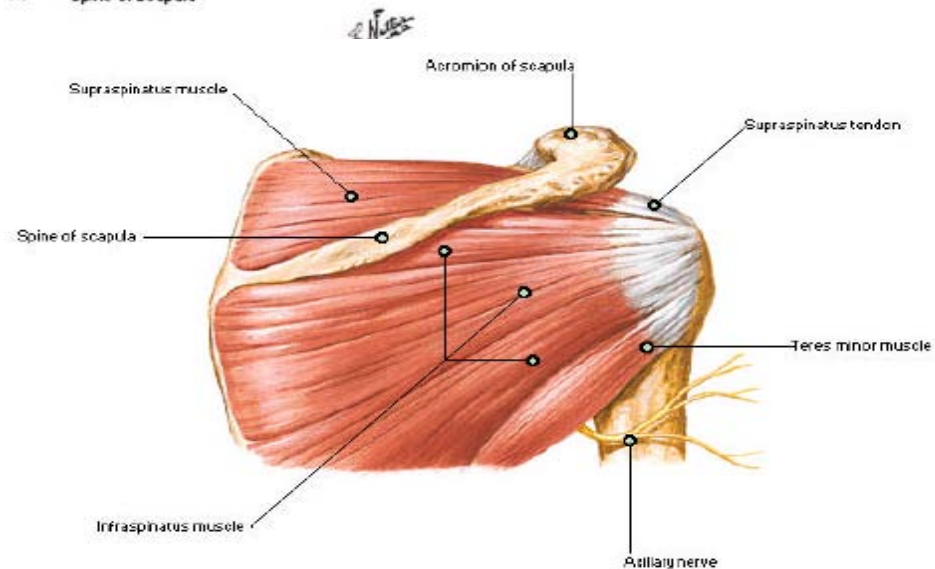
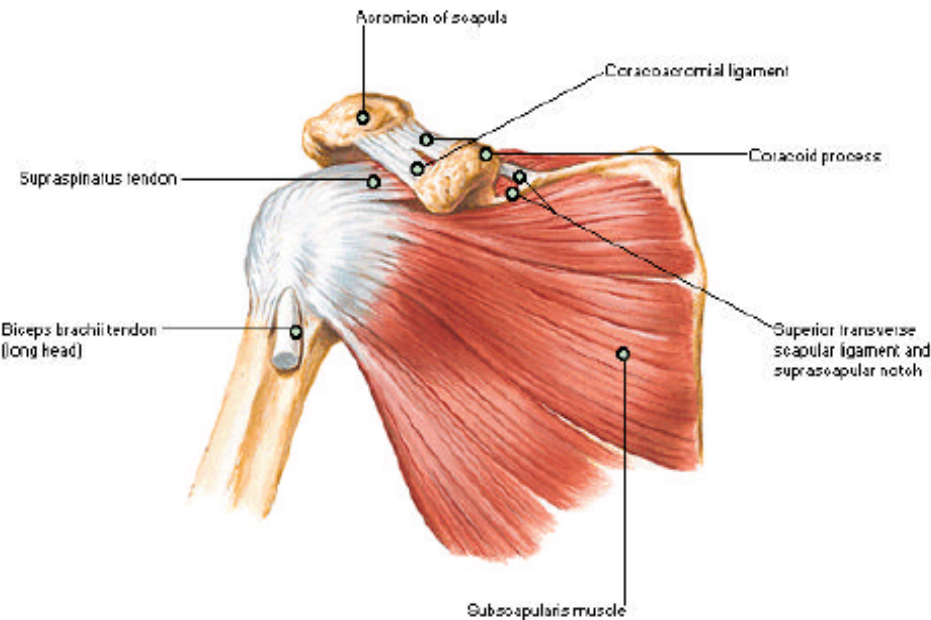
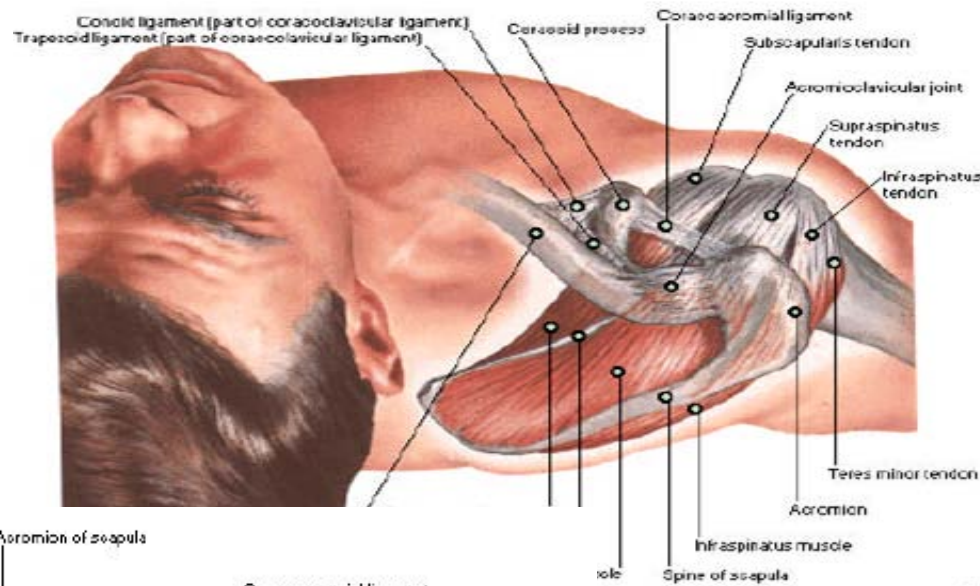


# Labrum, Capsule, and Ligaments

- Labrum
  - Fibrocartilage tissue surround the glenoid
  - Deepens the fossa
- Capsule and Ligaments
  - Three openings in the capsule
  - Superior, Middle, and Inferior GH Ligaments



# Local Muscles and Tendons



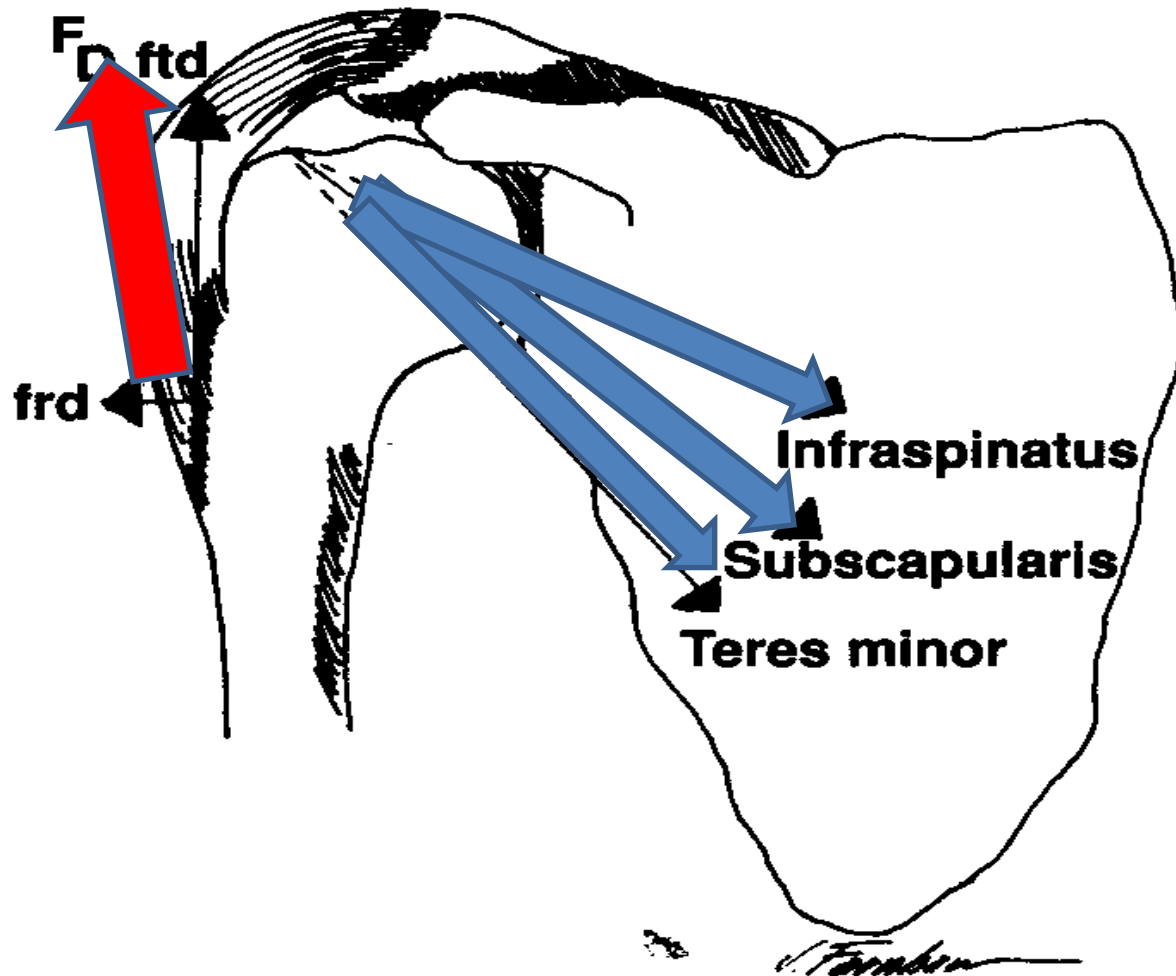


# Biomechanics of the Shoulder Complex

- [http://www.youtube.com/watch?v=\\_la0VvT81xc](http://www.youtube.com/watch?v=_la0VvT81xc)
- Force Couples
  1. Deltoid + Rotator Cuff
  2. Upper Trapezius + Serratus Anterior
  3. Anterior + Posterior Rotator Cuff Muscles

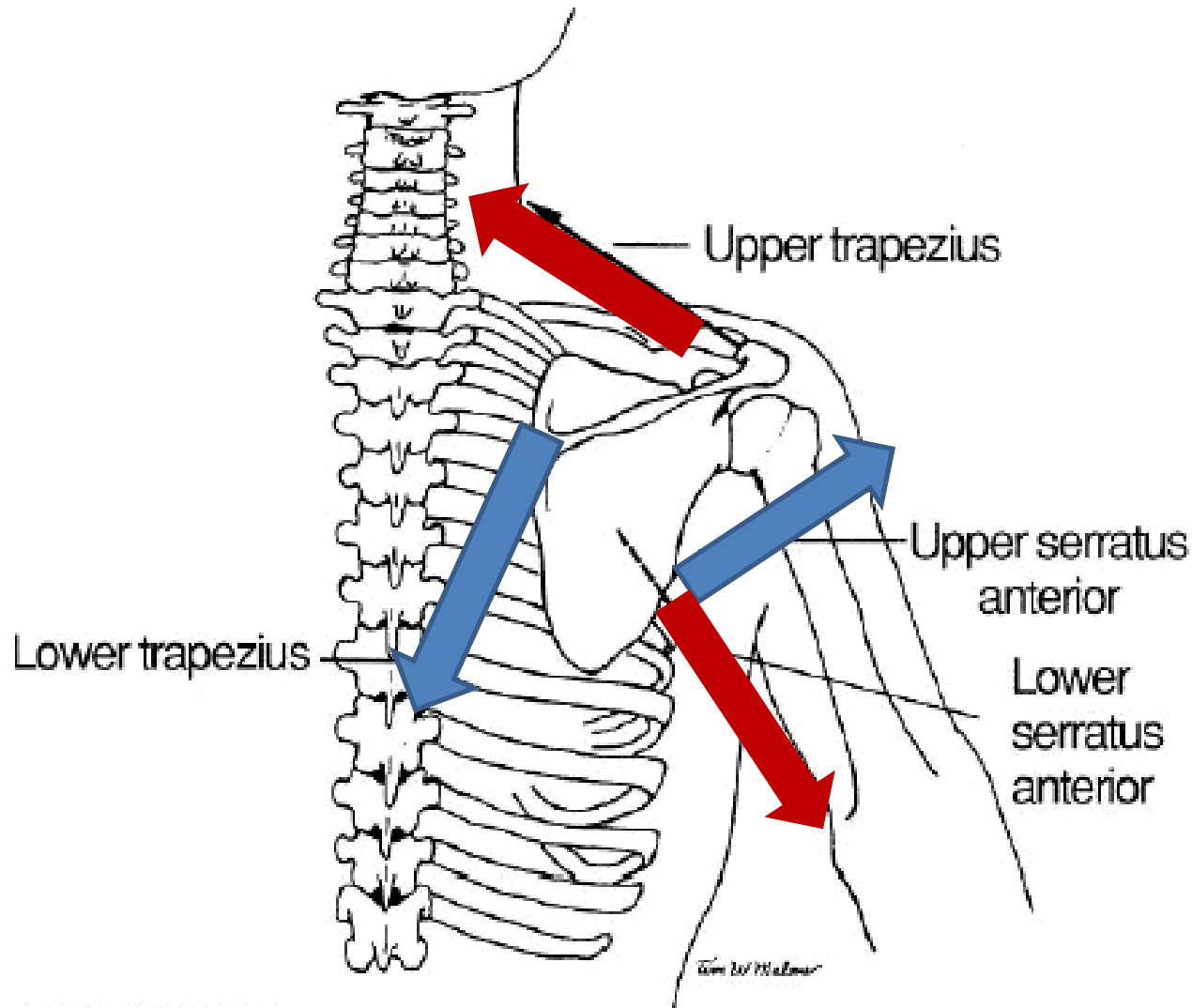


# Deltoid and Rotator Cuff

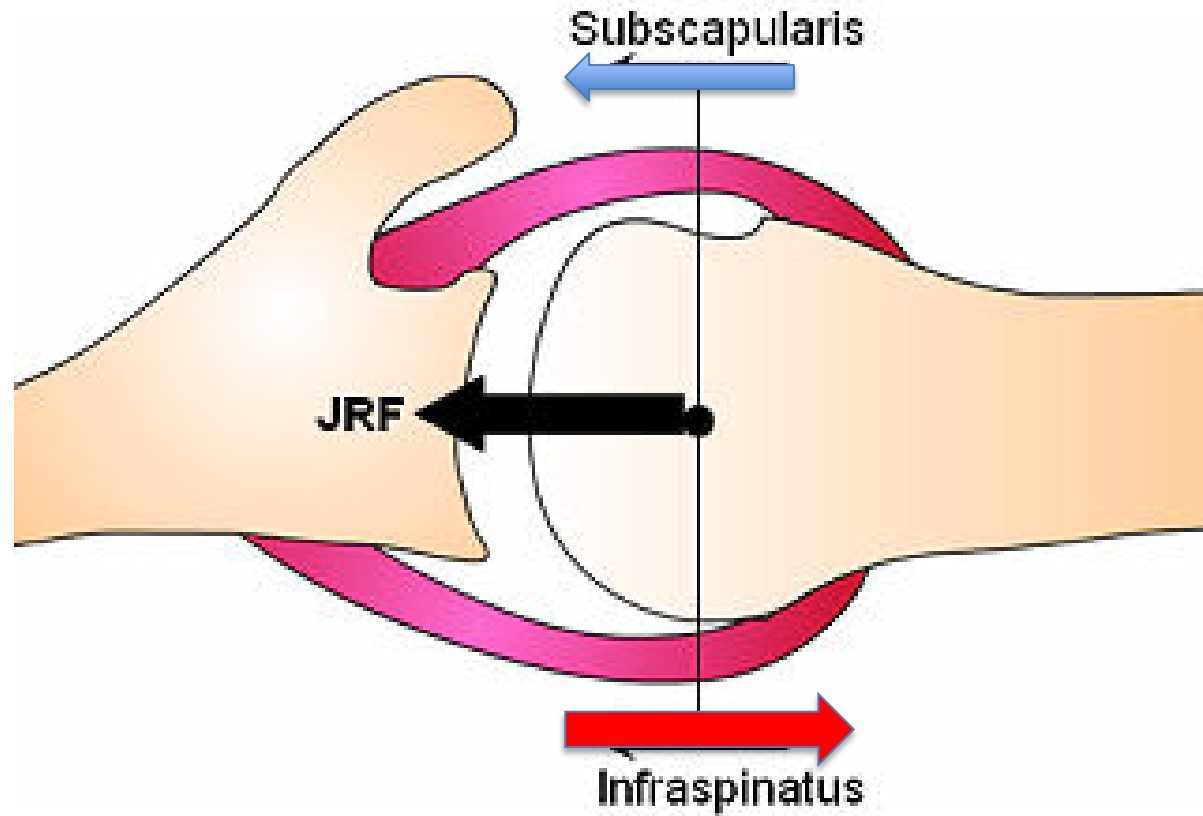


# Upper Trapezius and Lower Serratus Anterior

## Lower Trapezius and Upper Serratus Anterior



# Anterior + Posterior RC

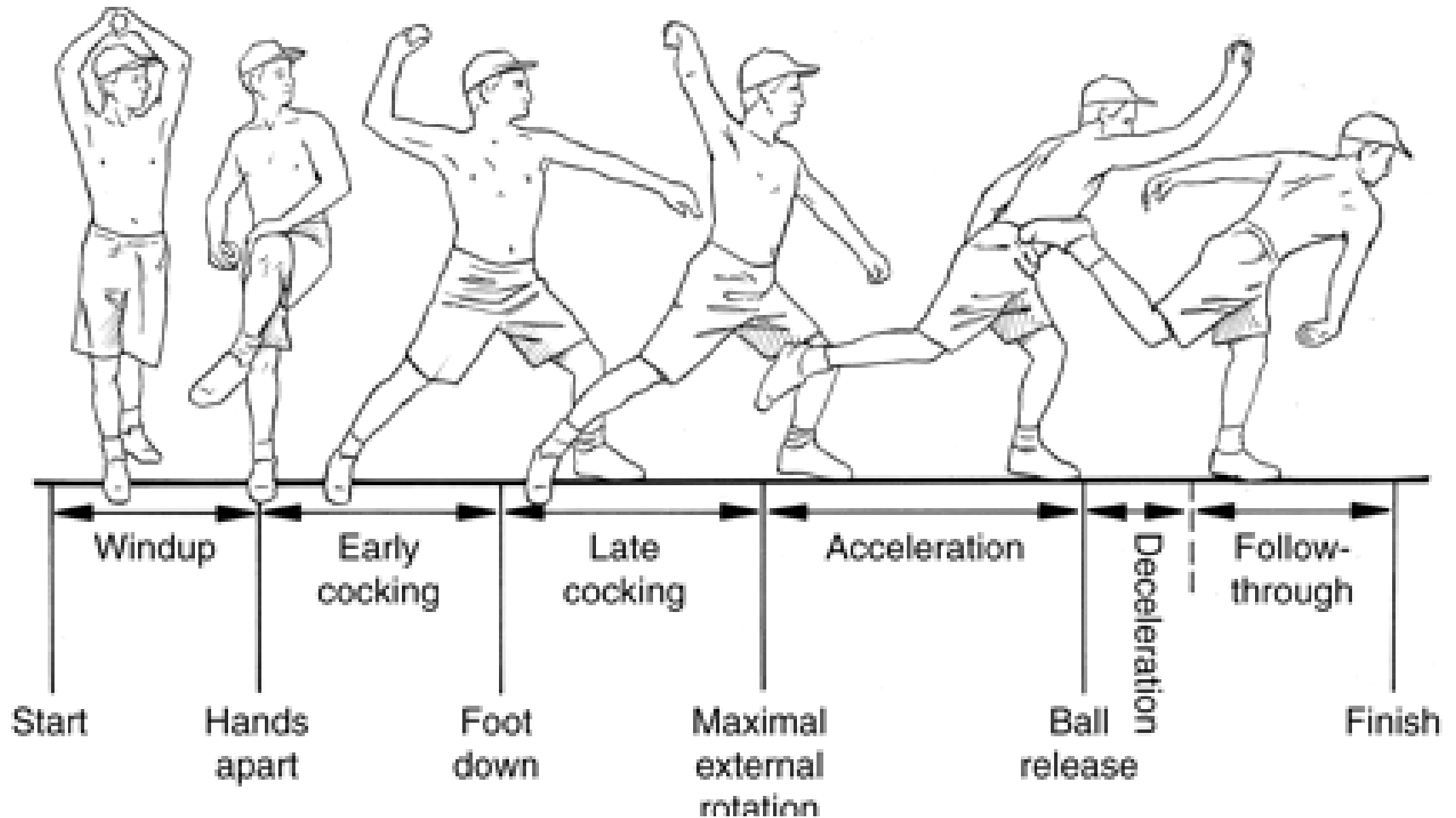




# Review

- Which force couple is not working properly when there is increased superior translation of the humeral head?

# Phases of the Pitch



I. Anatomy and Biomechanics

II. Shoulder Impingement Classifications

III. PT Examination

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VI. Outcome Measures

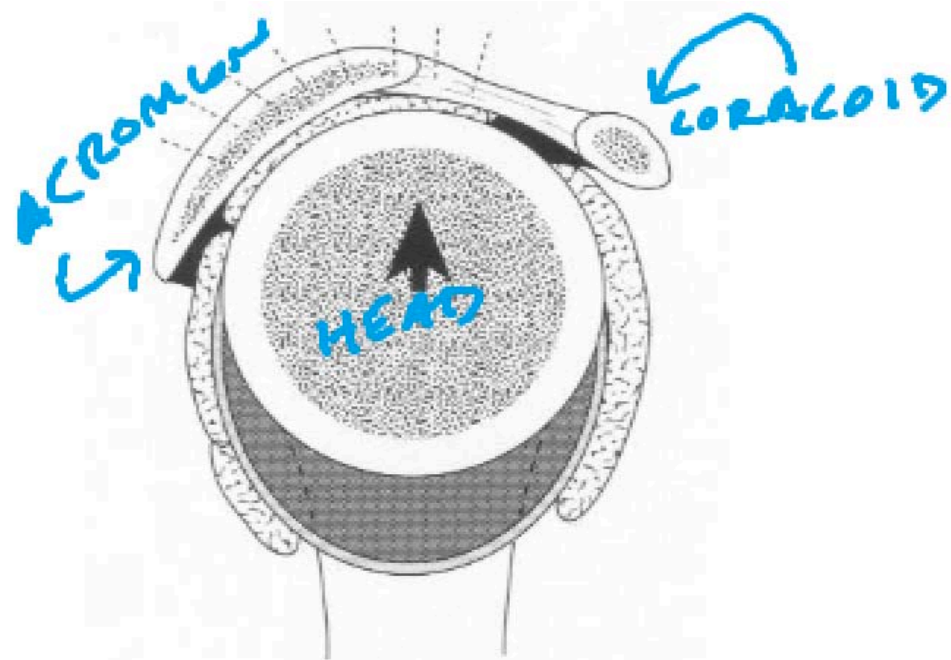


# Shoulder Impingement Classifications

- Primary Compressive Disease/Primary Impingement
- Secondary Compressive Disease/Secondary Impingement
- Posterior Impingement

# Primary (Subacromial) Impingement

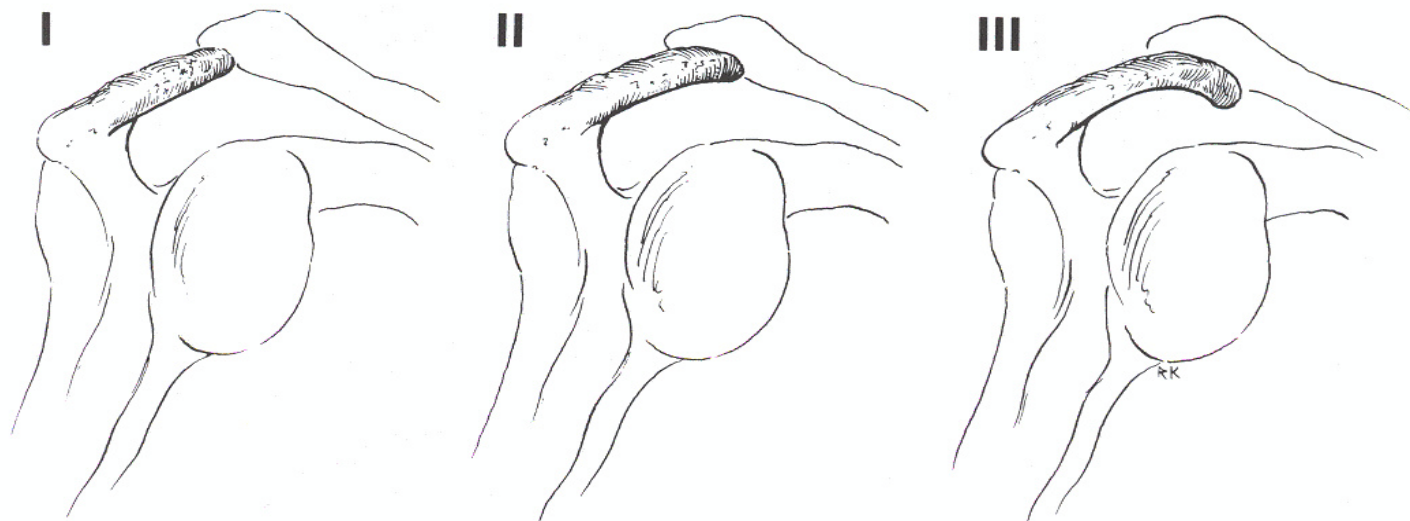
- Compression of the RC tendons and/or subacromial bursa between the humeral head and
  - Anterior 1/3 of Acromion
  - Coracoacromial Ligament
  - Coracoid
  - AC Joint





# Neer's Staging of Primary Impingement

- Stage I – Edema and Hemorrhage
  - Younger, athletic population
- Stage II – Fibrosis and Tendinitis
  - Ages 25-40 years
- Stage III – Bone Spurs and Tendon Rupture

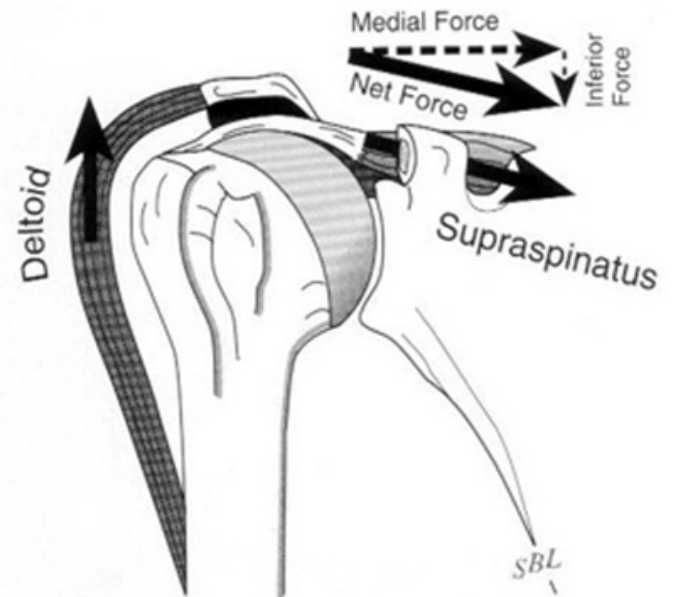


**Figure 2-16**

The three types of acromion morphology defined by Bigliani and Morrison. Type I, with its flat surface, provided the least compromise of the supraspinatus outlet, whereas type III's sudden discontinuity or hook was associated with the highest rate of rotator cuff pathology in a series of cadaver dissections.

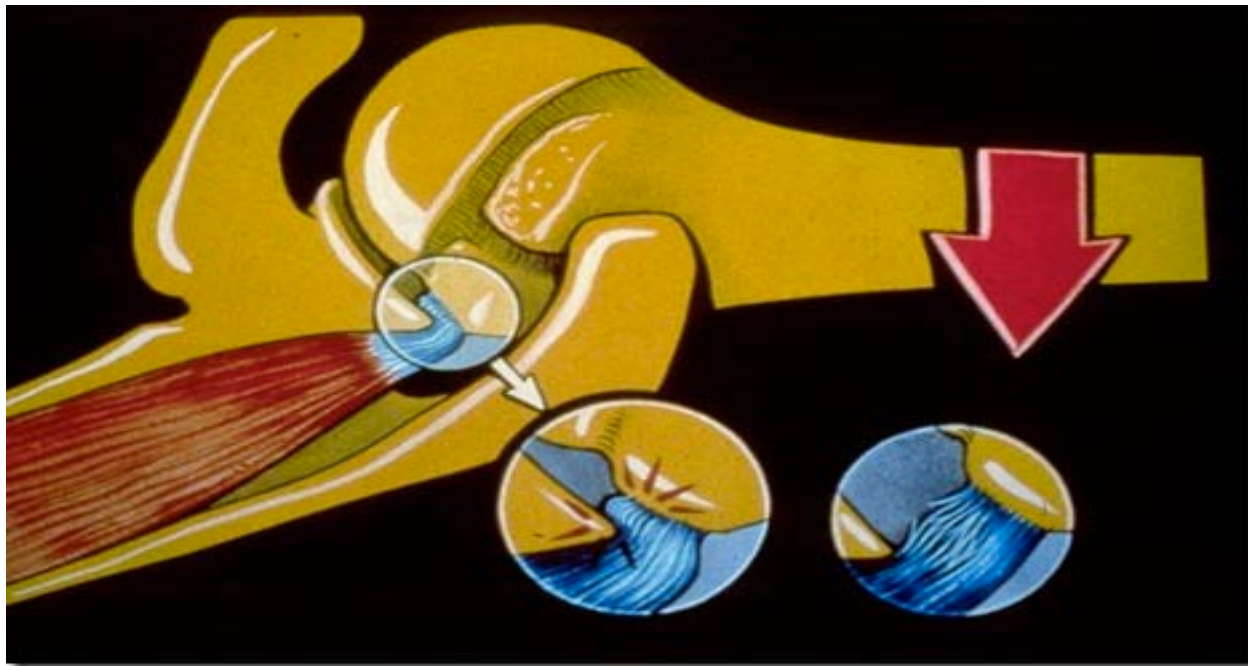
# Secondary Impingement

- Result of underlying instability of GH joint
  - Throwing/overhead activities → Anterior instability
- Increased humeral head translation
  - Biceps tendon
  - RC tendons



# Posterior Impingement

- Placement of the shoulder in 90° abduction and 90° ER
  - Supraspinatus and infraspinatus tendons





# Overhead Athletes and Impingement

- Predisposition
  - Repetitive motions
  - Joint changes
    - Decreased upward scapular rotation
    - Decreased scapular posterior tilt
    - Increased SC elevation
    - Increased humeral retrotorsion and glenoid retroversion
    - Increased ER
    - Decreased IR and horizontal adduction



# Muscle Imbalances and Impingement

- Increased pressure between humeral head and coracoacromial arch
  - Dominance of Deltoid
- Decreased levels of serratus anterior activity
- Delayed firing of middle and lower trapezius
- Dominance in upper trapezius, levator scapulae, and pectorals
- Development of the IR and subscapularis > posterior RC



# Review

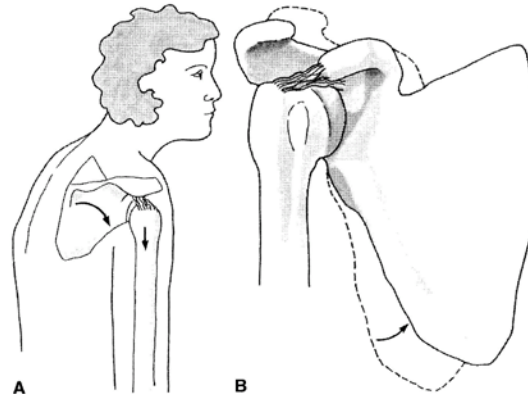
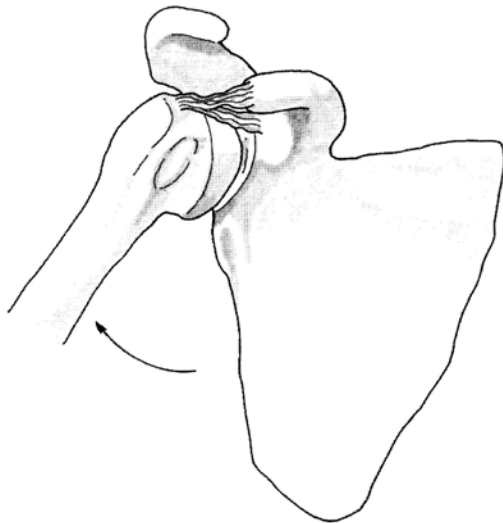
- Three types of Impingement:
  - Primary/Subacromial
  - Secondary
  - Posterior/Internal
- Cause versus Effect
  - Does it matter?

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# PT Examination

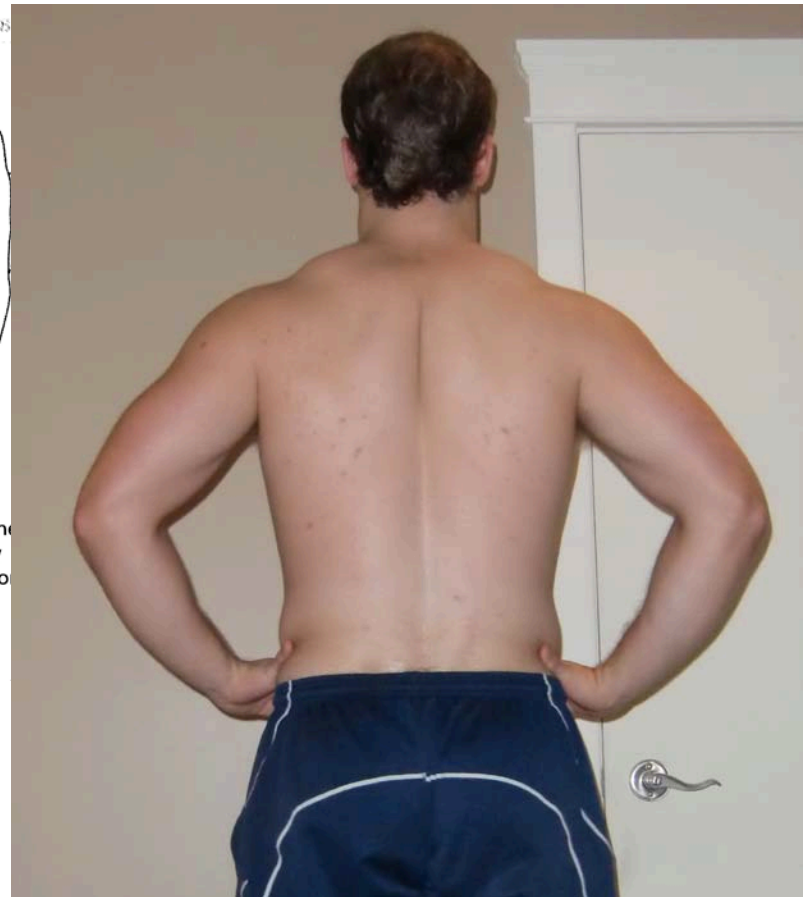
- Observation/Posture

CHAPTER 11 ■ SHOULDER AND SHOULDER GIRDLE 28



■ FIG. 11-12. In a person with thoracic kyphosis, the scapula assumes a downward, rotated position so that the glenoid fossa no longer faces upward (A), and the freely hanging humerus assumes a position of relative abduction with loss of tension in the superior joint capsule (B).

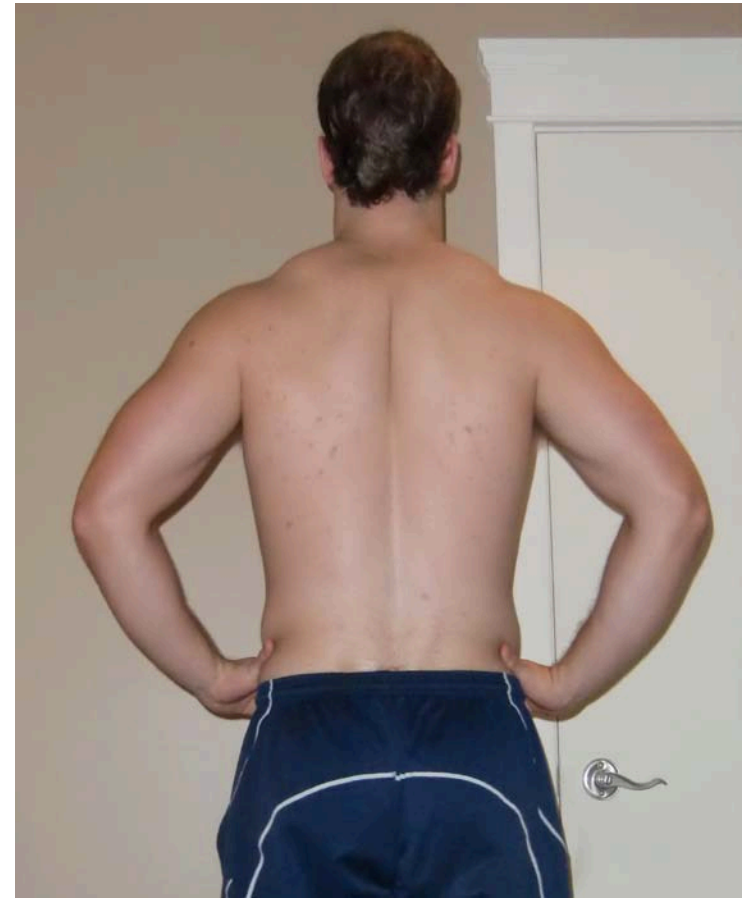
■ FIG. 11-10. During elevation of the arm, tension is lost in the superior joint capsule.





# Scapular Evaluation

- Normal Movement: Upward rotation + Posterior tilting + ER
- Classifying Dysfunctions
  - Inferior Angle Dysfunction
  - Medial Border Dysfunction
  - Superior Scapular Dysfunction





# Scapular Evaluation Clinical Tests

- Scapular Assistance Test (SAT)
- Scapular Retraction Test (SRT)
- Flip Sign



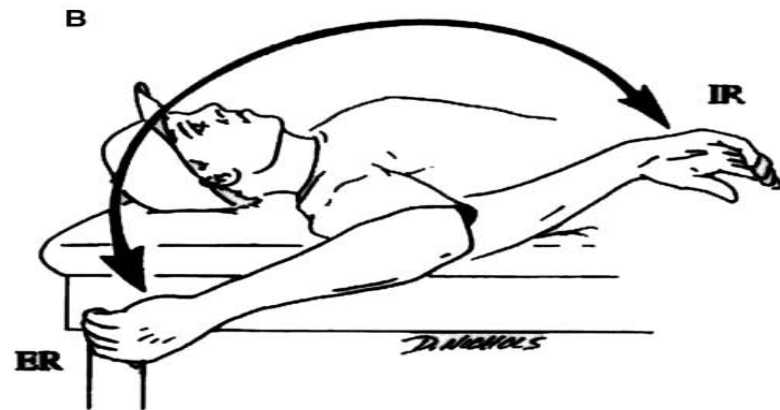
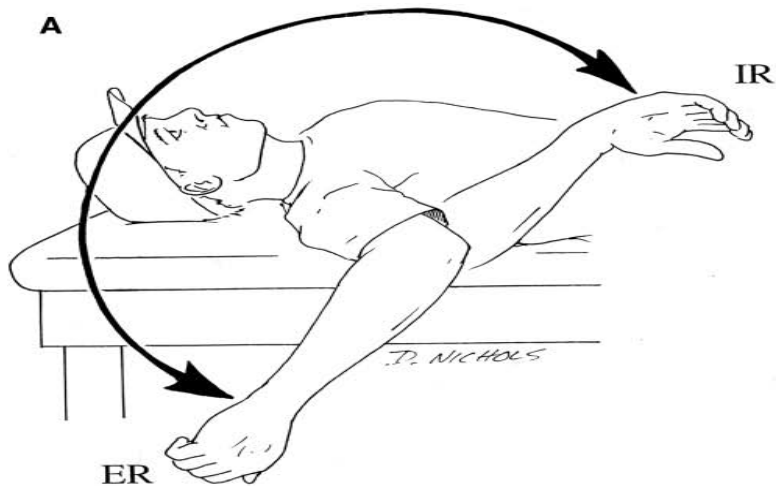
Figure 2 Scapular assistance test.



Figure 3 (A, B) Scapular retraction test.

# Measuring GH Joint ROM

- Total Rotational Motion
  - Amount of ER + IR at 90 degrees abduction
- Glenohumeral IR Deficit (GIRD)
  - Loss of IR of the throwing shoulder compared to non-throwing shoulder





# Rotator Cuff MMT and Strength Evaluation

- Supraspinatus
  - 90 degrees elevation in scaption, thumb pointing up; patient seated
  - “Full Can Position”
- Infraspinatus
  - Elbow flexed 90 degrees, GH IR 45 degrees from neutral; patient seated
- Teres Minor
  - 90 degrees abduction in the scaption plane and 90 degrees ER; giving resistance into IR
- Subscapularis
  - Gerber lift-off position



# Review

- Assess posture
- Evaluate scapula
- Evaluate ROM, specifically TRM
- Optimal positioning for maximal activation with MMT

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# Special Tests for Impingement

- Neer Test
    - Specificity 53-69%
    - Sensitivity 68-81%
  - Hawkins-Kennedy (Park HB. *J Bone Joint Surg Am.* 2005;87(7):1446-1455.)
    - Specificity 59-67%
    - Sensitivity 63-79%
  - Yokum Test (Silva L. *Rheumatology.* 2008;47(5):679-683)
    - Specificity 40%
    - Sensitivity 79%
    - +LR 1.32; -LR .98
  - Internal Rotation Resistance Strength Test (Zaslav KR. *J Shoulder Elbow Surg.* 2001;10(1):23-27)
    - Specificity 96%
    - Sensitivity 88%
- CPR for Impingement: 3 or more positive tests



# Degree of RC Disease

- Hawkins-Kennedy, Painful Arc, Infraspinatus Strength for any impingement
  - All + : LR = 10.56; Post-test Probability = 0.95
  - All - : LR = 0.17; Post-test Probability = 0.24
- Painful Arc, Drop Arm, Infraspinatus Strength for full-thickness RC tear
  - All + : LR = 15.57; Post-test Probability = 0.91
  - All - : LR = 0.16; Post-test Probability = 0.09
- With Age
  - All + & Age > 60: LR = 28.0; Post-test Probability = 0.95
  - All - & Age < 60: LR = 0.09; Post-test Probability = 0.06





# Review

- You find the following results with a 24-year old baseball pitcher:
  - Positive Painful Arc
  - Positive Hawkins-Kennedy
  - Negative IRRST
  - Tender to palpation at anterior acromial edge
  - Positive Infraspinatus Muscle Strength test
- How would you classify his injury, if any?

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# Rehabilitation Goals

1. IR of dominant arm within 12-20 degrees
2. Total rotational motion within 5 degrees
3. Stretch tight structures
4. Strengthen weak scapula stabilizers



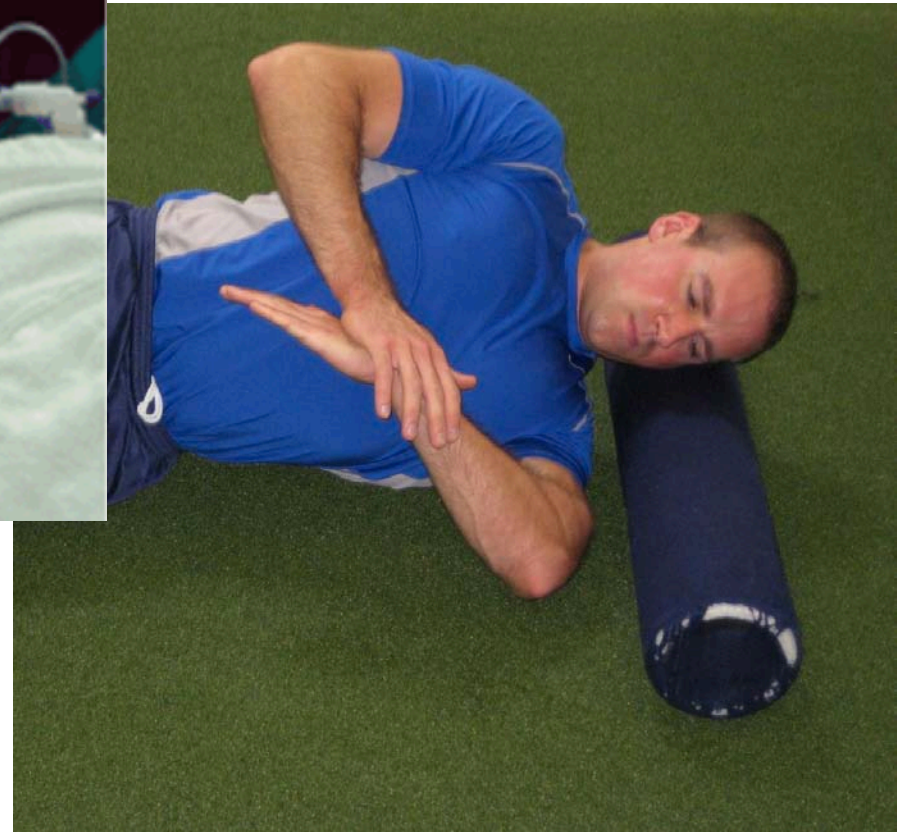
# Early Management

- Pain Control
- Rest
- Pain-Free ROM
- Kinetic Chain Training
- Modalities?
- Submaximal Contractions (5-50% maximum voluntary isometric contraction)

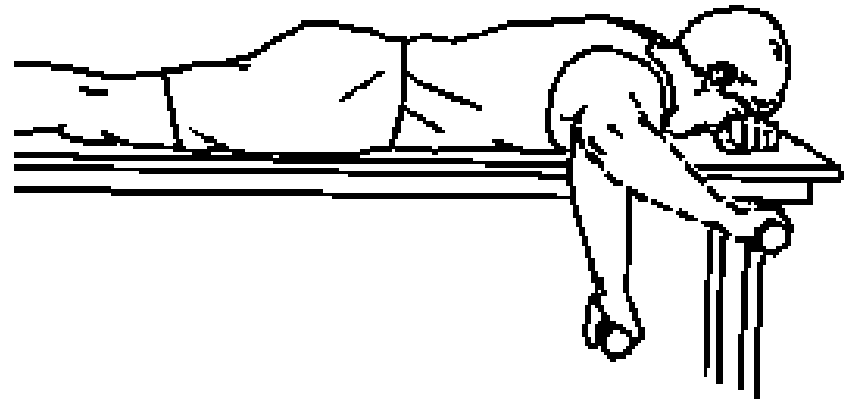
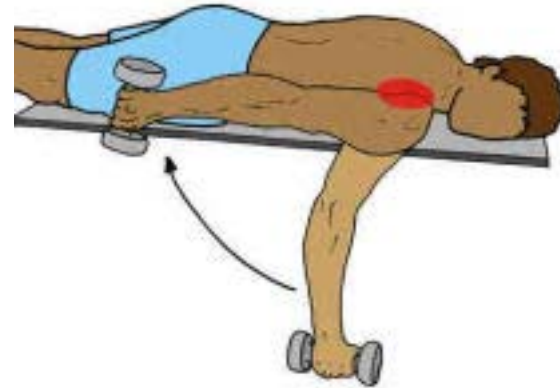
# Scapular Stabilization



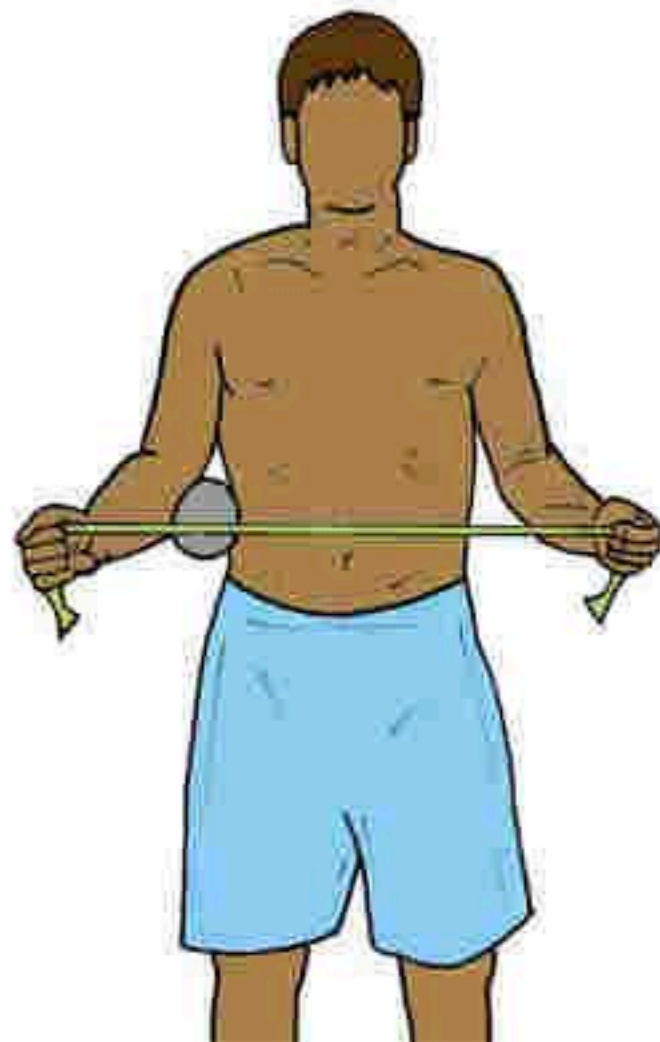
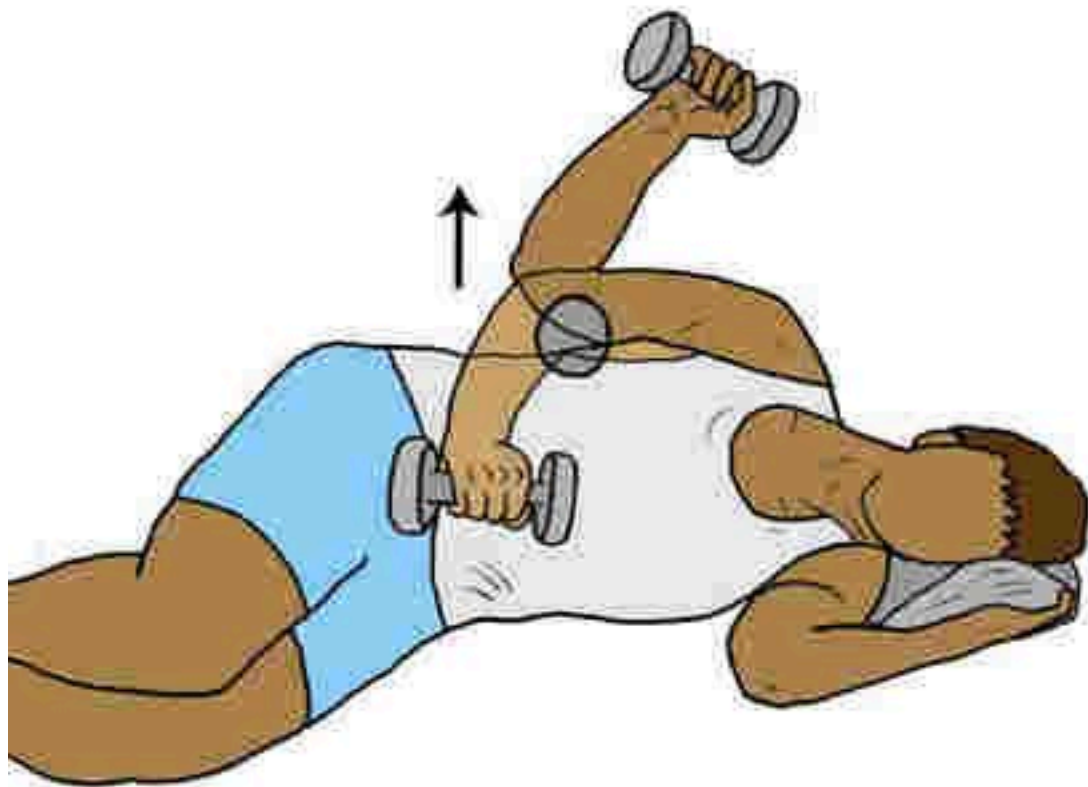
# Mobilization and ROM



# Strengthening



# Strengthening Progressions





# Strengthening Progressions



# Strengthening Progressions





# Return To Sport

## Plyometric Exercise Progression



# Plyometric Intervention Study

Carter et al. J Strength Conditioning Research 2007;21(1):208-215.

A-B: Latex tubing ER

C-D: Latex tubing 90-90 ER

E-F: OH soccer throw with 6# med ball

G-I: 90-90 ER side throw with 2# med ball

J-L: Deceleration baseball throw with 2# med ball

M-O: Baseball throw with 2# med ball





# Return to Sport Kinetic Chain Training





# Return to Sport

- Normalization of previously + special tests
- Normalized ROM, strength along kinetic chain
- ER/IR unilateral strength ratio = 66-75%
- Pain-free shoulder function



# Review

- Manage pain, rest, regain pain-free ROM
  - TRM within 5 degrees
- Strengthen weak musculature
  - Start sub-maximal
- Regain control

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# Outcome Measures

- Disabilities of the Arm, Shoulder, and Hand (DASH) – MDC 10 points
- Shoulder Pain and Disability Index (SPADI) – MDC 18 points
- American Shoulder and Elbow Score (ASES) – MDC 9.7 points
- UCLA Shoulder Scale
- Simple Shoulder Test – MDC not established

# One Arm Hop Test



FIGURE 1. Anterior view of subject positioned for the one-arm hop test.

- Procedure:
  - Start Position: one arm push-up position, feet shoulder width apart, back flat
  - 5 reps
  - Hop onto then off 10.2 cm (4") step
  - Record time



# Kerlan-Jobe Orthopaedic Clinic (KJOC) Score

- How Difficult is it for you to warm up prior to competition?
- How much pain do you experience?
- How much weakness and/or fatigue do you experience?
- How unstable do you feel during competition?
- How much have your UE problems affected your relationship with your coaches, teammates?
- How much have you had to change your motion?
- How much has your velocity/power suffered?
- What limitation do you have in endurance in competition?
- How much has your control suffered?
- How much do you feel your UE affects your current level of competition?



# Review

- Patient-oriented outcome assessment
- Quality of life measure
- Pre- and post-injury measures



# Conclusions

- Frequent injuries to shoulder joint complex
- Address biomechanical adaptations
- Careful examination of flexibility and strength

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