# Shoulder Injury in Competitive Swimming: Strategies for Early Identification and Prevention

*USA Swimming Webinar*

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# Disclosures

- I have no financial disclosures related to this talk


Swimming
"The" classic example of shoulder overuse syndrome

# Swimmer's Shoulder

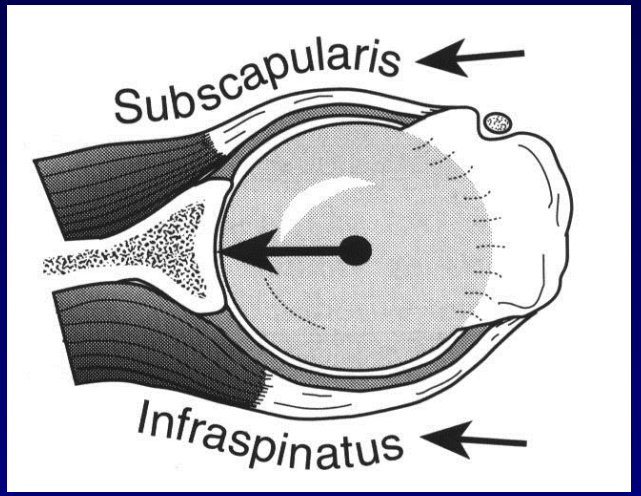
- Prevalence: 40-70%
- Estimate: 50,000-75,000 arm revolutions per week
- Up to 2,000,000 stroke revolutions/arm per season
- 6-8 miles/day, 5-6 days/week
- High training volumes → overuse injuries

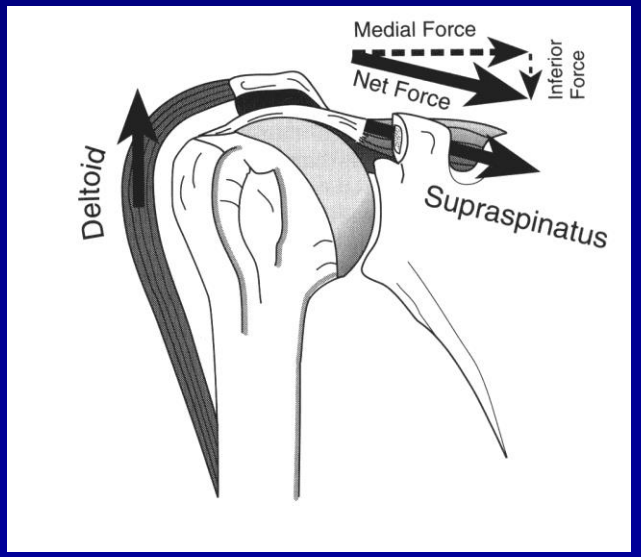
# Factors Associated with Swimmer's Shoulder

- 1) Muscle fatigue /overload
- 2) Rotator cuff tendonosis
- 3) Shoulder laxity
- 4) Impingement positions during swimming stroke

# Shoulder Kinematics

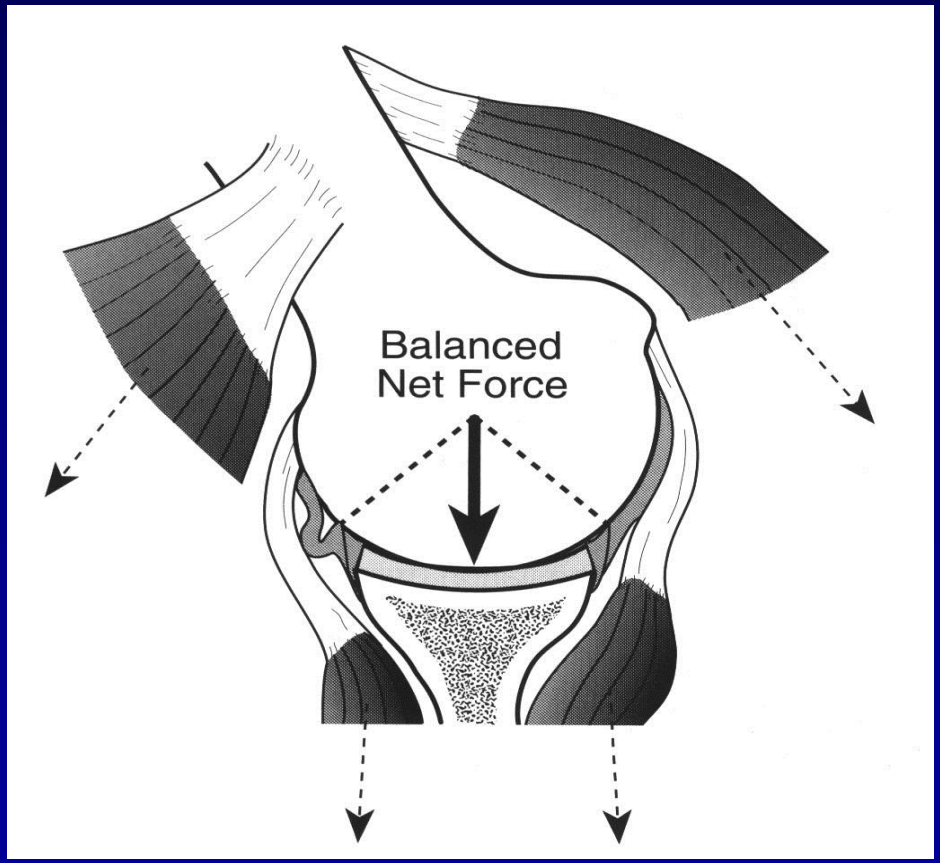
- Shoulder function requires highly coordinated, synchronous pattern of muscle firing
- Balanced muscle force to center humeral head



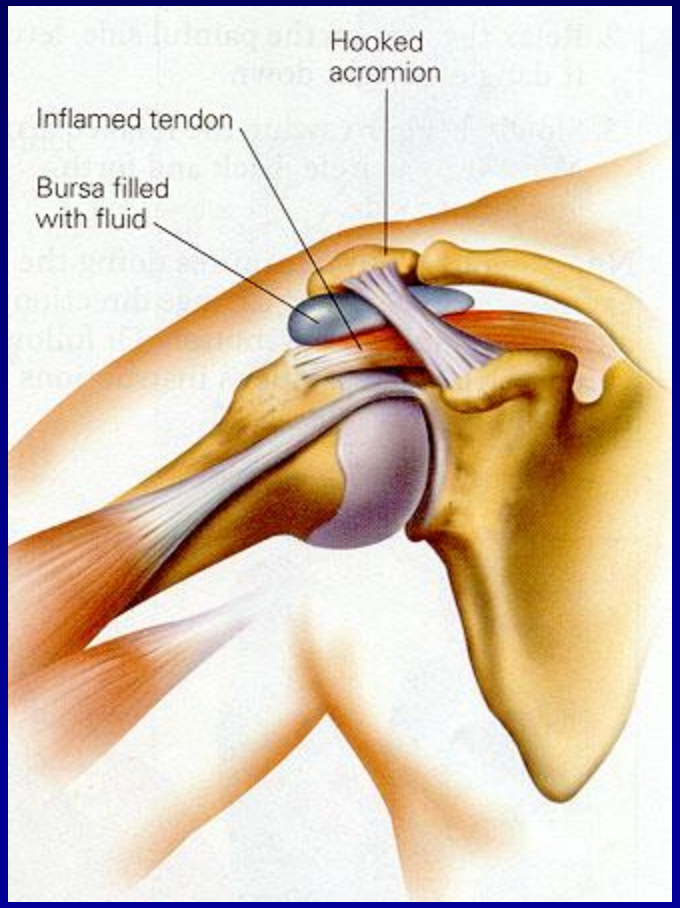
# Shoulder Kinematics

- Glenohumeral stability dependent on:
  - -Ligaments (static)
  - -Muscles (dynamic
- Muscle forces even more important with concomitant laxity
- Rotator cuff muscles “work harder” to control humeral head in athlete with laxity



# Impingement Occurs During Swimming

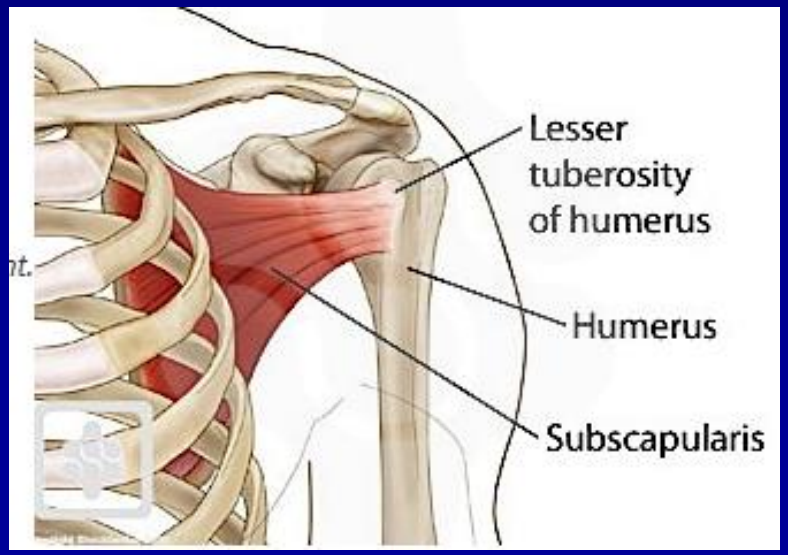
Certain stroke positions can cause impingement

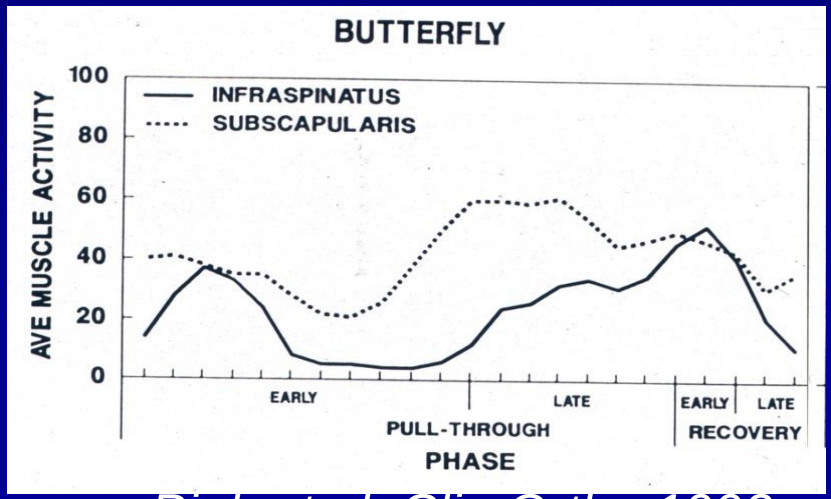



# Impingement Position with Kickboard Use

# Overuse, Cuff Fatigue in Swimming

- Muscle firing at continually high rate during swim stroke
- → fatigue
- Subscapularis and serratus anterior

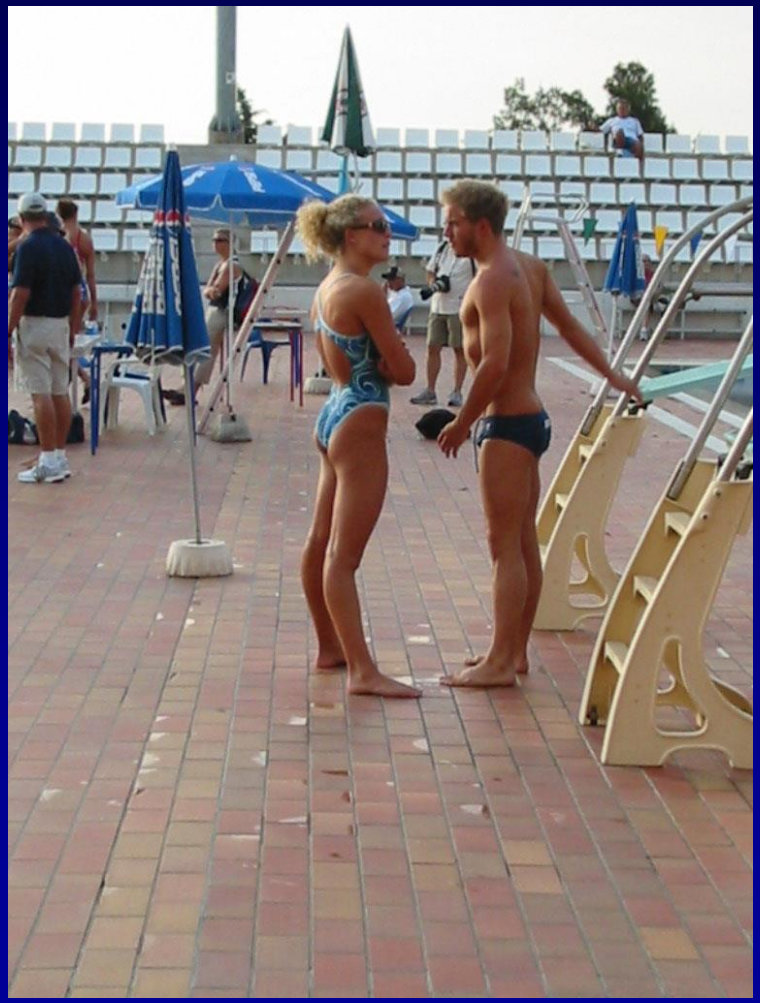



*Pink et al, Clin Ortho 1993*

# The Role of Laxity in Swimmer's Shoulder

- Swimmers often have some generalized laxity
- With shoulder laxity → more dependence on muscle contribution
- Muscle fatigue → abnormal kinematics → impingement → pain



# Olympic Team Survey

- History of shoulder pain: 29/42 (66%)
- Competitions missed due to pain: 6/42 (14%)
- Current shoulder pain:  16/42 (38%)
- Shoulder feels unstable:  12/42  (29%)
- Diagnosed with unstable shoulder: 4/42 (10%)
- Prior shoulder surgery:  2/42 (2.3%)

# Shoulder Pain in Swimming

Overuse and rotator cuff fatigue

↓

Contribution from laxity

↓

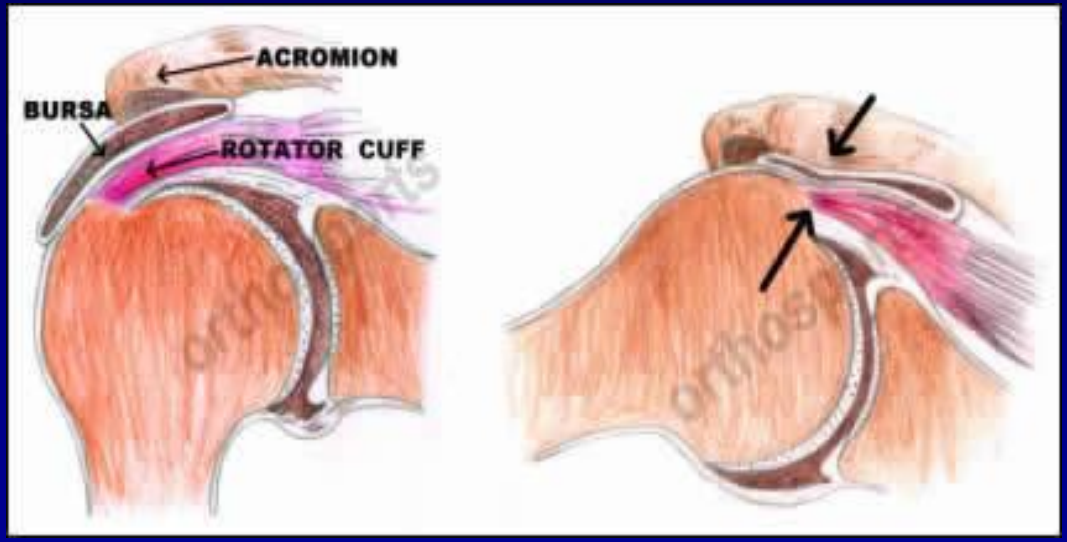
Altered shoulder joint function

↓

2º impingement

↓

Shoulder pain



# Other Considerations

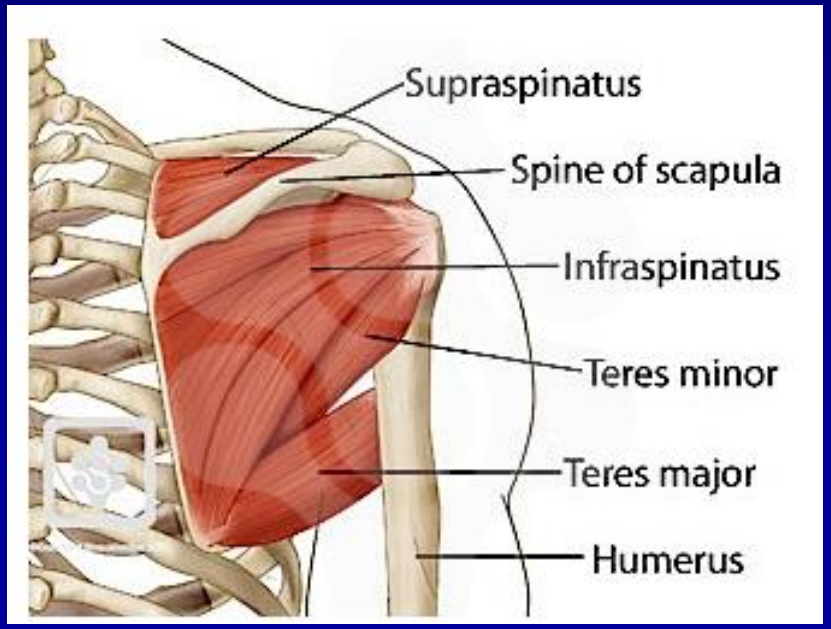
- Consider that activities outside of swimming can also contribute:
  - Other school sports activities
  - Does your swimmer also play water polo?
  - Heavy backpacks

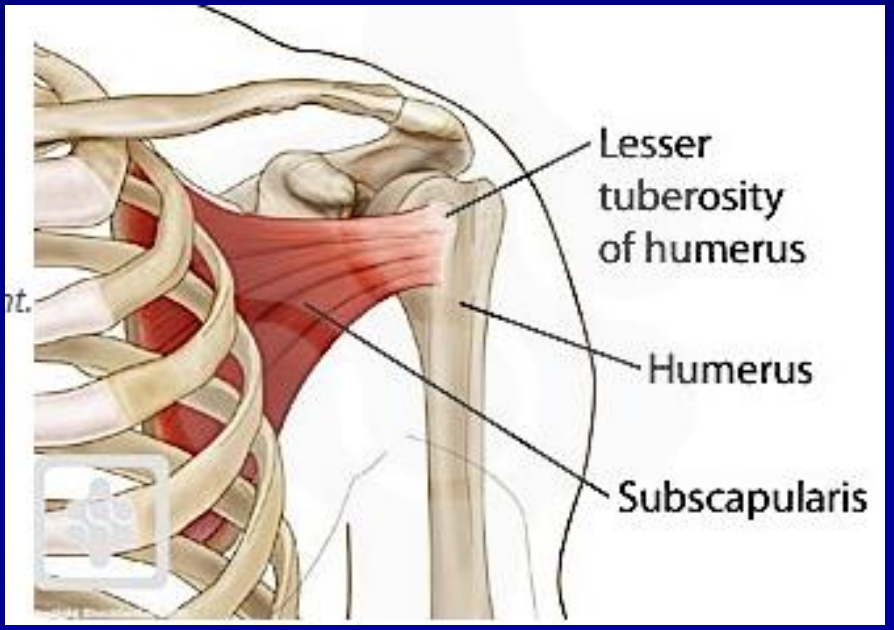
# Prevention/Rehabilitation

# Prevention/Rehabilitation

- Comprehensive program to develop strength, endurance, muscle balance, and flexibility

- 1) Rotator cuff
  - Subscapularis key

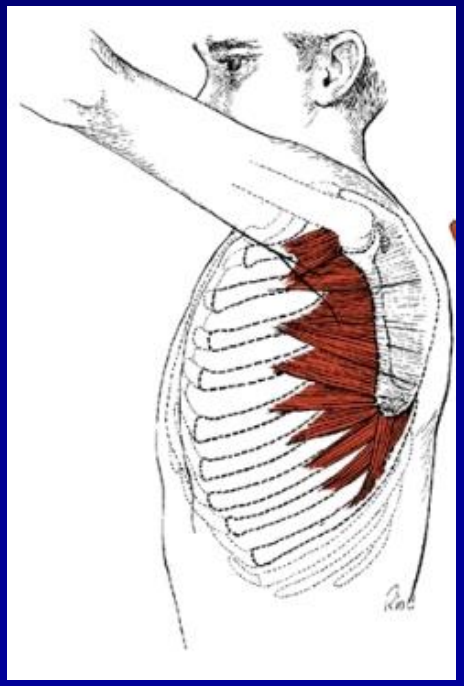


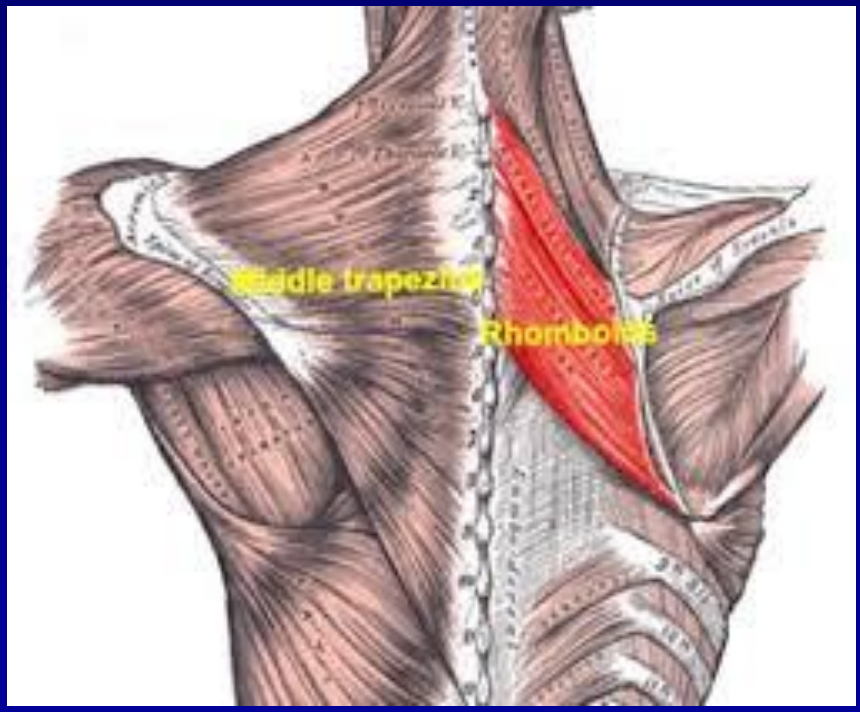



# Prevention/Rehabilitation

- Comprehensive program to develop strength, endurance, muscle balance, and flexibility

- 2) Scapular stabilizers
  - Serratus anterior
  - Lower trapezius
  - Rhomboids

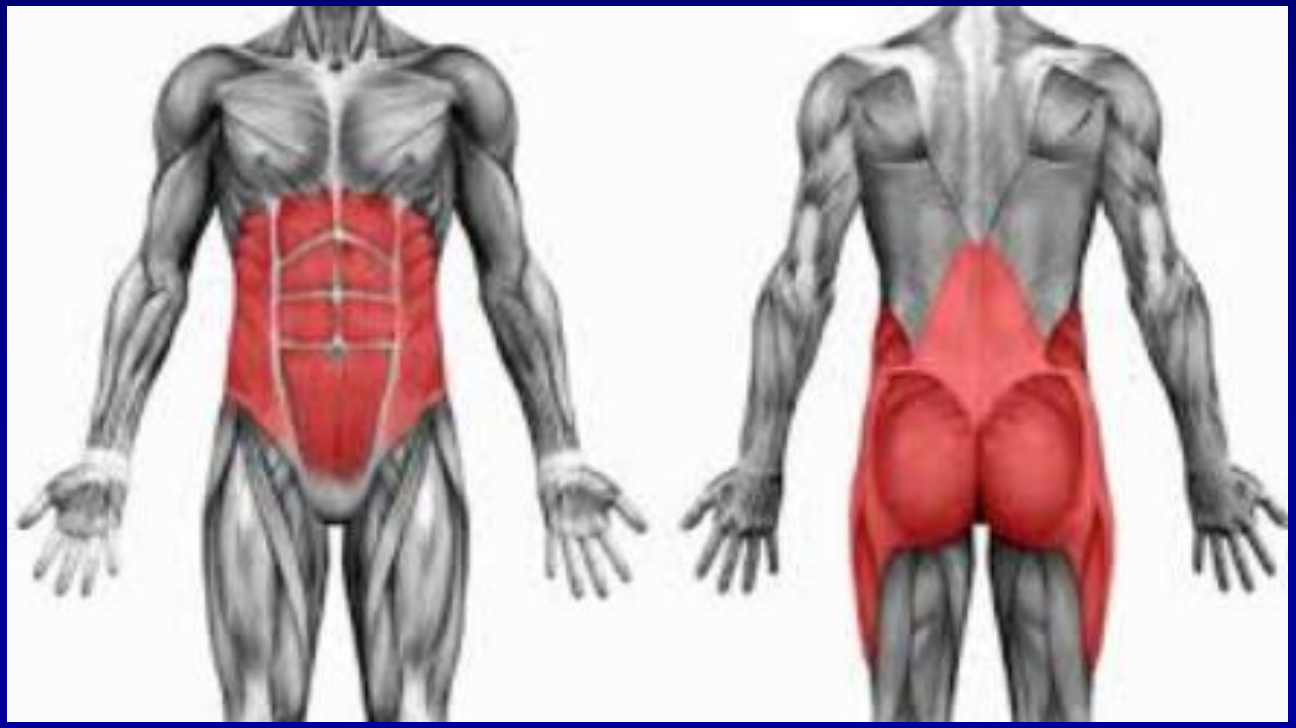




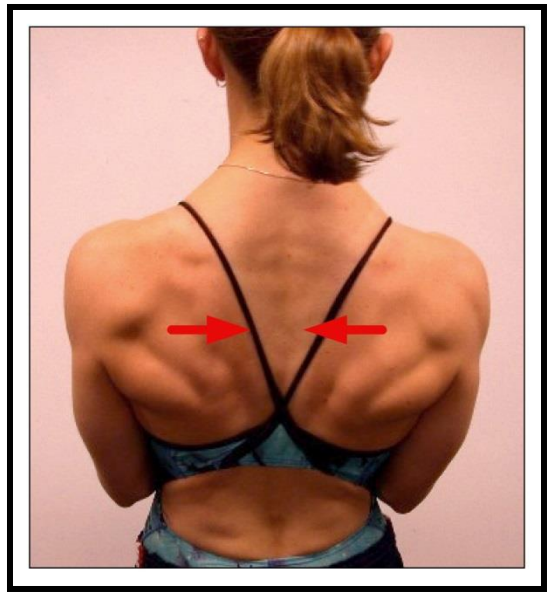
# Prevention/Rehabilitation

- Comprehensive program to develop strength, endurance, muscle balance, and flexibility

- 3) Core: low back, abdomen, pelvis



# External rotation exercise with Theraband





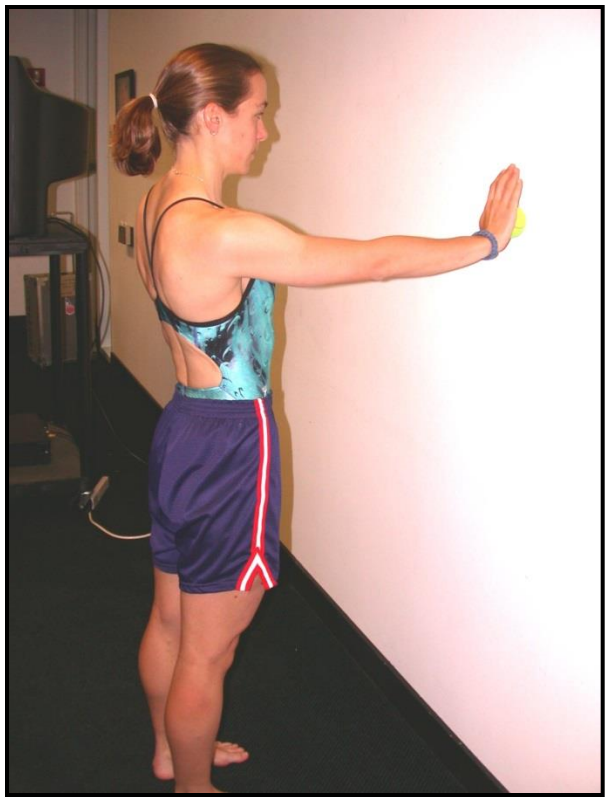
Goal is 3 sets of 2 minutes each, 30 seconds between sets

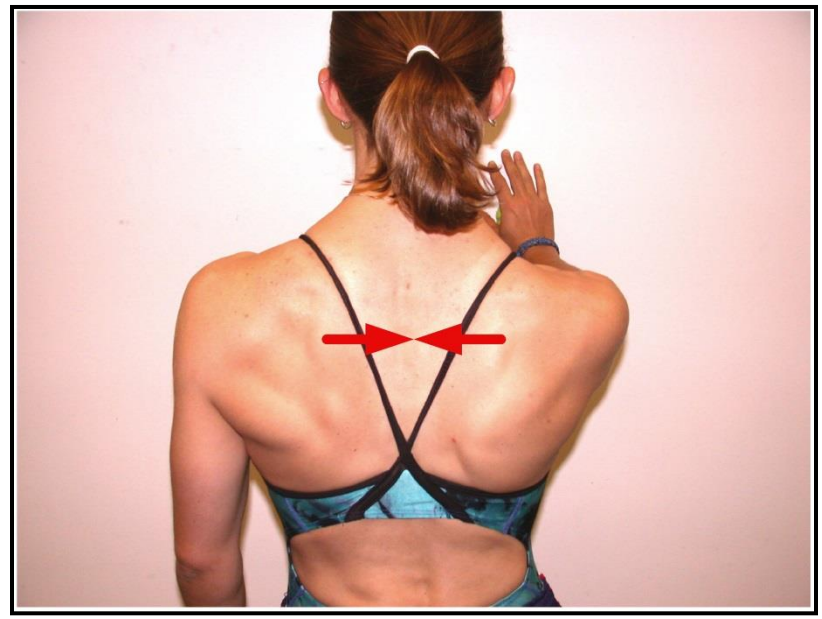
# Supraspinatus Exercise (Full Can Scaption)

Goal is 3 sets of 2 minutes each, 30 seconds between sets

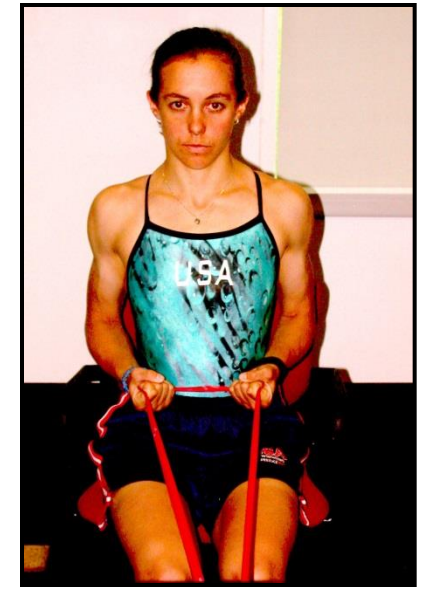
Progress to no more than 5 lbs.

# Scapular Muscle and Rotator Cuff Strengthening (Ball on the Wall)

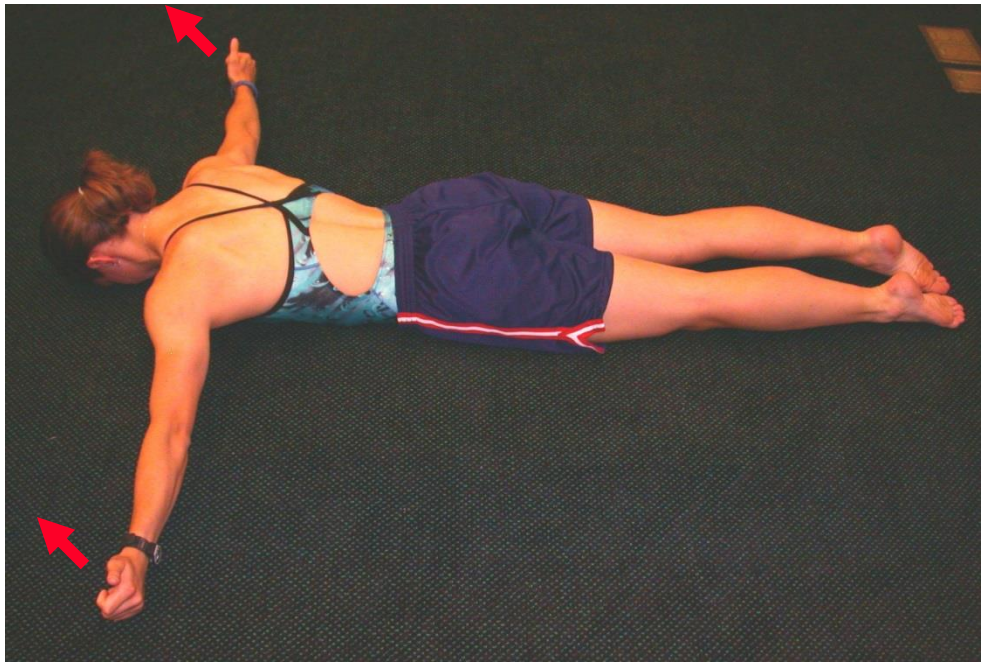




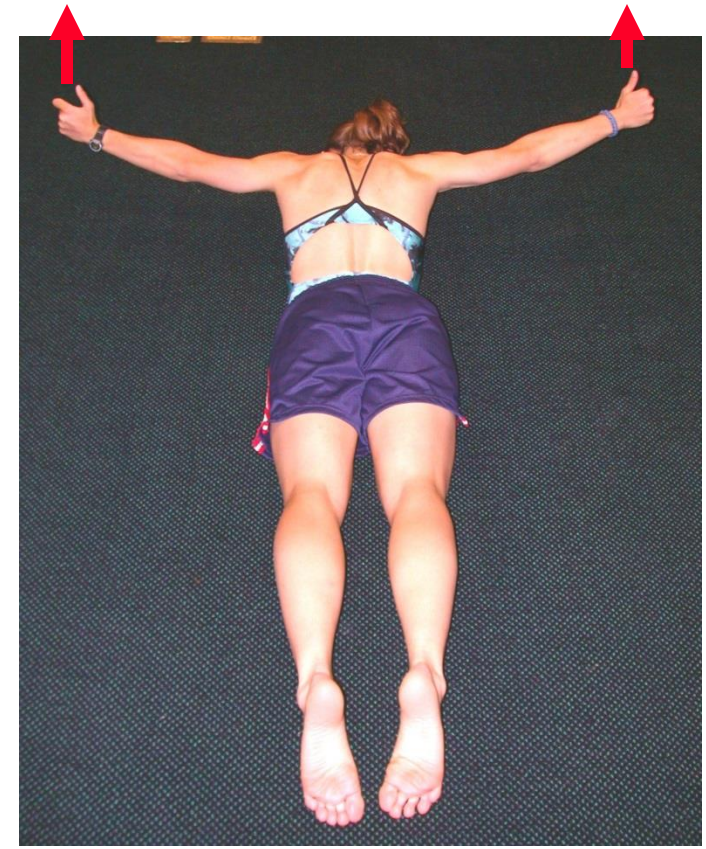
# Scapular Muscle Strengthening (Rows)



# Scapular Muscle Strengthening (Hitch Hiker)



Start



Finish

Hold position 1-2 seconds. Start with no weight. 2 minutes x 3 sets

# Scapular Muscle Strengthening (Push Ups with a Plus)

Progress to push-ups on the knees

Then progress to norma push-ups

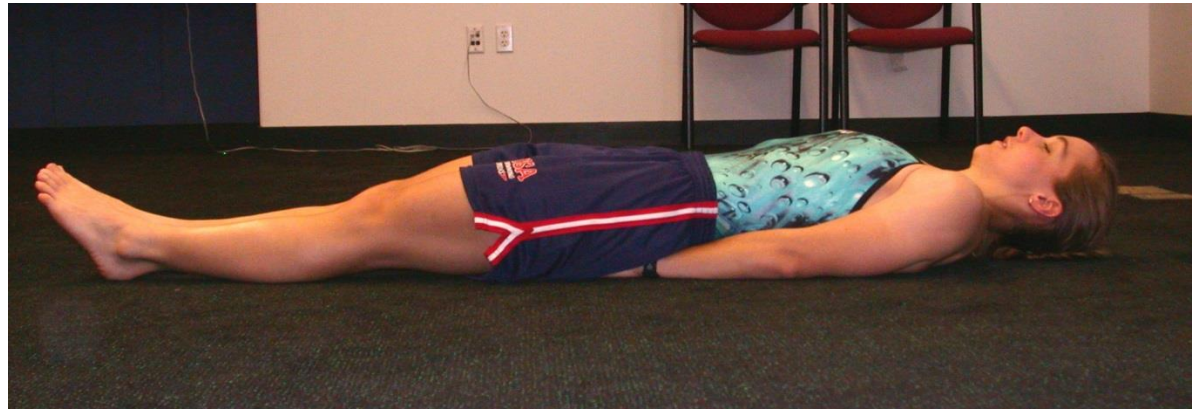
# Exercises for Subscapularis Strengthening

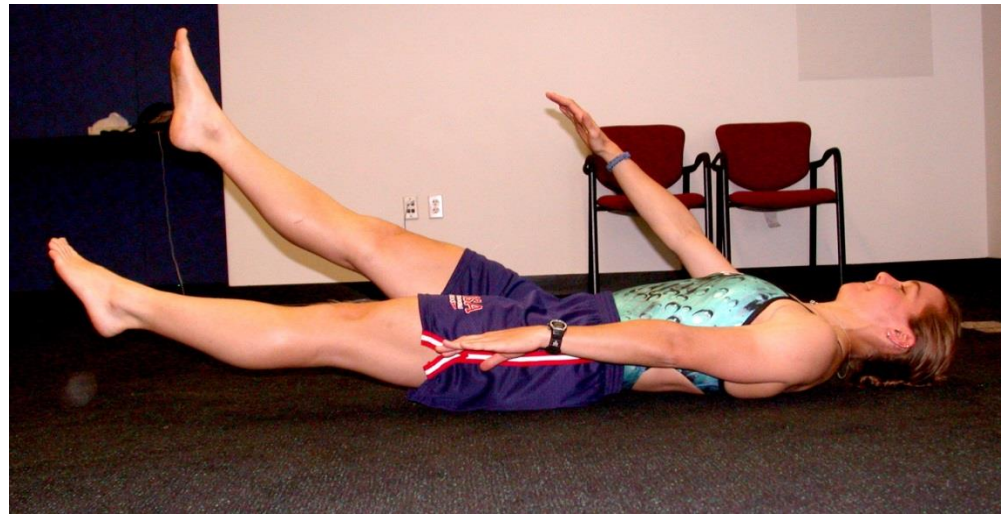

Dynamic Hug


Forward Punch


Diagonal

# Abdominal muscles (dead bug)





Keep back flat on floor. Start with legs only, then do arms also

# Low back and abdomen (quadruped)

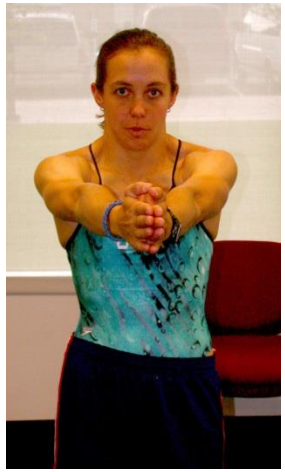
Left arm, right leg

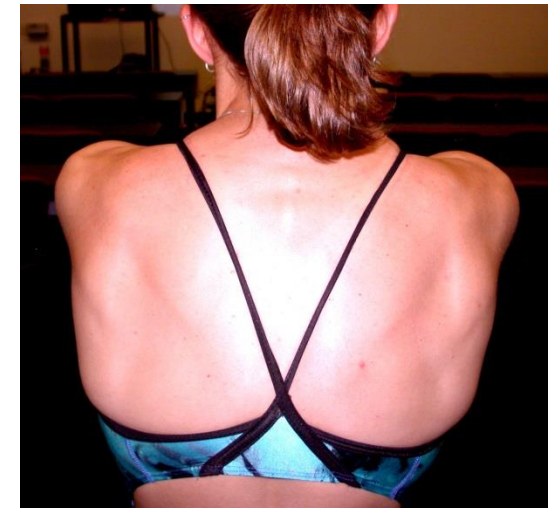
Right arm, left leg

Wrong position-keep back flat

# Stretching Exercises

Hamstrings

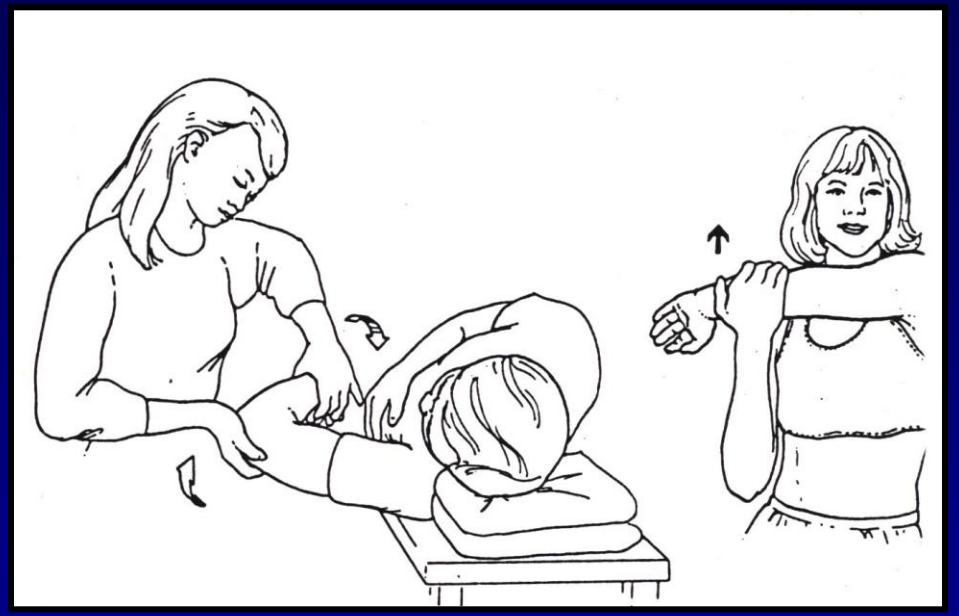


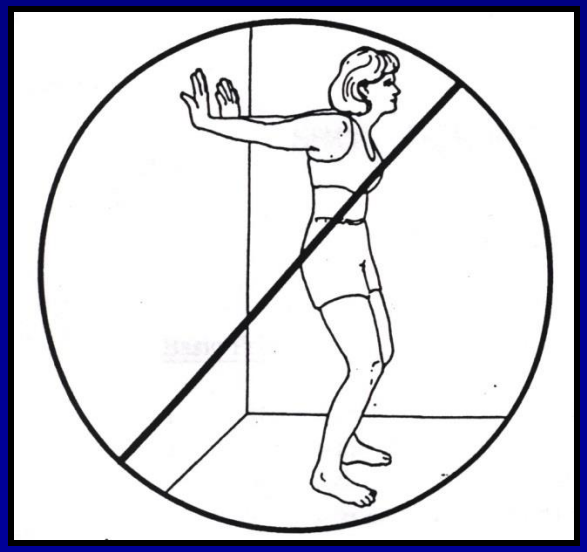


Upper trapezius

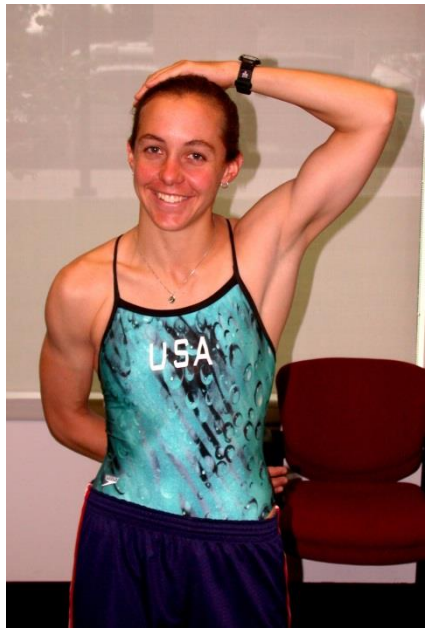
# Stretching Exercises

- Stretching of pectoral muscles, posterior capsule, posterior rotator cuff, latissimus
- Generally do not need to stretch anterior shoulder





# Stretching Exercises






Upper trapezius

Hold stretch for 30 seconds, rest 15 sec., then repeat

# Initial Treatment of Shoulder Pain in Swimmers

# Swimmer's Shoulder Treatment

- Training modifications (duration, frequency)
- Rest: change stroke, eliminate paddles, more kicking sets
- Vertical kicking
- Fins help maintain body position with ↓ upper body stress
- Pull buoy may actually help by changing position of shoulder in the water and decreasing drag

# Swimmer's Shoulder Treatment

- Proper warm-up
- Ice, limited used of NSAIDs
- Stop dry land upper extremity work
- Correct stroke abnormalities
- Stop other (non-swimming) activities: backpacks, other sports
- Proper nutrition important for muscle recovery

# Swimmer's Shoulder Treatment

## Possible stroke corrections:

- Arm in less internal rotation during recovery
- Wider hand entry
- Shorten follow-through
- Breathe bilaterally
- Increase body roll to side of painful shoulder during recovery

*-Physician/trainer should not suggest stroke corrections without consultation with coach-*

# When Do I Call My Doctor?

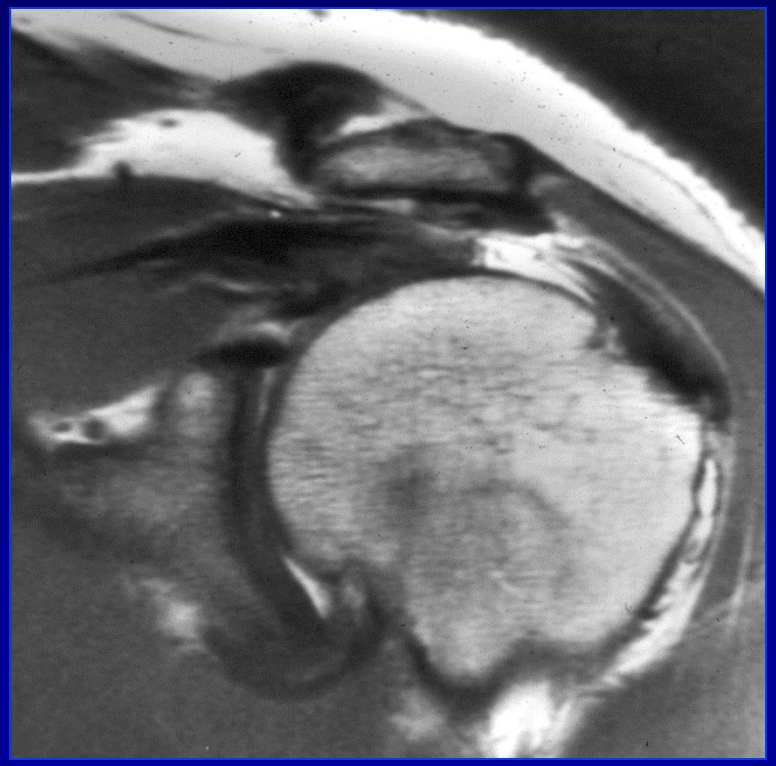
- Pain that persists despite initial course of relative rest, training modifications, anti-inflammatory meds
- Pain at night or at rest
- Recurrent pain
- New onset of weakness
- Neck pain with numbness in hand
- “Mechanical” symptoms: popping, catching, etc.

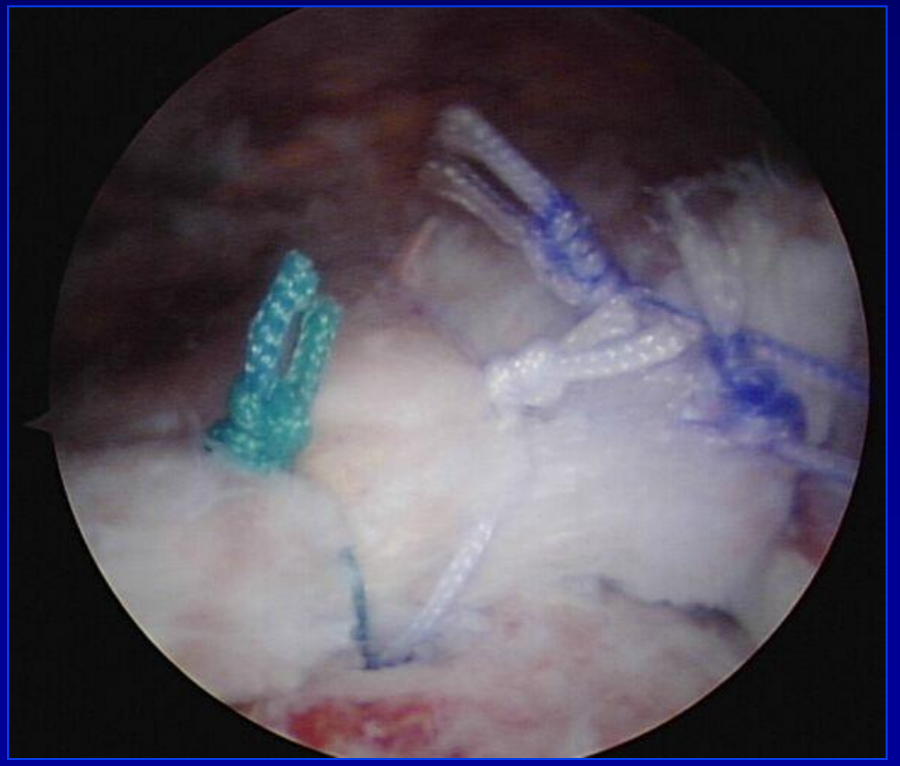
# Uncommon Conditions that Can Mimic "Swimmer's Shoulder"

- Cervical disc herniations
- Tumors
- Stress fractures of rib or acromion
- Thoracic outlet syndrome

# Shoulder Pain in Older Swimmer (Masters Athlete)

- Rotator cuff tears more common over age 40





# Summary

- Many injuries in swimming are due to overuse
- Primary prevention strategy is establishing strength, muscle endurance, and appropriate flexibility
- Dryland training important but may contribute to shoulder pain
- Consider activities outside of swimming (school sports, etc.)
- Early recognition and treatment
- Consult physician if symptoms persist

# Thank You