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 tendinosis
• 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

2° 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

![Muscle Diagram](image)
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 Scation)

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

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

Finish
Scapular Muscle Strengthening (Push Ups with a Plus)

Progress to push-ups on the knees

Then progress to normal 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

Wrong position—keep back flat

Right arm, left leg
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