The Swimmers Shoulder

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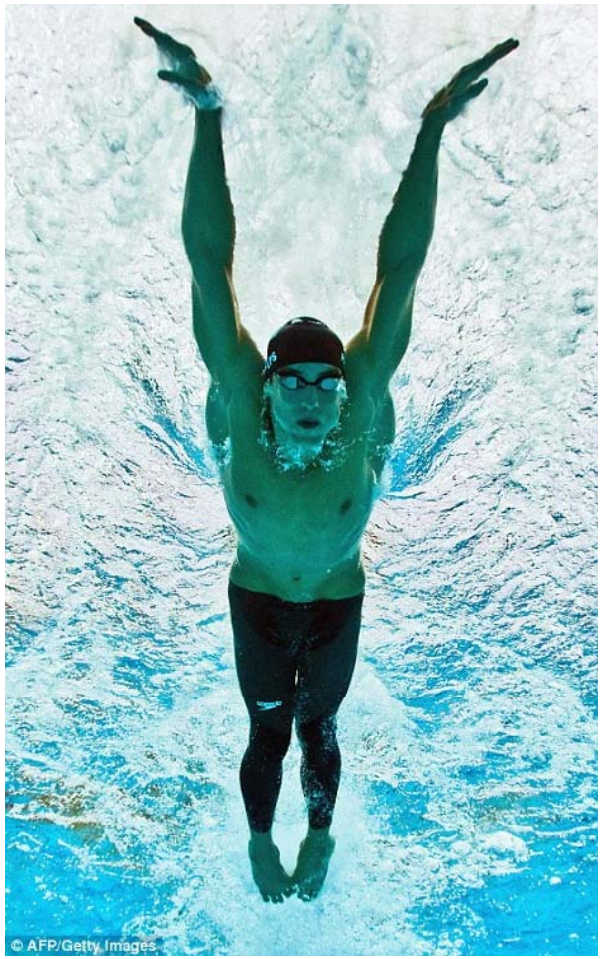
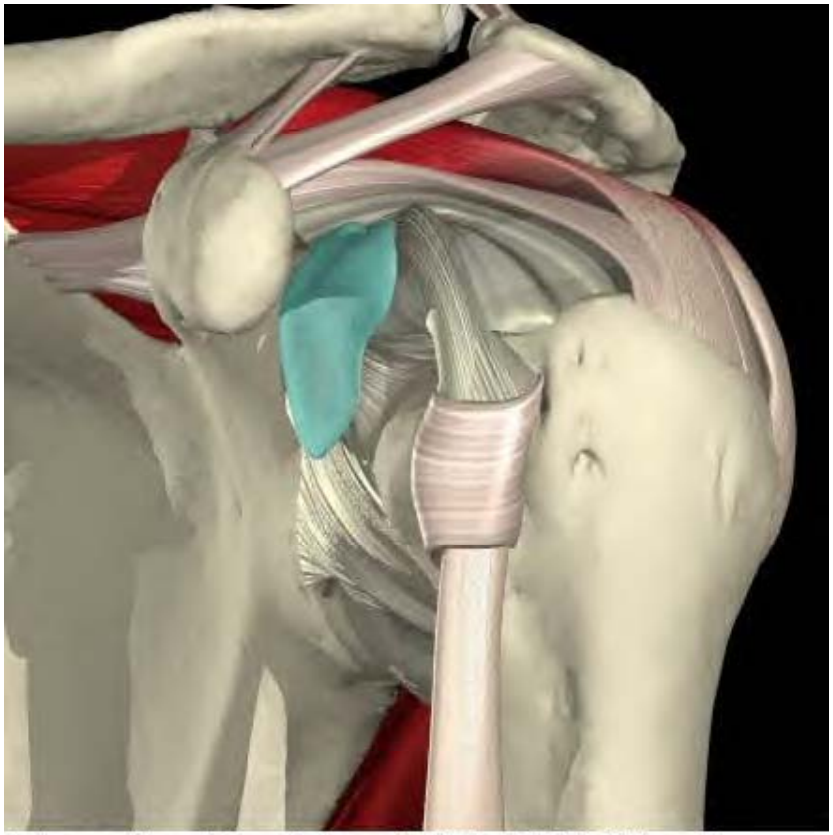
Overview

- Anatomy
- Swimming and the shoulder
- Posture
- Impingement
- Causes and progressions
- Treatment
- Prevention



The shoulder

- The shoulder joint is a ball and socket joint, formed by the ball-shaped end of the humerus and a shallow socket on the edge of the scapula (glenoid fossa). The joint is shaped rather like a golf ball on a tee.
- Stability is provided to this joint by capsule and ligaments, rotator cuff muscles and scapular positioning muscles.
- Co-contraction and coupling is necessary between the scapular positioning muscles to align the scapular for optimal rotator cuff muscle activation.



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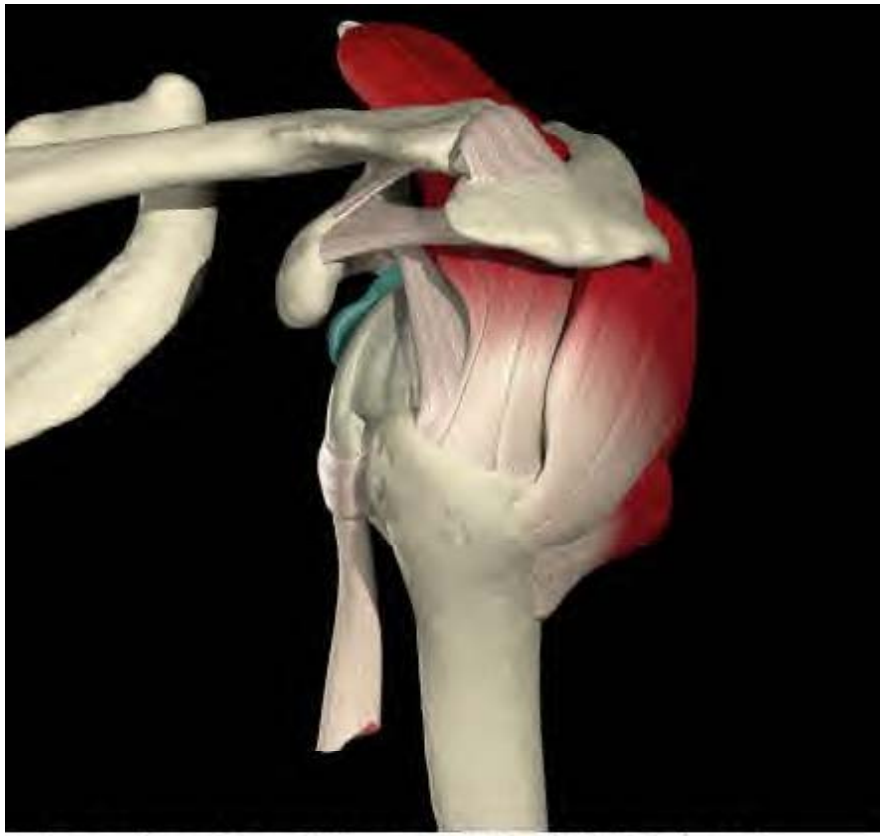

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Shoulder anatomy

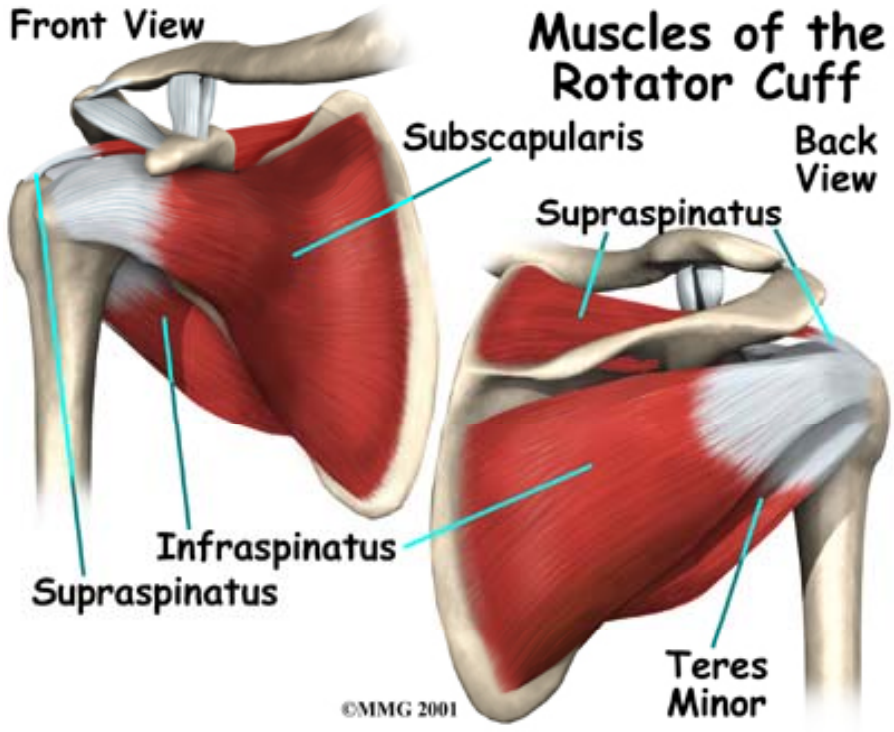
- The shoulder is comprised of 3 bones, 2 joints, and multiple tendons, ligaments and muscles including the rotator cuff.
- 3 bones: **humerus, scapular, clavicle**
- The **glenohumeral** joint is between the humerus and the glenoid fossa of the shoulder
- The **acromioclavicular** joint is between the scapular and the clavicle, the **sternoclavicular** joint is between the sternum and clavicle
- All joints need to have full mobility for the shoulder complex to function normally.

Shoulder anatomy

- Muscle surrounding the shoulder include:
  - Pectoralis major and minor,
  - Deltoid,
  - Trapezius
  - Levator Scapulae
  - Serratus Anterior
  - Latisimus dorsi
  - Rhomboid major and minor
  - Biceps, triceps
  - Coracobrachialis
  - Teres major
  - And the rotator cuff

What is the rotator cuff

- The rotator cuff is made up of a group of four muscles (called the *subscapularis, supraspinatus, infraspinatus and teres minor*) and their tendons. It plays a crucial role in keeping your shoulder joint stable. The tendons wrap around the shoulder, forming a cuff around the ball of the humerus.

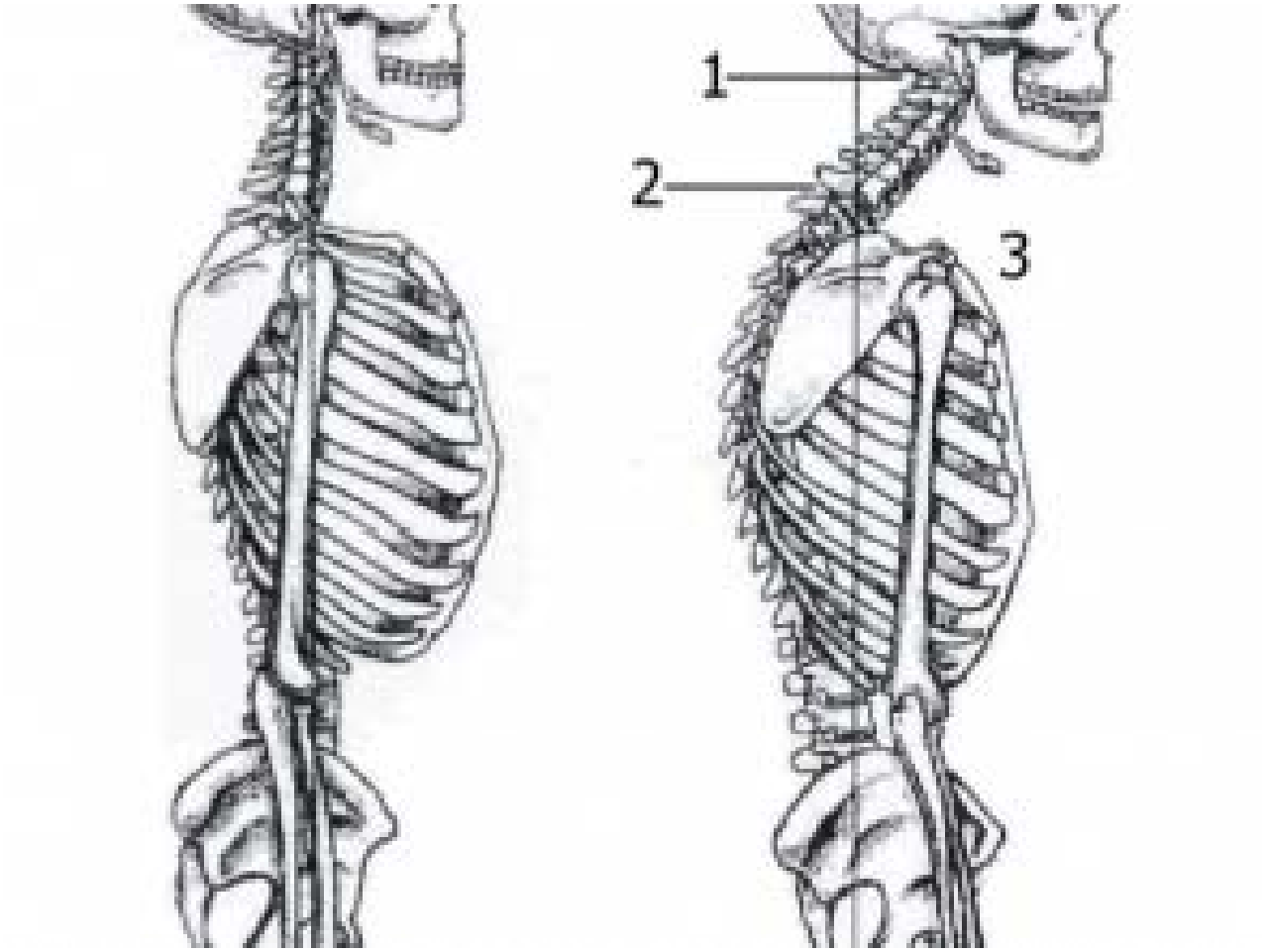


Swimming and the shoulder

- Free style:
  - **pull phase** – *adduction and internal rotation* – pectoralis major, latissimus dorsi with serratus anterior, subscapularis and teres major
  - **Recovery phase** – *external rotation and body roll* – rhomboids, mid trapezius, posterior deltoid, teres minor and infraspinatus
  - *abduction phase* –mid deltoid and supraspinatus
  - *mid recovery for hand entry* **–** serratus anterior, and upper traps

Swimming and the shoulder

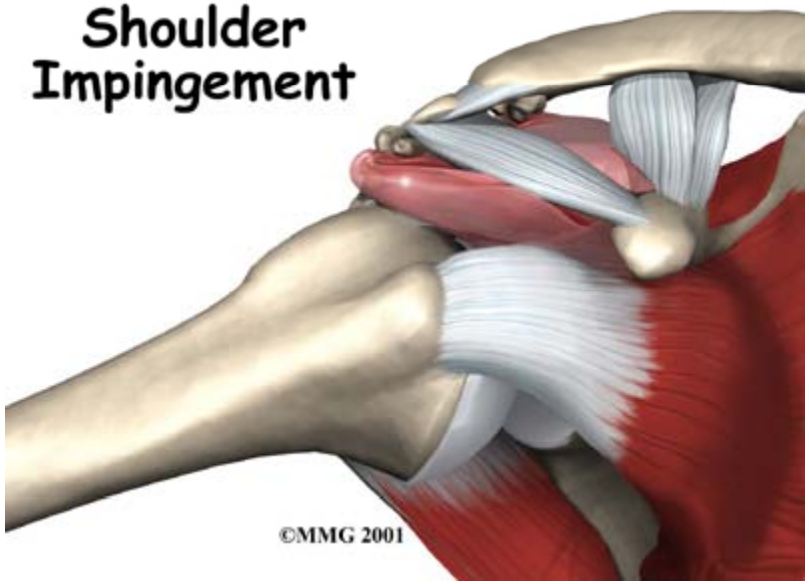
- Injuries in swimming are secondary to microtrauma and overuse.
- They originate from faulty technique and poor biomechanics
- Swimmers usually have greater flexibility of the glenohumeral joint which allows for greater power generation through the entire pull phase BUT increased flexibility increases the risk of instability
- Posture developed from swimming is a causative factor in injury development



Swimmers common posture

The humerus is held anteriorly with an increase in the thoracic curve caused by muscular imbalance in the shoulder internal and external rotators and shortening of the pectoral muscles, internal rotators and latissimus dorsi. Reduced extension in the thorax leads to increased compression through the AC and SC joints.

Shoulder pathology – instability and impingement



- Shoulder impingement occurs secondary to instability.
- Anterior translation of the humerus on the glenoid causes tightening of the rotator cuff to stabilise the joint,
- Increased flexibility in the swimmer is from capsuloligamentous laxity, the RC will tighten to stabilise the joint

Impingement

- In impingement syndrome, the rotator cuff tendon gets 'trapped' in the subacromial space (the space underneath the acromion). The tendon is repeatedly 'scraped' against the shoulder blade, causing inflammation and which can eventually lead to fraying of the tendon, the tendon becomes weaker and is more likely to tear.
- Impingement syndrome can occur because of longstanding 'wear and tear‘, posture and muscle imbalance. It can also happen due to problems with the bone of the acromion. These can include arthritis and bony spurs.

Shoulder impingement in the swimmer

- Increased reliance of adduction and internal rotation for pull phase causes excessive activity and increased development of the anterior chest and internal rotator muscles.
- This leads to imbalance between the IR and ER muscles, causing an anterior translation of the humeral head – swimmers posture.
- Decreased activity in teres minor, supraspinatus, and upper traps leads to increased risk of impingement
- Fatigue of serratus anterior and teres minor add to the anterior translation and impingement.

Tendon tear

- Free style and butterfly place increased load through the supraspinatus and biceps tendons
- Muscle imbalance secondary to decreased medial scapular stability causes the arm to move through abduction and forward flexion during the stroke,
- This increased stress on the tendon occurs in the avascular zone causing inflammation and mechanical impingement
- As this progresses it leads to partial or complete tearing of the tendon
- Persistent inflammation causes scarring/thickening of the tendon, they then become a mechanical irritant and aggravate the impingement problem
- As swimmers shoulder becomes a chronic injury it can lead to bony changes including erosion and osteophytes.

1,2 or 3?

- Grade 1 – pain, minimal tissue damage, little functional change
- Grade 2 – pain, moderate tissue damage, more fibres torn, functional effects
- Grade 3 – complete rupture, no pain, significant functional effects

Tightness in the unstable shoulder

- Swimmers have increased flexibility in their GHjt, but are often found to have tightness in their posterior capsules.
- This causes functional anterior translation of the humerus,
- This is worsened by the anterior shear to the humerus from the force applied to the hand during the stroke,
- Another factor in the development of impingement

Sustained maximal workouts

- Sustained maximal workouts cause dysfunction of the scapulothoracic muscles leading to winging of the scapular.
- Impaired positioning of the scapular and therefore glenoid reduces the concavity compression for the RC muscles.
- This causes forward rotation of the shoulder increasing the anterior instability and impingement
- Endurance training fatigues the scapular positioning muscles and rotator cuff.

Labral tear

- Fatigue of the rotator cuff, repeat overhead action and an anteriorly positioned humerus can lead to tearing of the anterior inferior labrum
- Symptoms include clicking, catching and locking of the shoulder
- Pain is usually present mid way through the pull phase of stroke

Thoracic outlet syndrome

- Instability, impingement, and tears are not the only dysfunctions related to the swimmers shoulder,
- Tightness of neck and shoulder muscles and joint positioning can lead to thoracic outlet syndrome
- Symptoms to watch for are:
  - Inability to keep fingers together,
  - Decreased control of movement of the hand during the pull phase
  - Coolness and pain
  - Engorgement or fullness
  - Identification of any of these symptoms in your swimmer required further assessment by a medical professional.

Initial treatment

- Treatment of the swimmers shoulder should start with
  - Rest
  - Ice
  - Compression
  - Elevation (be careful with elevation as this can be an aggravating position.)

  Stretch anterior chest and posterior capsule
  Postural correction

  Scapular retraction exercises with correction of over contraction of the rhomboids
  Strengthening of lower trapezius
  Endurance training of serratus anterior and rotator cuff
  Review of stroke mechanics – increase body roll, decrease hand crossing mid line, keep the elbow high and bilateral breathing.

  Avoid using hand paddles or tethered swimming as this will increase risk of injury, decrease use of kick board – this increases cervical hyper -extension and increases stress on the shoulder

  Remember water has increased resistance to air, ensure this is incorporated into dry side training.

Dry land training

- Dry land training is important to ensure correct muscle balance. Awareness of dominant and weak muscles secondary to swimming will guide dry land training to ensure it targets the muscles least used during swimming and therefore prone to weakness.
- Correcting posture in sitting, standing, in the water and during dry land exercises is crucial in ensuring muscles are strengthening in the correct position and alignment.
- Impaired posture during training will lead to ‘cheating’ through the dominant muscles to achieve the task, not benefiting the weaker muscles or correcting the postural induced muscular imbalance.
- Dry land strengthening should occur after the pool session to minimise the risk of fatiguing the rotator cuff and increasing the risk of injury.

What can the coach do?

- Review dry land training to ensure it targets all muscles of the back, neck and shoulders.
- Correct posture of athletes frequently,
- Ensure time for stretching
- Assess the movement of the athlete with a painful shoulder, correct the posture and reassess – if pain reduces postural impingement is the cause and strengthening must be addressed.
- Core stability training for whole kinetic chain treatment – improving the scapular link in the kinetic chain
- Correct any technique flaws identified in the stroke, relate to strength deficits, tightness and posture to ensure the changes are achievable to the athlete

Common stroke flaws – free style

flaw	**correction**
• Hand entry crossing midline • Thumb 1st entry	• Correct body roll
• Asymmetric body roll • Unilateral breathing	• Correct head/shoulder position, correct roll, strengthen scapular
• Weakness of serratus anterior with increased activation of rhomboids during pull	• Endurance, strengthening, muscle coupling and co-contraction retraining

Type of pain

- Pain will guide the coach and therapist to the source of pain. A strong constant aching pain is associated with inflammation and is often present at night.
- A sharp pain associated with movement is indicative of impingement of a structure or muscular tear.
- A sharp pain with a lingering ache indicates an inflamed impinged structure.
- If weakness is associated with the pain a tear is more likely as the torn fibers result in loss of strength and the remaining fibers trigger pain for a protective mechanism.
- Pain greater than 3/10 present for longer than 48 hours with no relief with postural correction, ice and rest requires assessment by a qualified therapist or physician to rule out serious pathology.

Prevention

- To prevent shoulder injuries, make sure athletes:
- Have the correct technique when playing swimming or doing activities that use their shoulder, particularly overhead motions against resistance
- Add exercises and stretches to keep the rotator cuff and scapular positioning muscles strong to home and dry land programs. Include a range of exercises to strengthen all of the rotator cuff muscles. Strengthening some of the shoulder muscles and not others can make the rotator cuff more prone to injury.
- Ensure the athletes are performing exercises or sports with the correct technique. When performing endurance or speed sessions ensure maintenance of correct technique is a key focus of the session.
- Ensure the athlete works to fatigue to enhance strengthening but not past fatigue of the weaker muscles where they will re-enforce compensatory movement patterns.