Shoulder Injuries in the Swimmer

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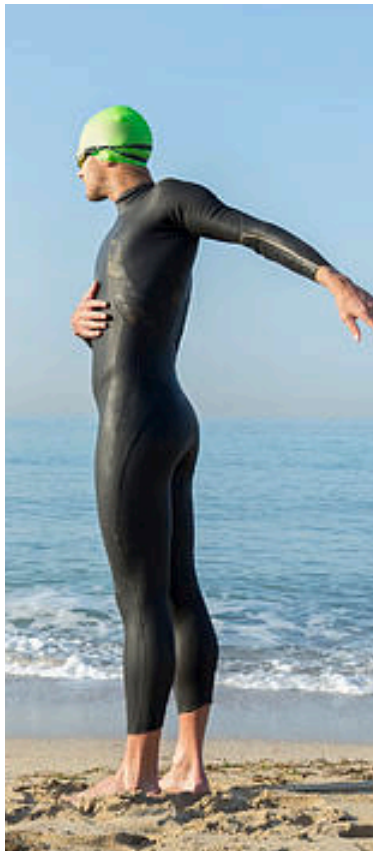
Disclosures

I have no disclosures

Case Study

- 50-year-old male triathlete (Ironman distance)
- Represented his school in swimming; did not compete for 18 years, picked up triathlons 2 years ago
- Right shoulder pain x 3 months
- Insidious-onset, no acute trauma
- Difficulty swimming freestyle, especially during the catch
- Affecting activities of daily living, e.g. removing T-shirt
- Partially better with rest
- Very keen to continue training and competing as he wants to clock better times



Background

- Elite swimmers may swim up to 14,000 m each day, i.e. > 2,500 shoulder revolutions per day or > 16,000 shoulder revolutions per week.

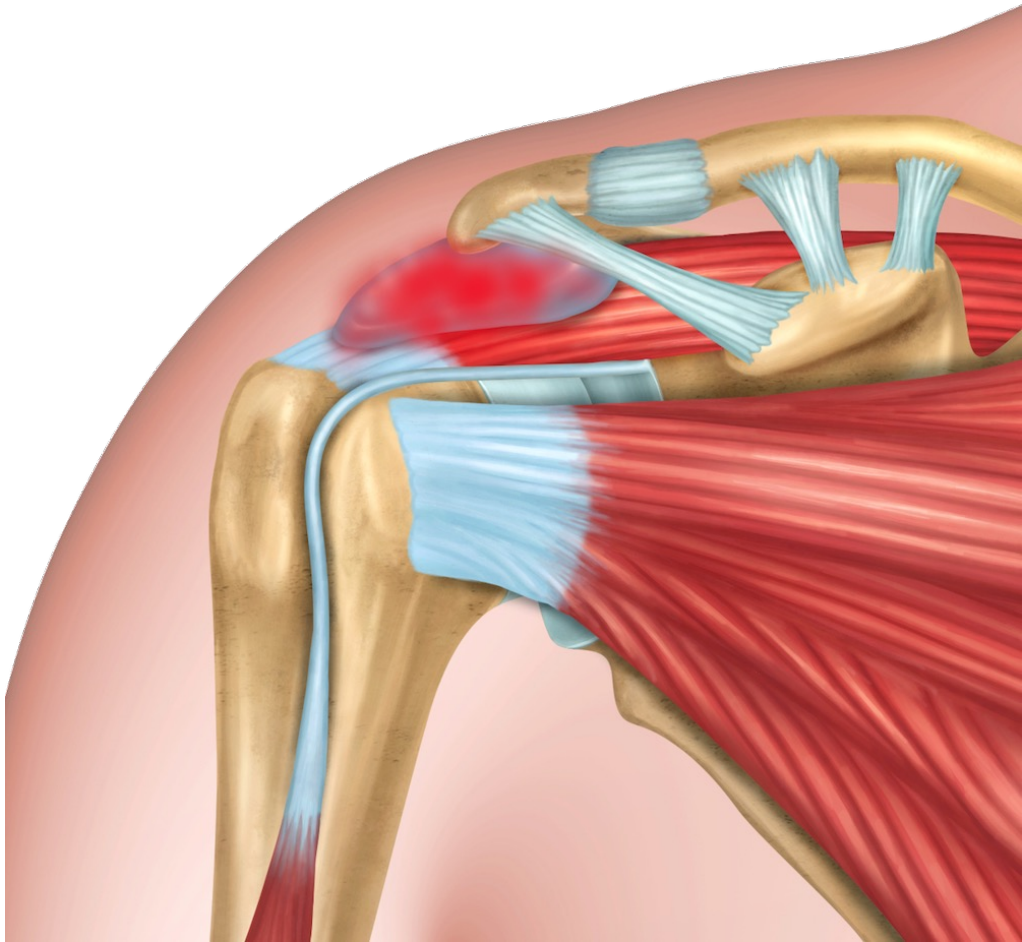
  Pink MM, Tibone JE. The painful shoulder in the swimming athlete. Orthop Clin North Am 2000;31:247–61

- A study of high school competitive swimmers revealed that 72% used pain medication to manage their shoulder pain during practice, with 47% reporting regular medication use.

  Pollard H, Croker D. Shoulder pain in elite swimmers. Australas Chiropr Osteopathy 1999;**8**:91–5

Diagnosis (for the purpose of this presentation)

- Mechanical diagnosis: Shoulder impingement
- Structural diagnosis:
  - Rotator cuff (supraspinatus) tendinopathy
    - Tendinosis, partial tear, full-thickness tear
    - Calcific (tendinitis calcarean) / non-calcific
  - Subacromial bursitis
  - Biceps long head tensosynovitis



Differentials

- SLAP lesions
- Cervical spondylosis
- Os acromiale
- Suprascapular nerve entrapment
- Thoracic outlet syndrome

Prevalence / Incidence

Talented, Dutch swimmers, competing at National or International level, swimming at talent or training Centres of the Royal Dutch Swimming Federation:

- 28.8% of the swimmers sustained a shoulder injury in past year
- Association between crossing the midline during thrust-phase and shoulder injuries (p-value=0.03)
- No significant association was found between the two other swimming techniques and shoulder injuries.

van Dorssen E, Stubbe J. SHOULDER INJURIES IN TALENTED, COMPETITIVE SWIMMERS. *British Journal of Sports Medicine* 2017;51:402

Prevalence / Incidence

Retrospective study of 132 young competitive swimmers:

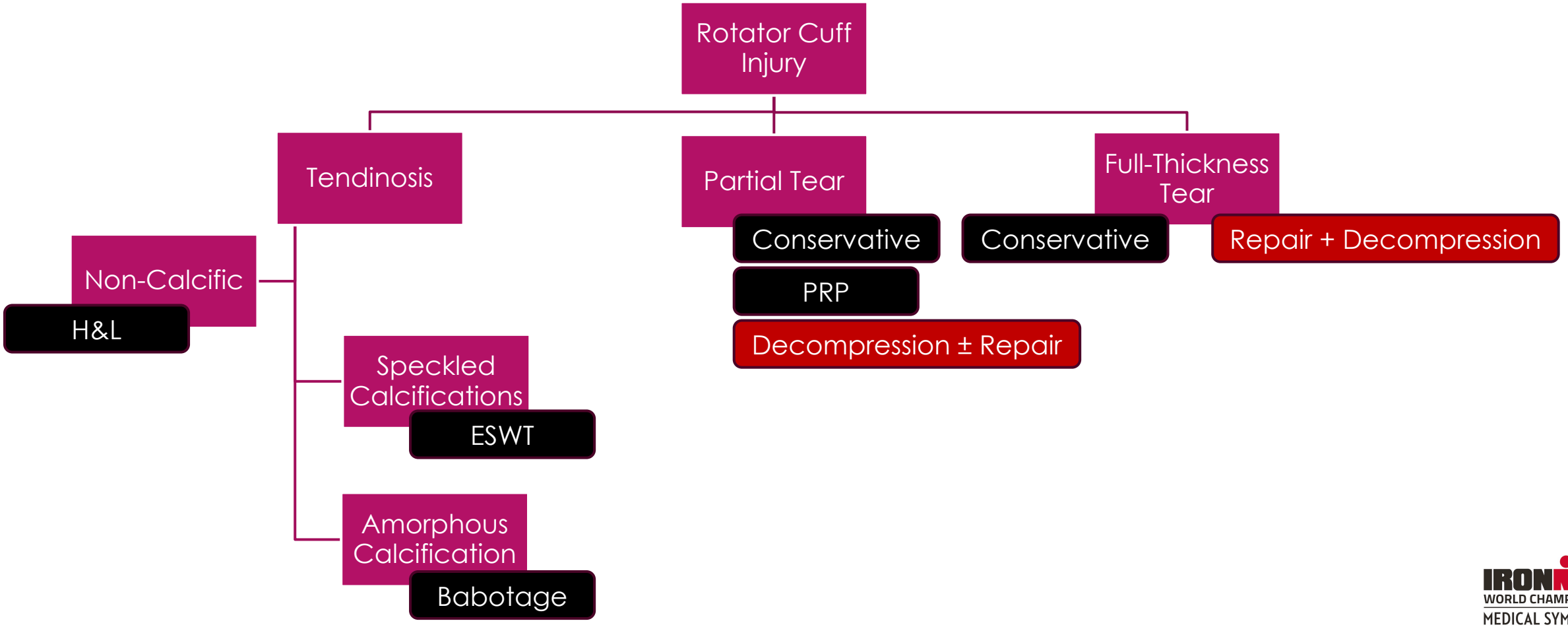
- 99 swimmers (74%) had experienced shoulder injury, collectively reporting 124 unique injuries, and >50% of these injuries had recurred at least once
- 22% of swimmers were currently experiencing shoulder pain
- 10% were currently receiving treatment for shoulder injury
- Injury incidence was not influenced by sex (P=.223) or competitive standard (P=.415)
- More chronic than acute injuries (86 vs 38; P=.001)
- Tendencies for more injuries to the right than left shoulder (65 vs 43, P=.066)
- Shoulder injury was 50% lower for breaststroke swimmers, but this difference was not significant P=.245).

Folland J, Archer G. SHOULDER INJURIES IN HIGHLY TRAINED COMPETITIVE SWIMMERS. *British Journal of Sports Medicine* 2014;48:593

Diagnosis

- History
- Physical examination
- Imaging
  - Bedside ultrasound scan
    - Biceps tenosynovitis
    - Subacromial bursitis, effusion
    - Cuff tendinosis (calcified / non calcified) / partial tear / full thickness tear
    - Dynamic impingement against acromion / coracoacromial ligament
  - X-ray (AP, Y-scapular view)
    - Calcific tendinosis
    - Bigliani type
  - MRI

Treatment Options



Predisposing Factors

- Muscle activation patterns
- Strength imbalances e.g. ER:IR
- Reduced strength endurance in the shoulder and core muscles
- Shoulder range of motion e.g. reduced IR, increased / decreased ER
- Glenohumeral laxity
- Shoulder posture
  - Posterior humeral head position (anterior humeral head relative to anterior edge of acromion)
  - Anteriorly tilted scapula (tight pectoralis minor muscle)
- Scapular dyskinesia

Struyf F, Tate A, Kuppens K, *et al.* Musculoskeletal dysfunctions associated with swimmers' shoulder. *British Journal of Sports Medicine* 2017;51:775-780

Differences in musculoskeletal function in swimmers with shoulder pain versus unimpaired swimmers

Shoulder muscle performance	
Muscle activity during freestyle swimming	Less activity of UT, R, AD, MD (hand entry); less activity of SA; higher activity of R (pulling phase); less activity of AD and MD; higher activity of IS (hand exit); less activity SSc (mid-recovery)
Muscle activity during breaststroke swimming	Less activity of Tmi; higher activity of SSc (pulling phase); less activity of MD, UT, SSp; higher activity of IS (mid-recovery)
Muscle strength	Tendency of reduced IR strength[18]
Muscle endurance at the shoulder	Less AB and ER endurance[9]
Core endurance	Less core endurance[6]
Shoulder range of motion	Higher (≥100°) or lower (<93°) ER ROM[20] ; reduced shoulder flexion and IR ROM[6]
Laxity and instability	Greater GH laxity and instability[1 17 21 22]
Shoulder posture	Greater posterior humeral head position[7] ; shorter PM[6 19]
Scapular dyskinesis	Tendency to greater incidence of SD[7] ; decreased scapular upward rotation after swim practice[29]

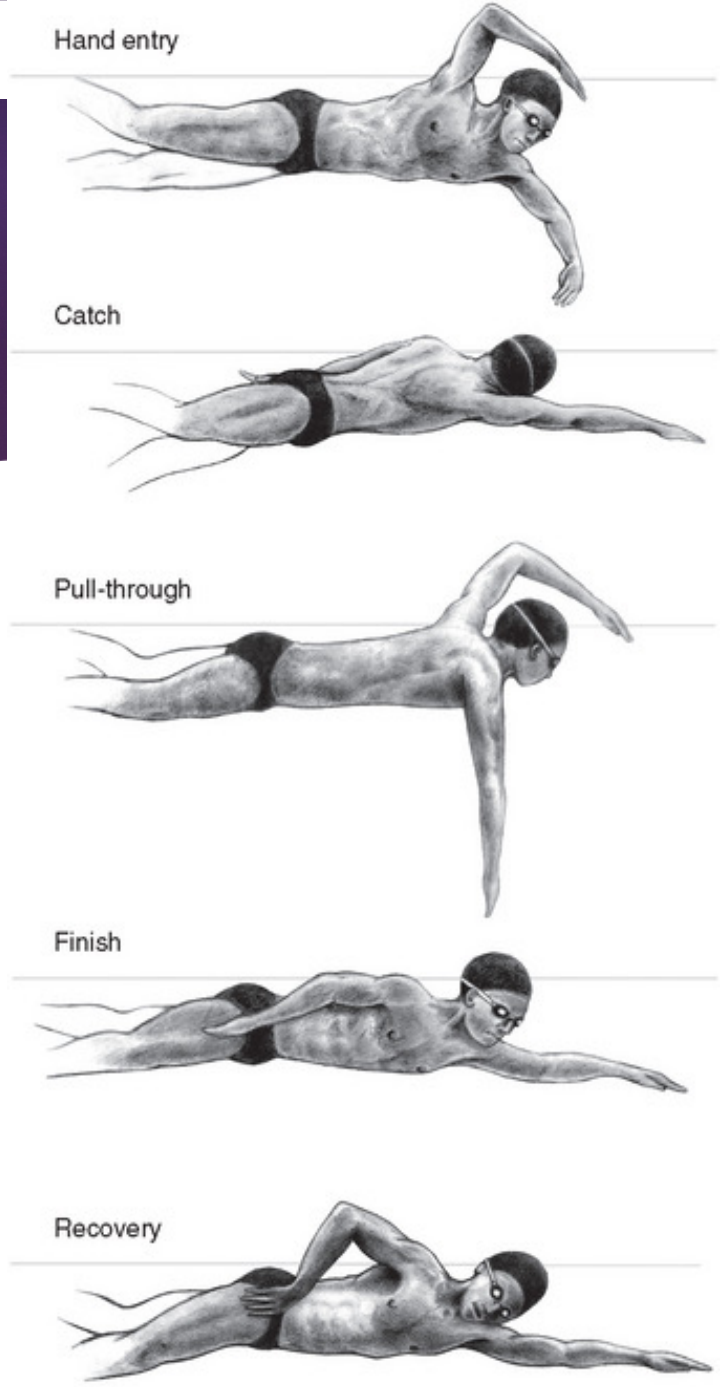
- **AB, abduction; AD, anterior deltoid; ER, External Rotation; GH, glenohumeral; IR, internal rotation; IS, Infraspinatus; MD, middle deltoid; PM, pectoralis minor; R, Rhomboids; ROM, Range of motion; SA, Serratus Anterior; SD, scapular dyskinesis; SSc, subscapularis; SSp, Supraspinatus; Tmi, Teres Minor; UT,Upper Trapezius.**

Struyf F, Tate A, Kuppens K*, et al.* Musculoskeletal dysfunctions associated with swimmers' shoulder. *British Journal of Sports Medicine* 2017;51:775-780

Challenges of the Swim Stroke

Impingement more likely with:

- Midline entry ~ Neer's Test
- Internal rotation during entry and catch ~ Hawkins-Kennedy Test
- S-shaped pull ~ Hawkins-Kennedy Test
- High elbow recovery ~ Posterior Impingement Test

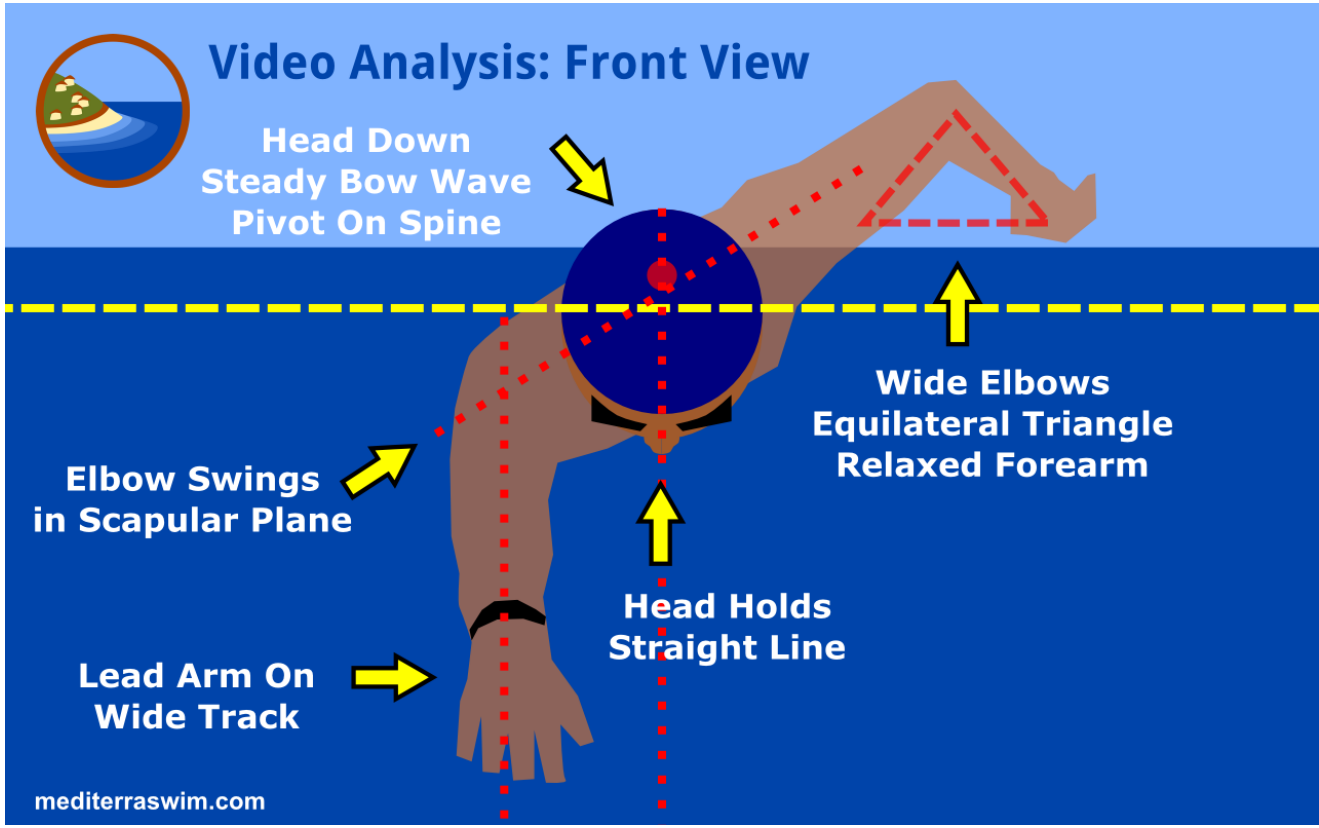


https://musculoskeletalkey.com/the-shoulder-in-athletes/

Stroke Corrections for freestyle

- Wider hand entry
- "Flat" hand entry
- "Windmill" pull
- Increase body roll
- Low / wide elbow during recovery
- Breathe bilaterally
- Hold kickboard under the chest

- Be mindful of trade-offs when correcting stroke – discuss with coach and swimmer
- Considerations: Open water and triathlons



Takeaways

- The nature of competitive swimming requires high-volume training that puts the rotator cuff at risk
- Accurate diagnosis, assessment of the severity, and addressing the biomechanical factors are essential steps
- Ultimately, the athlete has to return to swimming – consider change to the stroke in exchange for longevity. Unfortunately, speed and the "perfect technique" are the tradeoffs
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Q & A

IRONMAN WORLD CHAMPIONSHIP MEDICAL SYMPOSIUM