Shoulder injuries in elite sport

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3 critical clinical entities

1. Rotator cuff tendinopathy / partial tear
2. SLAP-lesion (superior lesion anterior to posterior)
3. Little Leaguer’s shoulder (proximal humeral epiphysitis)
Why is the shoulder at risk?

Stability of the shoulder
Biomechanics of throwing/serving

Stability shoulder

Ball and socket joint:
golf ball on a tee
Capsule and ligaments
Rotator cuff muscles
Scapulo-thoracic movement
**Biomechanics of throwing**

Repetitive movement
ROM up to 170° ER
Velocity near 7000 °/s

Posterior shear 400 N
Inferior shear 300 N
Compressive >1000 N

**Biomechanics of serving**

Repetitive movement
ROM 110° ER to 70° IR
Velocity: 1700 °/s

Distraction: bodyweight!
Acceleration 0-45 mph in 0.23 s
Spiking in volleyball

Freestyle and butterfly in swimming

Competitive swimmers used to train 10,000 to 20,000 m/day, mostly freestyle.
With 8-10 arm cycles/25 m, a swimmer completed more than 1 million shoulder rotations each week (Kammer, 1999).
Single traumatic event

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Rotator cuff tendinopathy / partial tears

Subscapularis, supraspinatus, infraspinatus and teres minor
Hold humeral head in glenoid socket during early abduction

Comprise >50% of all shoulder injuries
**Postero-superior impingement**

The supraspinatus may infold between the greater tuberosity and the posterior superior labrum. Articular surface rotator cuff tears and labral tears result.

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**Repetitive microtrauma**

Paris, Roland Garros  
May 22\(^{nd}\): 4-6, 6-0, 8-6  
May 24\(^{th}\) : 6-3 6-3  
May 25\(^{th}\): 6-4, 3-6, 6-4  
May 27\(^{th}\): 6-2 5-7 6-3 4-6 6-8.

Felt something snap at 5-4 in the 5th set. Called the physio, was able to continue, but with less speed and power of his serve.
**Clinical presentation**

Pain and tenderness over the top of the shoulder and/or the lateral side of the arm

Pain increases during throwing and serving

Nagging pain and heaviness of the arm after play

Weakness of the arm

Loss of speed and accuracy when throwing and serving

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**Physical exam**

Ann Cools will discuss this!
Useful test: lateral Jobe test

Lateral Jobe test vs. 3 combined tests:
Sensitivity 81% vs. 57% ; specificity 89% vs. 88%

Gillooly, 2010

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SLAP lesion
Superior Labrum Anterior to Posterior

A SLAP tear occurs where the biceps tendon anchors to the labrum.

Humerus
Glenoid
Labrum

Long head of the biceps is an important dynamic restraint against external rotation when the arm is abducted (Kuhn, 2005)

SLAP lesion

“Peel-back” mechanism: an increased strain at the biceps anchor during the late cocking phase at MER (Burkhart, 1998)

Braun, 2009
**Clinical presentation**

Pain in the front or top of the shoulder
Pain during the late cocking and early acceleration phase
There may be catching or locking of the shoulder
Loss of velocity of the pitch or serve

Braun, 2009

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**Physical exam**

Ann Cools will discuss this!
Useful test: Relocation test

Pressure over the back of the humeral head causes apprehension, while pressure over the front makes it disappear (pooled sensitivity 52%)  

Hegedus et al, 2012

Useful test: Yergason test

The examiner resists the patient's active attempts to supinate the arm and flex the elbow (pooled specificity 95%) 

Hegedus et al, 2012
Useful test: Crank test

The shoulder is placed in maximal abduction and external rotation. The test is positive if the patient expresses pain or apprehension (positive likelihood ratio 2.8).

Hegedus et al, 2012

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The young athlete with shoulder pain

Little Leaguer’s Shoulder

Proximal humeral epiphysitis: widening of the growth plate
**Clinical presentation**

Pain in the upper arm during throwing or serving
Pain, tenderness and/or heavy arm after play
Shoulder weakness
Loss of speed or accuracy

**Physical exam**

Ann Cools will discuss this!
Pitfall – be aware!

Shoulder tests for rotator cuff injury may be positive, but imaging is warranted!

Take home message

Most common cause of shoulder injuries in overhead athletes is repetitive strain
The rotator cuff (supraspinatus) is affected most often (incidence increases with age)
The growth plate is commonly affected in young athletes and they need REST, not exercises
Thank you for your attention!