An Evidence-Based Approach to the Examination & Treatment of the Acromioclavicular Joint

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2012 PHATS Annual Meeting
Fort Lauderdale, Florida
Affiliations

• Nova Southeastern University
  – Associate Professor
  – Orthopaedics
  – Exercise Physiology

• Boca Raton Orthopaedic Group
  – Physical Therapist

• Research Agenda/Clinical Interest
  – Shoulder Complex
    • Weight-training/weight-lifting population
Topics

• Epidemiology
• Pathology & Classification
• Biomechanics: Acromioclavicular Joint (ACJ)
• Examination Tests
  – Procedure & diagnostic utility
  – Testing cluster
  – Radiographic measurements
• Select Interventions
  – Taping
  – Flexibility
  – Muscle performance exercises
Epidemiology

• General population: Shoulder-17.6%  AC joint-13.6 %
  Clayton & Brown, J Care Injured, 2008

• Mixed participation level hockey: Shoulder up to 26%

• Collegiate AC joint injuries:
  • Comprised 8.9% regular & 12.7% severe* injuries
  • 2nd most common severe injury  *10+ days “activity” loss
    Agel et al, J Athl Train, 2007

• High school AC joint injuries: 37.8% (2-year study)
  Finke et al, J Orthop Sports Phys Ther, 1988

• ≈ 45% professional players: AC joint/clavicle injury
  • Separation, DJD, osteolysis & fracture
Acromioclavicular Joint (ACJ) Pathology

- Sprains/Separations
- Distal clavicle osteolysis (DCO)
- Degenerative joint disease (DJD)
Sprains & Separations

Type I

Type II

Type III

Type IV

Superior view

Type V

Type VI
Distal Clavicle Osteolysis
Degenerative Joint Disease
Acromioclavicular Joint Biomechanics
Examination Tests & Measures

- Cross arm test
- Resisted extension test
- O’Brien test/Active compression
- Arthrokinematic/Joint Play
- Paxinos sign
- Palpation
- Radiography
Diagnostic Validity Interpretation

- Sensitivity: “ruling out”
  - Considers false (-) results
- Specificity: “ruling in”
  - Considers false (+) results
- Likelihood ratios
  - Pretest to post test probability of condition
## Likelihood Ratio Ratio Interpretation

<table>
<thead>
<tr>
<th>(+) LR</th>
<th>(-) LR</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 10</td>
<td>Less than 0.1</td>
<td>Significant and conclusive shift in probability</td>
</tr>
<tr>
<td>5-10</td>
<td>0.1-0.2</td>
<td>Moderate shift</td>
</tr>
<tr>
<td>2-5</td>
<td>0.2-0.5</td>
<td>Small but important shift in probability</td>
</tr>
<tr>
<td>1-2</td>
<td>0.5-1.0</td>
<td>Minimally important shift in probability</td>
</tr>
</tbody>
</table>
Cross Arm Test

Sensitivity: 77%  Specificity: 79%  +LR: 3.67  -LR: 0.29
n = 553

Resisted Extension Test

Sensitivity: 72%  Specificity: 85%  +LR: 4.8   -LR: 0.32  
n = 348

O’Brien/Active Compression Test

Sensitivity: 41%  Specificity: 95%  +LR: 8.2  - LR: 0.62
n = 325

Acromioclavicular Joint Testing Cluster

- Cross arm
- AC resisted extension
- O’Brien/Active compression

2 of 3 tests = + or -

Sensitivity: 81%
Specificity: 89%
+ LR 7.36
- LR 0.21

Arthrokinematic/Joint Play Testing

Caudal Glides of Clavicle on Acromion
Arthrokinematic/Joint Play Testing

A/P-P/A Glide of Distal Clavicle on Acromion/Scapular Spine
Palpation

Sensitivity: 96%  Specificity: 10%  +LR: 1.1  -LR: 0.40  
n = 38

Walton et al, J Bone Joint Surg Am, 2004
Radiographs

• Views
  – Anterior to Posterior (AP)
  – Weighted AP
  – Zanca
  – Alexander/Cross Arm
  – Axillary with Horizontal Adduction
Anterior to Posterior (AP)
AP Erect vs. Supine
Weighted AP
Zanca View
Alexander: Adduction View
Axillary Lateral View with Adduction
Select Interventions

- Taping
- Therapeutic exercise
  - Flexibility
  - Muscle performance
Intervention Considerations

• Immobilization period
  – Taping may offer utility upon discontinuation of immobilization

• Maximum ACJ stress during:
  – Horizontal adduction
  – Internal rotation
  – Elevation > 90°
  – Deltoid/Upper trapezius activation (protective later)

• Mobility Impairments that ↑ AC stress
  – Pec minor & Posterior shoulder tightness
Shoulder Taping

Indication: Instability and Acute Stabilization

GH & AC joint instability

Step #1: Anchors

#2: Vertical strip

#3: Oblique strips
Mobility/Flexibility: 
*Pectoralis Minor Stretch*

**Procedure:** Patient lies supine with a cylindrical firm bolster positioned vertically along spine. An AP* stretch to is applied to anterior shoulders/coracoid region *toward mat at a 30° angle*

*Muraki et al, Phys Ther, 2009*
Mobility/Flexibility:

*Posterior Shoulder Tightness: Flexion, IR, H-ad*
Muscle Performance

• Key Musculature
  – External rotators & periscapular musculature

• Selection
  – Acute: desire isolation while avoiding excessive anterolateral deltoid & upper trapezius activity
  – Chronic: maximum activation
External Rotator Muscle Performance

• **Isolation**
  – 90° Sagittal plane & scapular elevation in 45° IR
    
  – Elbow at side in 45° IR
    

• **Infraspinatus Recruitment**
  – Sidelying ER: 62-85% MVIC
  – Elastic band ER: 46-70% MVIC
  – Prone ER: 50-130% MVIC
  – Prone HA at 100-130° with ER: ~39-85% MVIC

**Tip:** NMES may ↑ infraspinatus force production up to 22%

External Rotator Muscle Performance

**ER at side:**
- Teres minor 84% MVIC
- Infraspinatus 46-70% MVIC
- Supraspinatus 20-51% MVIC
- Lower trapezius 48% MVIC
- Lateral deltoid 8% MVIC

**ER at 90°:**
- Teres minor 89% MVIC
- Infraspinatus 51% MVIC
- Supraspinatus 50% MVIC
- Lower trapezius 88% MVIC
- Lateral deltoid 50% MVIC

External Rotator Muscle Performance

Eccentric: Mechanotransduction
External Rotation-Sidelying

Infraspinatus 62-85% MVIC  Teres minor 67-80% MVIC
Lat. deltoid < 40% MVIC  Posterior deltoid 64% MVIC
Supraspinatus 51% MVIC

Lower Trapezius

- Prone HA at 100-130° with ER:

<table>
<thead>
<tr>
<th>Muscle</th>
<th>% MVIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower trap</td>
<td>97</td>
</tr>
<tr>
<td>Middle trap</td>
<td>100+</td>
</tr>
<tr>
<td>Upper trap</td>
<td>79</td>
</tr>
<tr>
<td>Serratus ant</td>
<td>43</td>
</tr>
<tr>
<td>Lat delt</td>
<td>90</td>
</tr>
<tr>
<td>Post delt</td>
<td>88-100+</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>39-85</td>
</tr>
<tr>
<td>Supraspinatus</td>
<td>65-82</td>
</tr>
</tbody>
</table>

**Disadvantage:** ↑ upper trapezius & lateral deltoid recruitment

Conclusion

• AC joint injury common with hockey
  - Macrotrauma
  - Prevalence > general population
• Clinical tests ↑ value with clusters
  - Some “rule in” others “rule out”
• Radiographs important
  - Special views may increase detection (i.e. grade 4)
• Acute stage avoid:
  - AROM elevation > 90°, IR & adduction to end-range
  - High recruitment exercises
The End

Thank You for the Privilege of the Podium

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