Scapula Dyskinesis: 5 Ways to Put it Back on Track

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Evaluation & Treatment Scapula

Goals of the Presentation

- Present new concepts in the treatment of scapula disorders
- Scapular dyskinesis: what is it? What it isn’t?
- Evaluation of the scapula
- Describe exercises for strengthening scapular muscles
- Discuss scapular neuromuscular control exercises & drills

Scapular Dyskinesis

5 Ways to Put It Back On Track

- 5 Key Treatment Concepts:
  - Proper Recognition of the Lesion
  - Postural Correction Exercises
  - Synchronicity of Muscle Firing
  - Activation exercises
  - Re-establish force couple ratios
  - Strengthening & endurance exercises
Scapular Dyskinesis
5 Ways to Put It Back On Track

• 5 Key Treatment Concepts:
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  ✓ Re-establish force couple ratios
  ✓ Strengthening & Endurance exercises

Scapulothoracic Joint
Introduction

• Scapular Dyskinesis:
  ✓ Alteration in scapular position or movement
  ✓ Due to boney or soft tissue lesions
  ✓ As well as weakness or inflexibility

Kibler & Sciascia: Br J Spats Med ’10
Scapular Dyskinesis Test (SDT)

McClure et al: J Athl Train ‘09

- 2 handheld weights based on body size:
  - < 68.1 kg = 3 lb weights
  - > 68.1 kg = 5 lb weights

- Perform 5 bilateral reps of shoulder flexion (scapular plane) & then shoulder abduction
- Speed of movement 3 sec ascend/descend
- Videotaped for analysis

“If it looks abnormal – it’s scapular dyskinesis”

Scapular Evaluation

Scapular Dysfunction

- Shoulder elevation scapular plane
  - Without resistance
  - With resistance
- Shoulder abduction
  - Without resistance
  - With resistance

Which Motion is Better to Evaluate?
Scapular Dyskinesis Classification

**Overview**

- Scapular dyskinesis is too vague – not specific enough for differential diagnosis & specific treatment

  ✓ Classification system
  
  Kibler et al: JSES '02
  
  ✓ I: inferior border pattern
  
  ✓ II: medial border pattern
  
  ✓ III: superior border pattern
  
  ✓ IV: normal scapula

Shoulder Examination in Athletes (especially Overhead Athletes is an Entire Body Screening/Examination)

- Rubin & Kibler: Arthroscopy '02
- Burkhart et al: Arthroscopy '03
- Kibler et al: JOSPT '09
- Savoie et al: Arthroscopy '09
- Beckett et al: AJSM '14

Beckett et al: AJSM '14

- Assessment of scapular & hip joint in preadolescent (7-12 yrs) & adolescent (13-18 yrs) in baseball players

- High rate of scapular dyskinesis in adolescent players compared to pre-adolescent
- Also poor single leg squat test
- Higher coracoid process distance – correlated dyskinesis
Scapular Kinematics

- **3 Rotations**
  - Upward/Downward
  - Internal/External
  - Anterior/Posterior

- **3 Translations**
  - Superior/Inferior
  - Anterior/Posterior
  - Medial/Lateral

McClure JSES ’01

Superior/Inferior Translation
Internal/External Rotation
Ant / Post Tilting
Anterior/Posterior Translation
Up / Down Rotation

Scapular Motion
Scapular Upward Rotation

\[ \text{Mean} = 50^\circ (4.8) \]

(n = 8)

McClure JSES '01

Humerothoracic SP Elevation [degrees]

Scapular Posterior Tilting

\[ \text{Mean} = 30^\circ (13) \]

(n = 8)

McClure JSES '01

Humerothoracic SP Elevation [degrees]

Scapular Dyskinesis

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Lukasiewicz et al: JOSPT '99

- Analyze scapular position and orientation in subject w/ impingement & normals
- 3D electromechanical devices in 3 planes
- During arm elevation: posterior tilting, upward rotation, retraction
- Impingement subjects: greater scapula elevation & less posterior tilting
Rehabilitation of Shoulder Impingement

Rehab Overview:

- Specific rehab concepts:
  - pain reduction
  - restoration ROM & flexibility
  - normalizing posture
  - muscular strength (balance)
  - advanced phases
  - return to activity phase
    - sports
    - work activities


- Scapular angular position assessment at end range internal rotation
- 3-dimensional scapular assessment
- 23 subjects were analyzed
- IR ROM deficit group exhibited significantly greater scapular anterior tilt (9 deg) compared to control group

Solem - Bertoft: Clin Orthop ’93

- Used MRI to determine effect of scapular retraction & protraction on acromial space
- Subjects supine & passively positional

Protraction position sign reduced acromial angle, or increased anterior tilting of scapula & decreased SA space
Slouched Thoracic Posture

- Shoulder abduction ROM
  - Erect: 157.5° (± 10.8)
  - Slouched: 133.9° (± 13.7)
- Abduction strength @ 90°
  - Erect: 10.4 kg (± 4.5)
  - Slouched: 8.7 kg (± 3.5)

Scapular Kinematics
- Upward rotation:
  - Erect: 43.1° (± 7.2)
  - Slouched: 37.9° (± 6.5)
- Posterior tilt
  - Erect: 44.7° (± 6.8)
  - Slouched: 40.6° (± 6.9)


Evolution

(or is it?)
Bastan, Wilk, Reinold: APTA CSM ’06
• Analyzed scapular position in 43 professional baseball pitchers
• Assessed 4 static positions
  » Arm at side
  » Full can
  » 90 deg abd ER
  » 90 deg abd IR
• Compared bilateral differences (T vs NT)
  ✔ Results: most significant difference was with protraction in all positions, then anterior tilt & more depressed scapula

Macrina, Wilk: CSM ’07
• Analyzed the effects of fatigue on scapular position in 39 professional baseball pitchers
• Assessed 4 static positions
  » Arm at side
  » Full can
  » 90 deg abd ER
  » 90 deg abd IR
• Compared bilateral differences (T vs NT)
  ✔ Results: most significant difference was with protraction in all positions then anterior tilt

Scapular Strength Ratios
Wilk, Reinold, Hooks...Unpublished data ’07

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<th></th>
<th>Pitchers</th>
<th>Non-throwers</th>
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<td></td>
<td>D</td>
<td>ND</td>
<td>D</td>
<td>ND</td>
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<tr>
<td>Elev / Depress</td>
<td>400%</td>
<td>480%</td>
<td>520%</td>
<td>540%</td>
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<tr>
<td>Retract / Protract</td>
<td>88%</td>
<td>71%</td>
<td>78%</td>
<td>71%</td>
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Best Stretch for Pectoralis Minor

Comparison of three stretches for the pectoralis minor muscle

Table 4: Best stretches for pectoralis minor muscle
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  ✓ Synchronicity of Muscle Firing – Activation
    ▶ muscle re-education drills
  ✓ Re-establish force couple ratios
  ✓ Endurance exercises & drills

Cools, Witvrouw, et al: AJSM ‘03

• Scapular muscle recruitment patterns (timing)
• Compared 39 overhead athletes with shoulder pain (impingement) to 30 painfree overhead athletes
• Performed sEMG to scapular & deltoid muscles – performed drop arm test
  ✓ Significantly slower muscle activation in MT,LT in painful group compared to control grp. (esp. LT)
  ✓ Painful group slower recruitment from deltoid to trapezius

Scapular Motor Control
Re-Education

✓ Visual feedback
  • Mirror
  ▶ Two mirrors positioned at side of patient to view posterior trunk
  • Video
  ▶ Video posterior with the person watching the monitor
  • Do not overly verbal correct
  Uhl & Kibler: ‘15

Scapular Motor Control
Re-education – mirror to mirror

Scapular Muscle Training
Muscle Firing Patterns

• Muscle stimulation:
  ✓ lower trapezius
  ✓ middle trapezius/rhomboids

• Biofeedback to specific muscles
  ✓ lower trapezius
  ✓ Middle trapezius/rhomboids
Lower Trapezius Stimulation

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Best Exercises for the Scapular Muscles
Not a Early Exercise

Reinold, Escamillia, Wilk: JOSPT ’09
Scapular Neuromuscular Exercise

Scapular Muscle Training
Train the Scapular Daily

- **Isotonic table days**
  - Heavier weights
  - Isolated movements
  - Hypertrophy
  - Neuromuscular drills

- **Stability Ball days**
  - Lighter weights
  - Bilateral movts.
  - Combined movts
  - Trunk, core, …

Best Exercises for Scapular Muscles
Lower Trapezius

- The Lower Trap exercise  
  *Wilk ’11*
- Robbery exercise  
  *Kibler et al: AJSM ’08*
- Prone horz abd at 105  
  *Ekstrom’93 Blackburn JAT*
  "prone full can"
- Table push down with depression & retraction  
  *Wilk: NAJSPT ’06*
- Inferior Glide  
  *Kibler AJSM ’08*
Best Exercises for Scapular Muscles

**Serratus Anterior**

- Push-up with a plus
  
  *Moseley: AJSM '92*

- Punches
  
  *Kendall: '79*

- Dynamic hug
  
  *Decker: AJSM '99*

- Wall slide
  
  *Hardwick: JOSPT '06*

- Bench press

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Wall Slide (high EMG 90°+)

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Advanced Thrower’s Ten Program
Endurance

Scapulothoracic Joint

Summary

• Key to shoulder joint function
  • Intimately involved in shoulder pathology
• Scapular muscle function
  • Synchronized action
  • Muscles working in concert
• Scapular motion (normal & pathology)
• Understanding abnormal & normal movts
  patterns assists in assessment
• **Think Proximal Stability**
• “Best exercises for scapular muscles”

Thank You!

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