Scapula Dyskinesis

Evaluation and Treatment

Presented by

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Resources

1. Shoulder Symposium: The Scapula in Shoulder Function. Lexington Clinic Sports Medicine Center, July 21-22, 2006
2. Clinical Orthopaedic Rehabilitation, Wilk et al.
3. BioMechanics, August 2005. Shoulder inquiry encompasses kinetic chain structures. Kibler and Tambay

Roles of the Scapula in Shoulder Function

- 1. The scapula is important in relation to scapulohumeral rhythm
  - 3-D Motions: upward/downward rotation, internal/external rotation, anterior/posterior tilt
- 2. Integral part of shoulder articulation
- 3. Retraction/Protraction around thorax wall



Roles of Scapula in Shoulder Function

- 4. Elevation of acromion in arm elevation
- 5. Stable Muscle attachment/anchor-maximum muscle activation/strength.
  - 17 muscles attach to scapula
- 6.Link in kinetic chain of segment activation and motion
  - Cocking of the arm
  - Anterior preloading for stretch/shortening
  - Acceleration/throwing and controlling deceleration forces

3-D Motions vs. Translations

- **3-D Motions**: upward/downward rotation, internal/external rotation, and ant/posterior tilt

- **Translations**: elevation/depression, retraction/protraction

Altered Scapula Kinematics

Increased Protraction:

- Causes increased anterior tilt (thus decreased posterior tilt potential) which decreases the subacromial space leading to impingement
- Weak serratus can cause UT and Rhomboids to compensate, which then inhibits SA = painful shoulder

Need: Full posterior tilt and external rotation to allow RTC to strengthen without impingement

Scapula Dyskinesis

- Asymmetrical position of the scapula when comparing the dominant and non-dominant arm
- Measures Dynamic motion
  - Most patients with shoulder pain develop their condition as a result of movement impairments of the scapula, which disrupts the relationship between the glenoid and the humerus
  - 60 - 100%

Shoulder/Scapula Evaluation

1. Thorough History (other injuries besides shoulder)
2. Screen the core “one-legged stability series”
3. Thoracic and cervical posture - trigger points and flexibility
4. Shoulder strength - especially supraspinatus, infraspinatus, and subscapularis
5. Shoulder ROM @ 0 and 90 degrees - GIRD

Shoulder/Scapula Evaluation

6. Scapula position @ rest
7. Scapula position during active abduction and flexion - especially watch descending phase
8. Scapulothoracic bursitis
9. Special Tests: SAT, SRT, lateral scapular slide test
10. Assess Labrum with Anterior Slide Test, O'Briens, Kim Test and Mayo Shear test

Shoulder/Scapula Evaluation

11. Glenohumeral instability - anterior and posterior drawer, sulcus
12. Impingement Tests - Neer and Hawkins

Scapula evaluation

- Assess at rest and during shoulder elevation
- Look for winging, translation, and rotation
- Watch for hitching or jumping during the descending phase
  - Type 1 - lower trapezius weakness; inferomedial border is prominent (increased anterior tilt)
  - Type 2 - serratus anterior weakness; medial border is prominent (increased internal rotation)
  - Type 3 - upper trapezius weakness; superomedial border is prominent

Views

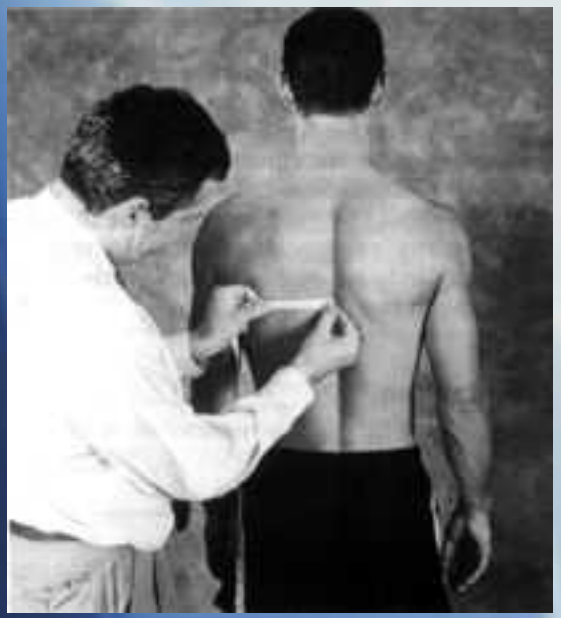




***Commonly dyskinesis is present in more than one plane and it is more important to diagnosis the presence or absence of dyskinesis than determining the type of pattern

Lateral Scapular Slide Test

- Static measurement of scapular positioning in three positions



1. Arms at side
2. Hands on the hips with the fingers anterior and the thumbs posterior with 10 degrees of shoulder extension
3. Arms at 90 degrees of elevation with maximal IR of the GH joints

Lateral Scapula Slide Test

- In each position the distance between the inferior angle of the scapula and a fixed bony point on the spine is marked on each side.

- A side-to-side difference of at least 1.5 cm in any of these positions is considered abnormal.

GIRD

- Glenohumeral Internal Rotation Deficit
  - Adaptive contracture of the posterior inferior GH capsule that ultimately effects the kinematics of the GH joint and scapula, decreasing static and dynamic flexibility of the posterior shoulder muscles
  - Causes postero-superior shift of humeral head during cocking and anterosuperior shift in follow through.
  - Significantly associated with shoulder injuries, specifically labral tears and partial thickness rotator cuff tears, in overhead athletes.

GIRD

- GIRD is

  - an absolute number - less than 25 degrees internal rotation

  - and a relative number- side to side difference in total rotation arc (internal plus external rotation) of greater than 25 degrees.

- Assess: Supine position and assess total shoulder mobility - Should be 180 ° ER and IR total motion
- The measurement of rotation must be done with the arm at 90 degrees of abduction and off a ***stabilized*** scapula.
- An athlete presenting with more than 25 ° Difference is positive for GIRD



SAT (Scapula Assistance Test)

- Kibler devised the scapular assistance test to determine whether impingement is due to a lack of active acromial elevation.
- A significant impingement sign is a painful arc between 60 degrees and 130 degrees upon actively or passively elevating an arm, indicating that something in the subacromial space is being compressed and irritated.

SAT

- Muscle testing of a single cuff muscle may appear weak due to pain along with clicking and symptoms of impingement.
- The SAT may normalize these impingement signs indicating that dysfunction of the scapular is related to the impingement syndrome.
- The examiner pushes the inferior medial border of the scapula laterally and upward while stabilizing the upper medial border of the scapula to simulate the serratus anterior/lower trapezius muscle portion of the elevation force couple, as the patient elevates the arm in the scapular plane.

SAT

- If the impingement is related to these muscles being inhibited, the impingement symptoms will diminish or be abolished.



Fig. 1: The scapular assistance test.



Fig. 2: Scapular assistance test, arm elevated.

SAT RESULTS

- (+) Relief of external impingement symptoms during movement. For example, with the assisted scapula held in a normal position (as if the scapular muscles functioned normally), a patient will experience less pain during the elevation, or a painful arc will no longer be present as the patient elevates the arm.
- While the arm is elevated 90 degrees during the test, retesting the supraspinatus, for example, might exhibit less pain and more strength.
- The test, in effect, gets the acromion out of the way by keeping the scapula back and down instead of allowing it to go over and up causing pain. Eliminates hooked acromion or bony abnormality.
- Rehabilitation should then emphasize strengthening of the upper and lower trapezius, rhomboids and serratus anterior muscles. Next, rehabilitation should be directed to the rotator cuff muscle.

SRT

- SCAPULA RESISTANCE TEST
  - Assess empty can without manual support. Pain?
  - Assist scapula external rotation and posterior tilt and re-assess empty can/supraspinatus strength
  - (+) test = reduced pain with scapula assistance to properly stabilize and rehabilitation is indicated.

- Note: if patients get relief with SAT or SRT then rehabilitation is applicable. If they don't, may need to send them for MRI/other diagnostic tests.

Scapula & Posture

- Common malalignment: slouched posture with forward head posture and rounded shoulders
  - Causes: increased internal rotation, decreased upward rotation, and decreased posterior tilt of the scapula
  - Causative/Compsensatory agents?
    - Tight Pec Minor (won't allow scap to post tilt)
    - Weak scapula retractors/depressors
    - Hypomobile thoracic spine
    - Tight cervical musculature

Scapula & Posture

- Hypomobile T-spine
  - Assess mobility
  - Treat with manual PA or AP mobs
  - Self mobs @ foam roller, tennis balls, or mobilization wedge

Increasing Tspine mobility has been shown to improve GH mobility by 15 degress or more

Core Assessment

- Screen the entire core “one-legged stablity series”
  - SL balance
  - SL squat
  - Step up/step down
- Look for Trendelenberg’s sign, knee valgus, pelvic rotation, increased lumbar lordosis, forward lean, opposite foot touch-down or corkscrew position.
- In general, these signs suggest weakness of the core muscles.

Scapula Taping vs Bracing

Taping:

- McConnell has several techniques to reposition the scapula and effect scapula musculature
- Differing opinions from studies:
  - 1. 60 patients with and without impingement underwent taping and placebo taping to retract scapula and correct posture

    Results: Kyphosis ↓ by 6°, ↓ lateral scapula displacement, ↑ shoulder elevation by 15°
  - 2. Taped professional violinists into retraction and studied EMG activity of UT and MT

    Results: Increased UT activity during vigorous activity; no change in MT; decreased muscle performance; increased discomfort

Scapula Taping & Bracing

Bracing:

1. Figure 8 clavicle straps (OPTP) – increases thoracic extension and clavicle retraction
2. The S3 scapula brace (Spine and Scapula stabilizing brace)
   - Advantage: No skin breakdown: self-application; doesn't loosen with time
   - includes lumbopelvic strap/support

S3 Brace Study

- Study: Effects of S3 Brace on Scapular Resting Position and Kinematics
  - 30 volunteers (15 with scap dyskinesis & 15 healthy)
  - Measured scapular IR, UR, and PT with brace on/off
  - Measured at rest and 10 degree intervals b/w 20-90 druing elevation and lowering of FF
  - Results: Resting posture increased PT by 4 degrees, increased UR by 2 degrees, and no change with IR.
  - Results: During active elevation, PT increased by 3 degrees, UR decreased in the dominant arm and increased in non-dominant arm, and IR decreased by 3.5 degrees in lowering phase
  - Conclusion: Brace may affect scapular kinematics @ rest and during motion. Increased PT and decreased IR may assist the scapular muscles in controlling scapular motion.

Treatment/Rehabilitation

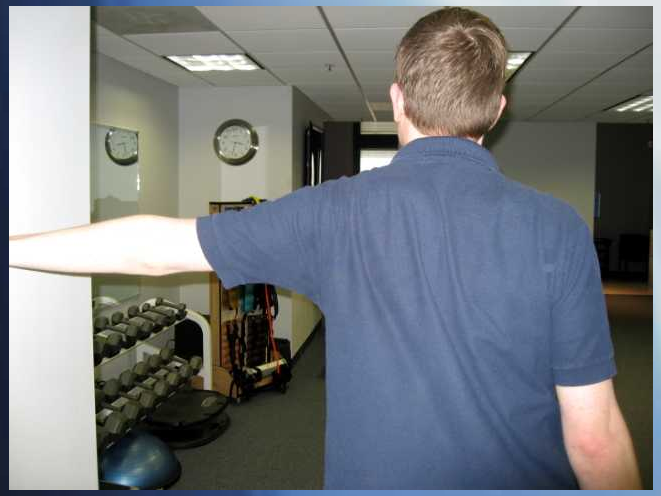
- REHAB Goals
  1. Decrease pain and improve function
  2. Alter impairments
     - Posture and position of scapula
     - muscle deficitis (stretch pecs; strengthen scap)
  3. Restore Normal Scapula Mechanics
  4. Gain proximal stability and control (core)
  5. Exercise progression from low to high
  6. Return athlete to prior functional performance.

Acute Stage

- Avoid painful movement and establish scapula motions - teach athlete to dissociate between GH and Scapula movement
- Initiate STM, especially pec minor, levator scapulae, upper trap, lats, and post rtc (teres minor and infraspinatus)
  - Muscular or myofascial restrictions can significantly impede ability to gain full scapula motion and must be addressed or problem will persist
- Initiate weight bearing UE exercises: scapula clock, wobble boards, RS ball exercises, isometric extension

Scapula Clock

- Reciprocally moves from protraction to retraction with weight bearing
- Pain free
- Can also perform with hand at ball on table and perform all 4 translations





Isometric Extension

Weight bearing with axial load through the hand

Facilitates thoracic extension and scapula posterior tilt, external rotation with emphasis on lower traps



Acute Stage

- Continue with isolated scapula movement without arm elevation
  - Prone V with palms on table (traps, etc)
  - S/L scapula retraction/protraction, elevation/depression - Rhythmic initiation of scapula PROM - AAROM - AROM and RROM
  - Manual tapping for patient awareness effectively recruits muscles desired during exercises
  - Isolated scap protraction increases SA activity without overusing the upper traps (good for patients with excessive substitution) - supine punches

Acute Stage



- Use core to initiate movement
  - Use trunk flexion and rotation to facilitate protraction and trunk extension, backward rotation and hip extension to facilitate retraction
  - Weight shift with ipsilateral foot back
  - Perform staggered or stepping motion
  - Strengthen the core while shoulder tissues are inflamed, especially if they have a positive SL balance or SL squat test

Recovery Stage

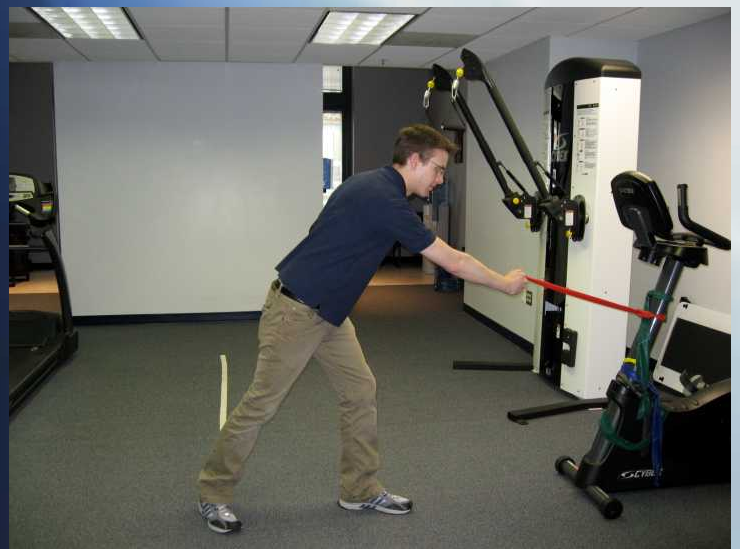
- Goal is to maintain proximal stability and appropriate muscle activation
- Strength depends on available motion and motion depends on flexibility and posture
  - Lower abdominals and hip extensors
  - Stretching of scapula muscles (pecs, lats, External rotators, capsule)
  - Increase CKC loads - wall pushups, table pushups, progressive prone pushups
  - Change arm elevation/angle with CKC exercises to improve scapular control

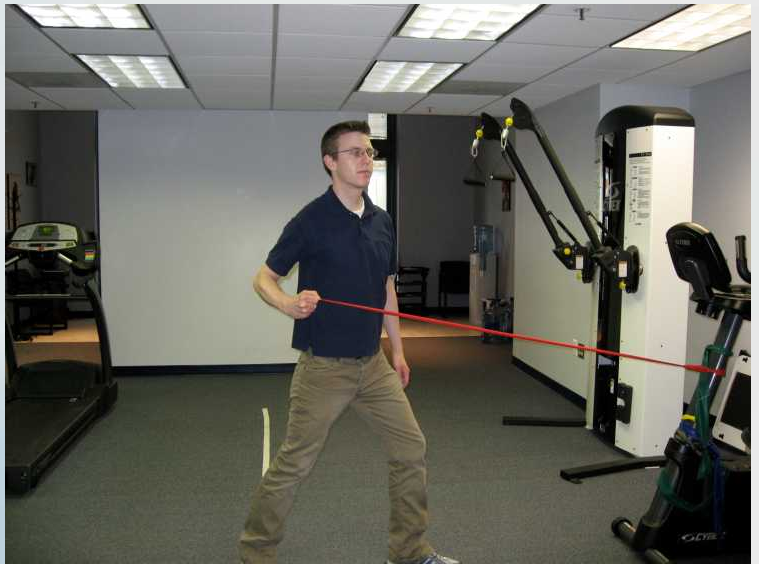
Recovery Stage

- Add arm elevation and rotational patterns to scapula motion
  - Diagonal patterns to scapula plane to flexion and finally abduction
  - Incorporate trunk and hip motion to facilitate protraction and retraction

Recovery Stage

- Progress to tubing exercises using various angles of pull and planes of motion.
- **Lawnmower**
  - Progress from no weights to tubes/free weight
  - Start protracted and end with lumbar extension/rotation, scap retraction, and shoulder external rotation





Recovery Stage

- Exercises:
  - Dumbbell punches
  - Lunges with dumbbell reaches
  - Varying angle of reaching: avoid shrugging or winging

Sleeper Stretch

- Most effective stretch for treating GIRD. Stretches post rotator cuff and capsule
  - Technique is key - keep scapula stabilized
  - Make sure the stretch is not causing pain in the subacromial space
  - Hold 3-5 minutes



Pec Minor Stretch

- One study showed short pec minor at 90 degrees elevation resulted in:
  - 7 degrees less external rotation
  - 6 degrees less upward rotation
  - 7 degrees less posterior tilt
- 2005 study showed corner stretch produced most length of pectoralis minor
  - Activate the scapula while stretching to cause reciprocal inhibition of pecs

Posterior shoulder

- Stretching horizontal adduction has been shown to increase IR by 20 degrees.
  - Keep scapula stabilized and IR humerus
  - Pt can actively IR during stretch
  - Hold 30 seconds
  - Self stretch and manual

FOAM ROLLER PECS

- Emphasizes thoracic extension and pectoral flexibility
  - Vary angle of horizontal abduction
  - Squeeze shoulder blades around the roller
  - 30 second holds



Thoracic spine mobs

- Mobilize T-spine by finding restricted segment take deep breath and sink into roller
- Manual mobs



Functional Phase

- Goal: Good scapula control throughout entire range of shoulder elevation
  - Sport specific training
  - UE plyometrics
  - Promote kinetic chain stabilization during dynamic scapular loading
  - Overhead dumbbell press and and punches
  - Progressively increase external rotation resistance
  - Challenge LE stability - wobble boards, BOSU, Airex pads, trampoline, slide board, etc.

Think Functional

- Tband external Rotation
  - Have athlete put opposite hand behind head to facilitate thoracic extension and scapula retraction
- Use stepping forward, backward, side to incorporate the core
  - Rows, tbands, presses, etc.

Case Study

QuickTime™ and a
Motion JPEG OpenDML decompressor
are needed to see this picture.