MANUAL THERAPY AND EXERCISE FOR SUBACROMIAL IMPINGEMENT OF THE SHOULDER

Combined Sections Meeting 2006
San Diego, CA
February 1-5 2006

Mark R. Bookhout, PT, MS, FAAOMPT
President, Physical Therapy Orthopedic Specialists, Inc.
Minneapolis, MN

Course Description: This three hour presentation will present six functional factors that may cause subacromial impingement of the shoulder. Tests and measures used in the examination process for each of these functional factors will be discussed. The speaker will then present the use of manual therapy and exercise as procedural interventions in an eclectic approach to treatment and management of these patients.

Level 3 - Advanced

Course Objectives

• The therapist will become familiar with six functional factors that may lead to subacromial impingement
• The therapist will understand the biomechanics of each of these factors as they relate to the development of subacromial impingement
• The therapist will understand the role of manual therapy in the examination of each of these six functional factors
• The therapist will learn an innovative and eclectic approach to the overall examination and intervention of patients diagnosed with subacromial impingement
Subacromial Impingement

- Definition – Impingement of the rotator cuff beneath the coracoacromial arch (Neer, 1972)
  - Primary Impingement vs. Secondary Impingement

Primary Impingement

- Definition – occurs as a result of subacromial crowding, posterior capsule tightness, or excessive superior migration of the humeral head due to weakness of the humeral head depressors (Harryman et al, 1990; Matsen and Amtz, 1990; Neer, 1972)

Secondary Impingement

- Definition – thought to occur due to a relative decrease in the subacromial space because of instability of the glenohumeral joint (Harner et al, 1990; Jobe and Kivitne, 1989) or functional scapulothoracic instability (Kibler, 1989)
Functional Factors that may lead to Subacromial Impingement
(Adapted from Matsen and Arntz, 1990)

I. Abnormal scapular motion due to limited motion at the scapulothoracic joint
II. Functional scapulothoracic instability due to scapulothoracic muscle weakness or fatigue (Kibler, 1998, 2002)
III. Loss of humeral head depression
IV. Posterior capsular tightness (Harryman, 1990)
V. Glenohumeral joint capsular laxity
VI. Abnormal scapular position due to thoracic kyphosis

A Biomechanical Approach to Examination, Intervention and Exercise Instruction
• Sternoclavicular Joint
• Acromioclavicular Joint
• Scapulothoracic Joint
• Glenohumeral joint
• Cervico-Thoracic Spine and Rib Cage

I. Abnormal Scapular Motion due to Limited Motion at the Scapulothoracic Joint
• Movements of the scapula are associated with movements of the Sternoclavicular and Acromioclavicular Joints (Inman, 1944)
• Scapula rotates 60 degrees during full shoulder elevation dependent upon the ability of the clavicle to elevate and rotate at the SC and AC joints
• Evaluation of the Scapulothoracic Joint must therefore include evaluation of the SC and AC joints
Scapular Movement
Scapular movement occurs in three planes
(Lukasiewicz et al., 1999 and Ludewig et al., 1996)
- Upward/downward rotation around an AP axis
- Anterior/posterior tipping around an axis along the spine of the scapula
- Internal/external rotation around a vertical axis

II. Functional Scapulothoracic Instability due to Scapulothoracic Muscle Weakness/Inhibition

- Postural observation
- Stability tests
- Functional muscle tests

Kibler Scapular Dysfunctions
(Kibler et al. 2002)

- Inferior Angle Dysfunction – anterior tilting
  - Most commonly found in patients with rotator cuff dysfunction
- Medial Border Dysfunction – internal rotation
  - Most often occurs in patients with glenohumeral joint instability
- Superior Dysfunction - scapular elevation
  - Most often occurs with rotator cuff dysfunction
  - Deltoid-rotator cuff force couple imbalances
    (Inman, 1944)
Stability Tests for the Scapulothoracic Joint

• Kibler Lateral Scapular Slide Test
• Kibler Scapular Assistance Test
• Kibler Scapular Retraction Test
• Posterior Tilt Test

III. Loss of Humeral Head Depression due to:

• C5-6 radiculopathy
• Suprascapular nerve palsy
• Partial/full thickness rotator cuff tears
• Rupture of long head of the biceps

Matzen and Arntz, 1990

Rotator Cuff Assessment for Partial or Full Thickness Tears

• Empty and full can tests – integrity of the supraspinatus
  – Accuracy of the test is greater when muscular weakness rather than pain is the determining factor (Itoi et al, 1999)
• Gerber Lift-Off Test – integrity of subscapularis
  – Accuracy of this test requires the patient to have normal internal rotation ROM (Gerber and Krushell, 1991)
• Dropping Sign Test – integrity of infraspinatus
  – A positive test has been correlated with a complete tear of the infraspinatus (Walch et al, 1998)
Rotator Cuff Impingement Tests

- Used to determine the integrity of the rotator cuff and the long head of the biceps
- Impingement of these muscles may result in pain and/or weakness resulting in a loss of their ability to depress the humeral head
- An impairment of balance between the deltoid and supraspinatus ultimately leads to superior migration of the humeral head (Weiner and Macnab, 1970)

Rotator Cuff Impingement Tests

- Neer Impingement Test
- Hawkins-Kennedy Impingement Test
- Coracoid Impingement Test
- Cross-Arm Adduction Test
- Yocum Impingement Test

Significance of Posterior Capsule Tightness

- Tightness correlates to a loss of internal rotation and increased anterior humeral head translation (Tyler et al, 1999; Gerber et al, 2003)
- Tightness of the posterior capsule linked to increased superior migration of the humeral head (Matsen and Amtz, 1990)
- Positive Tyler posterior shoulder tightness test found in patients with subacromial impingement (Tyler et al, 2000)
V. Glenohumeral Joint Stability Tests
Assessment for Capsular Laxity
- Multidirectional Instability Sulcus Sign
- Load and Shift Test
- Anterior and Posterior Drawer Tests
- Apprehension Test
- Subluxation/Relocation Test
- Dynamic Rotary Stability Test

VI. Abnormal Scapular Position due to Thoracic Kyphosis
- Fu et al, 1991 noted weakened scapular muscles in association with thoracic kyphosis as companions of rotator cuff tendonitis
- Solem-Bertoft et al, 1993 using MRI found that protraction of the scapula decreases the subacromial space, hypothetically related to the degree of thoracic kyphosis
- Greenfield et al, 1995 however found no difference in thoracic kyphosis (posture) in shoulder patients vs. normals

Additional Tests for the Manual Therapist to Consider:
- Side lying shoulder circles
- Apley’s scratch tests (Hoppenfeld, 1976; Magee, 1997)
- Passive mobility testing of the cervical spine
- Passive mobility testing of the thoracic spine and ribs
- Combined mobility testing of the shoulder and thoracic spine
Comparative Combined Shoulder Rotation Assessment

- Apley’s scratch tests (Hoppenfeld, 1976) with adduction, IR and slight extension right arm and flexion abduction and ER of left arm (top)
- Compare top with bottom picture
- Illustration of restricted thoracic rotation to the left?

Manual Therapy Treatment

Manual Therapy combined with supervised exercise is better than exercise alone for increasing strength, decreasing pain and improving function in patients with shoulder impingement (Bang & Deyle, 2000)

Manual Therapy Treatment for Joint Dysfunction

- Address mobility restrictions in the cervical spine and thoracic spine
- Address mobility restrictions in the rib cage especially restricted torsional (rotational) movement of the ribs
- Mobilize the SC, AC and Scapulothoracic Joints as indicated
Is this a Shoulder or a Thoracic Spine Problem?

Does restricted thoracic rotation to the left result in a loss of IR of the right shoulder and/or a loss of ER of the left shoulder? (observed in this model)

Manual Therapy Treatment for the Shoulder

- **Sternoclavicular Joint**
  - Restrictions for anterior/posterior glide, abduction or IR/ER
- **Acromioclavicular Joint**
  - Restrictions for anterior/posterior glide, abduction or IR/ER
- **Scapulothoracic Mobility**
  - Restrictions for upward rotation, ER and especially for posterior tilt
- **Glenohumeral Joint Retraining**

Manual Therapy Treatment for Muscle Imbalances

- Stretch/lengthen the muscles that interfere with normal 3-D scapulothoracic mobility
  - Levator scapulae
  - Pectoralis minor
  - Latissimus dorsi
Manual Therapy Treatment for Muscle Imbalances

- Facilitate and strengthen muscles that tend to be inhibited and weak
  - Serratus anterior
  - Lower trapezius
  - Supraspinatus
  - Infrspinatus
  - Teres Minor
  - Subscapularis

Home Exercises

- Self mobilization exercises
- Stretching exercises
- Neuromotor retraining
- Strengthening exercises

Bibliography for Manual Therapy and Exercise for Subacromial Impingement of the Shoulder

<table>
<thead>
<tr>
<th>Reference</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>David G, Jones MA, Magarey ME, Sharpe MH, Dvir Z:</td>
<td></td>
</tr>
<tr>
<td>Rotator cuff muscle performance during glenohumeral joint rotations: an</td>
<td></td>
</tr>
<tr>
<td>isokinetic, electromyographic and ultrasonographic study. Tenth Biennial</td>
<td></td>
</tr>
<tr>
<td>Conference, Manipulative Physiotherapists Association of Australia,</td>
<td></td>
</tr>
<tr>
<td>David G, Magarey ME, Jones MA, Dvir Z, Turker KS, Sharpe M: EMG and</td>
<td></td>
</tr>
<tr>
<td>strength correlates of selected shoulder muscles during rotations of the</td>
<td></td>
</tr>
<tr>
<td>Davies GJ, DeCarlo MS: Examination of the shoulder complex: current</td>
<td></td>
</tr>
<tr>
<td>concepts in rehabilitation of the shoulder. Sports Physical Therapy</td>
<td></td>
</tr>
<tr>
<td>Association Home Study Course. LaCrosse WI, 1993.</td>
<td></td>
</tr>
<tr>
<td>Ekstrom RA, Donatelli RA, Soderberg GL: Surface electromyographic analysis</td>
<td></td>
</tr>
<tr>
<td>of exercises for the trapezius and serratus anterior muscles. J Orthop</td>
<td></td>
</tr>
<tr>
<td>Ellenbecker TS: Clinical Examination of the Shoulder. St Louis, Elsevier</td>
<td></td>
</tr>
<tr>
<td>Saunders; 2004.</td>
<td></td>
</tr>
<tr>
<td>Fu F, Freddie H, Harner CH, Klein AH: Shoulder impingement syndrome. A</td>
<td></td>
</tr>
<tr>
<td>Gerber C, Krushell RJ: Isolated rupture of the tendon of the subscapular</td>
<td></td>
</tr>
<tr>
<td>is muscle: clinical features in 16 cases. J Bone Joint Surg. 1991;73B:389-</td>
<td></td>
</tr>
<tr>
<td>394.</td>
<td></td>
</tr>
<tr>
<td>on the passive range of motion of the glenohumeral joint. J Bone Joint</td>
<td></td>
</tr>
<tr>
<td>Greenfield B, Catlin PA, Coats PW et al: Posture in patients with</td>
<td></td>
</tr>
<tr>
<td>shoulder overuse injuries and healthy individuals. J Orthop Sports Phys</td>
<td></td>
</tr>
<tr>
<td>Presented at the Fourth Annual Panther Sports Medicine Symposium (Current</td>
<td></td>
</tr>
<tr>
<td>Concepts of the Shoulder in Throwing and Racquet Sports), Pittsburgh,PA,</td>
<td></td>
</tr>
<tr>
<td>November 29-December 1, 1990.</td>
<td></td>
</tr>
<tr>
<td>Harryman DT, Sidles JA, Clark JM et al: Translation of the humeral head</td>
<td></td>
</tr>
<tr>
<td>72 A: (9):1334-1343.</td>
<td></td>
</tr>
<tr>
<td>1980;8:151-158.</td>
<td></td>
</tr>
<tr>
<td>Hoppenfeld S: Physical Examination of the Spine and Extremities. Norwalk</td>
<td></td>
</tr>
<tr>
<td>Howell SM, Galinat BJ: The containment mechanism: The primary stabilizer</td>
<td></td>
</tr>
<tr>
<td>of the glenohumeral joint. Annual Meeting of American Academy of</td>
<td></td>
</tr>
<tr>
<td>Imman VT, Saunders JB, Abbott LC: Observations on the function of the</td>
<td></td>
</tr>
</tbody>
</table>
