

Shoulder Muscle Power Deficits

ICD-9-CM codes: 840.6 Supraspinatus strain
 726.12 Bicipital tenosynovitis

ICF codes: Activities and Participation Domain codes:

d4452 Reaching (Using the hands and arms to extend outwards and touch and grasp something, such as when reaching across a table or desk for a book.)

d4300 Lifting (Raising up an object in order to move it from a lower to a higher level, such as when lifting a glass from the table.)

Body Structure code: **s7202** Muscles of shoulder region

Body Functions code: **b7300** Power of isolated muscles and muscle groups

Common Historical Findings

Shoulder abductors/external rotators musculotendinous involvement:

Pain in posterior-lateral shoulder

Pain with overhead activities

Midrange (about 90 degrees) catching sensation

Symptoms developed from, or worsen with, repetitive overhead activities – or from an acute strain such as a fall onto the shoulder

Shoulder flexors musculotendinous involvement:

Pain in anterior-lateral shoulder

Pain with shoulder flexion and lifting activities

Painful arc

Symptoms developed from, or worsen with, repetitive flexion and lifting activities

Common Impairment Findings - Related to the Reported Activity Limitation or Participation Restrictions:

Shoulder abductors/external rotators musculotendinous involvement:

Painful arc with active elevation

Supraspinatus manual resistive test: weak and painful (moderately painful)

Infraspinatus manual resistive test: weak and painful (mildly painful)

Palpable posterolateral rotator cuff tenderness

Shoulder girdle muscle flexibility, strength, and coordination deficits

Shoulder flexors musculotendinous involvement:

Painful arc with shoulder flexion

Biceps brachii manual resistive test: weak and painful

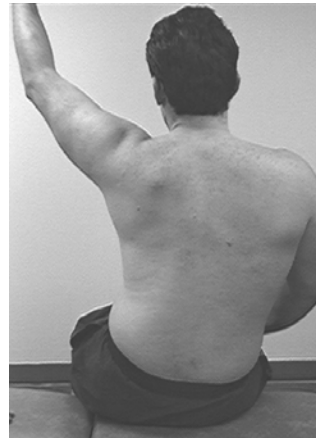
Palpable tenderness in bicipital groove

Shoulder girdle muscle flexibility, strength, and coordination deficits

Physical Examination Procedures:



Normal Arm Elevation



Painful Arc and Associated
Motor Control Deficits

Performance Cues:

Common muscle flexibility deficits include short pectoralis minor, levator scapulae, teres major, and latissimus dorsi

Common muscle strength deficits include weak supraspinatus, infraspinatus, lower trapezius, and serratus anterior

Common motor coordination deficits include excessive 1) thoracic spine flexion, 2) contralateral weight shift of thorax, 3) scapular protraction and downward rotation, 4) scapular abduction during overhead activities



Supraspinatus Manual Resistive Test

Performance Cues:

Elevate arm about 40 degrees in scapular plane

“Thumb down” to internally rotate humerus

Contact only dorsal surface of distal forearm

Stabilize thorax - contact contralateral shoulder

Remember - slow build-up of resistance, sustain peak, slow release of resistance

If there is a grade III (complete) tear of the rotator cuff the patient will be unable to hold the arm in this position (positive “Drop Arm Test”)



Infraspinatus Manual Resistive Test

Performance Cues:

Contact only dorsal surface of distal wrist

Stabilize ipsilateral elbow

May test at differing degrees of humeral flexion and abduction



Biceps Manual Resistive Test



Supraspinatus and Infraspinatus Tendon
(Rotator Cuff) Palpation

Performance Cue:

Placing the humerus in a position of internal rotation, extension, and adduction assists in gaining easier access to the tendons



Palpation of the Bicipital Groove

Shoulder Muscle Power Deficits: Description, Etiology, Stages, and Intervention Strategies

The below description is consistent with descriptions of clinical patterns associated with the vernacular term
“Rotator Cuff Tendinitis”

Description: Repetitive strain injury to the deep tendons of the shoulder – most commonly the tendons of the supraspinatus or infraspinatus muscles.

Etiology: The suspected cause of this disorder is the abnormal “impingement” of the tendons of the rotator cuff between the humeral head and the acromial arch due to deficits in the ability of the humeral head depressors (the “rotator cuff muscles”) or the scapular upward rotator muscles to function in a coordinated manner during overhead activities.

Acute Stage / Severe Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions codes: **b7300.3** SEVERE impairments of muscle power

- Accentuated thoracic kyphosis, scapular protraction, scapular abduction, and/or scapular downward tilt
- Excessive scapular elevation, abduction, downward rotation or winging with overhead reaching
- Midrange “arc” of pain with overhead movements (e.g., pain during 130° to 160° of shoulder flexion)
- Weak and painful supraspinatus and/or infraspinatus during manual muscle tests
- Palpation of involved rotator cuff tendons reproduce the patient’s reported pain complaint

Sub Acute / Moderate Condition: Physical Examinations Findings (Key Impairments)
ICF Body Functions codes: b7300.2 MODERATE impairments of muscle power

As above, except:

- Strong and painful supraspinatus and/or infraspinatus

Now (when less acute) assess thoracic and scapular malalignments, and muscle flexibility and strength deficits – for example:

- Shortened pectoralis minor, levator scapulae, teres major, and latissimus dorsi myofascia
- Weak scapular upward rotator muscles – commonly lower trapezius, middle trapezius, and serratus anterior

Settled Stage / Mild Condition: Physical Examinations Findings (Key Impairments)
ICF Body Functions codes: b7300.1 MILD impairments of muscle power

As above, except:

- Strong and painful supraspinatus and/or infraspinatus muscles only with repeated contractions
- Midrange “arc” of pain only with repeated overhead movements
- Overpressure, or passively forcing end range shoulder flexion (e.g., “impingement tests”) reproduce the patients reported pain complaints

Intervention Approaches / Strategies

Acute Stage / Severe Condition

Goals: Alleviate pain with active arm elevation
Restore strength to supraspinatus and infraspinatus muscles

- Physical Agents
Ultrasound, iontophoresis, and/or ice applied to the rotator cuff tendons
- Manual Therapy
Soft tissue mobilization to shortened pectoralis minor, levator scapulae, teres major, and latissimus dorsi myofascia
- Neuromuscular Reeducation
Facilitate neutral thoracic cage and scapular posture with overhead activities

- Therapeutic Exercises
Strengthening exercises for the supraspinatus and/or infraspinatus
- External Devices (Taping/Splinting/Orthotics)
Taping procedures to promote scapular alignment and to facilitate contraction of the lower trapezius, middle trapezius, and/or serratus anterior
May consider a sling if necessary to temporarily limit painful active movements
- Re-injury Prevention Instruction
Temporarily limit overhead activities

Sub Acute Stage / Moderate Condition

Goals: Prevent re-injury of the rotator cuff

Improve strength of supraspinatus and infraspinatus

Alleviate upper quarter malalignments and muscle flexibility and strength deficits contributing to the mechanical “impingement” of the rotator cuff

- Approaches / Strategies listed above
- Manual Therapy
If a localized area of tendon thickening is palpable – transverse friction massage may be indicated
- Neuromuscular Reeducation
Normalize scapulohumeral and scapulothoracic rhythm using verbal, manual, or biofeedback training
- Therapeutic Exercises
Stretching exercises for shortened pectoralis minor, levator scapulae, teres major, and latissimus dorsi myofascia
Strengthening exercises for weak lower trapezius, middle trapezius, and serratus anterior muscles
- Ergonomic Instruction
Promote efficient, pain free, motor control of the trunk, scapulae and arm with overhead activities
Modify activities to prevent overuse and re-injury

Settled Stage / Mild Condition

Goals: As above

Progress activity to improve tolerance with overhead arm use

- Approaches / Strategies listed above
- Therapeutic Exercises
Provide muscularendurance exercises to improve muscle performance of the relevant trunk, scapulae, and glenohumeral muscles required to perform the desired occupational or recreational activities
- Ergonomic Instruction
Add job/sport specific training

Intervention for High Performance / High Demand Functioning in Workers or Athletes

Goal: Return to desired occupational or leisure time activities

- Therapeutic Exercises
Provide exercises to maximize muscle performance of the relevant trunk, scapulae, and glenohumeral muscles required to perform the desired occupational or recreational activities
- Ergonomic Instruction
Progress job/sport specific training to increase more mechanically demanding activities

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Shoulder Muscle Power Deficits: Description, Etiology, Stages, and Intervention Strategies

The below description is consistent with descriptions of clinical patterns associated with the vernacular term
“**Bicipital Tendinitis**”

Description: An inflammatory process involving both the tendon and its sheath within the intertubercular groove caused by repetitive strain injury to the long head of the biceps brachii tendon typically producing anterior shoulder pain.

Etiology: The suspected cause of this disorder is abnormal friction or strain of biceps tendon against the medial wall of the bicipital (intertubercular) groove. The structure of the anatomy leaves the tendon relatively unprotected. It is very important to recall that the bicipital groove acts as a trochlea, causing the tendon and its overlying sheath to be susceptible to wear and injury in this region. Eventually, fraying and narrowing of the tendon may occur with dense adhesions if the repetitive activities precipitating the condition are not ceased. It is important to differentiate between primary and secondary bicipital tendonitis. With primary bicipital tendonitis, the tendonitis is specific to the intertubercular groove without associated shoulder pathology. When the condition occurs in association with other pathologic conditions, such as impingement syndrome or rotator cuff disease, it is termed secondary bicipital tendonitis.

Acute Stage / Severe Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions codes: **b7300.3** SEVERE impairments of muscle power

- Excessive scapular protraction
- Pain with lifting objects
- Pain with reaching and overhead activities
- Pain with shoulder flexion, lateral rotation or extension
- Weak and painful biceps brachii
- Tenderness to palpation over bicipital groove

Sub Acute / Moderate Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions codes: **b7300.2** MODERATE impairments of muscle power

As above with the following differences:

- Strong and painful biceps brachii contraction – e.g., pain with resisted shoulder flexion with the elbow fully extended
- Pain with resisted shoulder horizontal adduction with the shoulder in 90° of glenohumeral lateral rotation

In conjunction with the above findings, it is appropriate to examine the patient for common coexisting upper quadrant impairments in this stage.

- Posterior glenohumeral capsular tightness
- Coexisting upper thoracic or cervical disorders

- Upper limb nerve tension
- Scapular malalignment
- Muscle flexibility and strength deficits, e.g., shortened pectoralis major, coracobrachialis, biceps brachii and weak middle and lower trapezius musculature

Settled Stage / Mild Condition: Physical Examinations Findings (Key Impairments)
ICF Body Functions codes: b7300.1 MILD impairments of muscle power

As above with the following differences:

- Strong and painful biceps brachii only with repeated contractions
- Pain with repetitive activities, such as lifting

It is important to rule out any rotator cuff disorders since these groups of muscles play a critical role in anterior shoulder stability. One of the most vulnerable positions for the shoulder complex is during extreme abduction and external rotation, as seen in the late cocking phase of pitching or throwing. Studies have shown that the glenohumeral joint (shoulder complex) can withstand higher and higher external rotational forces (torque) as the long head of the biceps muscle force is increased. In other words, the shoulder becomes torsionally stiffer with increasing biceps force. The greater the shoulder's torsional stiffness or rigidity, the more force that would be required to externally rotate it to a state of dislocation. In one of the studies, it was discovered that while the shoulder was being stressed in the vulnerable abducted and externally rotated position with 100% predicted biceps force, the long head of the biceps muscle was able to increase the torsional rigidity of the glenohumeral joint by 32%. Further studies have provided evidence to support an additional significant stabilizing effect of the tendon of the long head of the biceps brachii against superior translation of the humeral head during abduction of the shoulder, contributing to a reduction in impingement.

Other reasons as to why it is important to rule out pathologies of the shoulder lie in the possibility of pre-existing lesions or tears in the glenohumeral region, which may impair stability. In the case of a superior labral lesion, this can lead to disruption of the superior labrum's firm attachment to the glenoid as well as a disruption of the origin of the long head of the biceps tendon, impairing shoulder stability.

Intervention Approaches / Strategies

Acute Stage / Severe Condition

Goal: Alleviate pain with active arm flexion

- Physical Agents
 Ultrasound, phonophoresis, iontophoresis or ice applied to the biceps tendon for pain relief and to decrease inflammation

- **Manual Therapy**
Soft tissue mobilization and manual stretching to normalize the length of pectoralis major and coracobrachialis
Friction Massage to the long head of the biceps brachii may be used to reduce adhesions of the retinaculum and tenosynovitic tissues in the intertubercular groove
- **External Devices (Taping/Splinting/Orthotics)**
May consider a sling if necessary to temporarily limit painful active movements
Taping to reposition the scapula in order to promote normal scapulohumeral rhythm when raising the arm.
- **Neuromuscular Reeducation**
Facilitate neutral thoracic cage, scapular posture, and shoulder proprioception exercises
Taping may also be used to train the patient to use weak, elongated muscles (e.g., lower trapezius) to function in a normal position
- **Therapeutic Exercises**
Normalize the strength of the muscles commonly found to be weak, namely lower trapezius, serratus anterior, and perhaps the biceps brachii and brachialis
- **Re-injury Prevention Instruction**
Temporarily limit shoulder flexion, lateral rotation, and overhead activities

Sub Acute Stage / Moderate Condition

Goals: Prevent re-injury of the biceps tendon

Normal length and strength of the shoulder girdle musculature

- Approaches / Strategies listed above
- **Therapeutic Exercises**
Manual stretching procedures and home/gym stretching exercises to the trunk and shoulder girdle muscles that have flexibility deficits
Progressive resistive exercises to trunk and shoulder girdle muscles that have strength deficits. (Depending on the patient's strength deficits, this may include instructing the patient in isometric, isotonic (e.g., tubing or free weights), and/or glenohumeral/scapular stabilization exercises (e.g., seated press-ups, progressive push-ups, Swiss ball exercises))
- **Neuromuscular Reeducation**
Progression of strengthening exercises to regain normal coordination of rotator cuff and shoulder girdle musculature during functional activities. (Depending on the patient's strength deficits, this may include instructing the patient in isometric,

isotonic exercises. For example, use of tubing or free weights for shoulder elevation, rows, scaption, curls and/or glenohumeral/scapular stabilization exercises such as seated press-ups, progressive push-ups, Swiss ball exercises)

- Ergonomic Instruction
Modification of jobsite or other environmental factors as well as ergonomic cuing (movement training) to promote efficient, painfree, motor control of the trunk, scapulae and arm with lifting, reaching and overhead activities
Modify activities to prevent overuse and re-injury

Settled Stage / Mild Condition

Goals: As above

- Approaches / Strategies listed above
- Therapeutic Exercises
Progress activities to tolerance
Maximize muscle performance of the relevant trunk, scapulae, shoulder flexion and shoulder girdle muscles required to perform the desired occupational or recreational activities

Intervention for High Performance / High Demand Functioning in Workers or Athletes

Goal: Return to desired occupational or leisure time activities

- Approaches/ Strategies listed above
- Ergonomic Instruction
Progress job/sport specific training depending on the needs and desires and (impairments) of the worker or athlete

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