Physical Therapy Evaluation and Management of the Shoulder Complex

UW – La Crosse Continuing Education
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House Keeping Items

- Welcome!
- Registration and name tags
- Restrooms!
- Lunch
- Questions???

A little about Us

- Physical Therapists vs. Physical Therapy Assistants vs. Occupational Therapists vs Athletic Trainers vs Students?
- Settings?
  - Outpatient
  - In-patient rehab vs. Acute Care
  - Home Care
  - Specialty areas
- Manual Therapy Experiences
  - Australian based:
    - Maitland/McKenzie/Mulligan/Paris (St. Augustine)
  - Osteopathic
    - Michigan State/Gibbons & Tehan
  - Norwegian Based
    - Institute of Orthopedic Manual Therapy (klatensborn & Evenh)
  - Netherlands Based
    - Manual Therapy Institute

Day 1 Agenda

8:30-9:00am Welcome and Introductions
9:00-9:15am Lecture - Introduction to the shoulder
9:15-9:30am LAB - CT Screen and Shoulder Examination
9:45-10:15am LAB - Shoulder Complex Soft Tissue Techniques
Noon-1:00pm Lunch
1:00-1:30pm LAB - Scapulothoracic Mobilizations
1:30-2:15pm LAB - Acromioclavicular Joint Mobilizations
2:15-2:30pm Break
2:30-3:00pm LAB - Glenohumeral Joint Mobilizations
3:00-4:00pm Lecture - Neuromotor Control / Power Deficits
4:00-5:00pm LAB - Scapulothoracic Strengthening/Neuromotor control
5:00pm Course Adjourns

Objectives

- Integrate an evidence informed clinical decision making framework in the evaluation and management of patients with different upper extremity disorders.
- Understand common movement impairments associated with upper quarter dysfunction and appropriately match manual therapy techniques and therapeutic exercises to address these impairments.
- Demonstrate clinical decision making ability to integrate a multi-model treatment plan including manual therapy skills in patients with upper quarter dysfunction.
- Demonstrate psychomotor competency in performing different manual therapy techniques for the upper quarter.
- Integrate a variety of therapeutic exercises and activities to compliment and reinforce manual therapy interventions
Why this course?

• Upper extremity injuries are a common diagnosis seen in healthcare.
  - 30% of patient visits
• Shoulder pain is the 2nd most commonly seen diagnosis by primary care physicians
  - 22%
• Elbow, Wrist and Hand
  - 8%

Shoulder Pain in Physical Therapy

(De Fabio R. JOSPT, 1998)

National Center of Health Statistics, National Ambulatory Medical Care Survey 2006

Evidence “Informed” Practice

Lessons of Time
Patient Management

Traditional “Medical” Model
(Nagi / Disablement)
But Where’s the Patient???

“Traditional Model” of Healthcare

- Identifying the “Active Pathology”
  - Multiple visits
  - Duration of care
  - Increased medical procedures
  - $Elevated costs$
- SAME OUTCOME!
  - Physical Therapy

Paradigm Shift

- Pitfalls of the “Nagi Model”
  - Care is based around a pathology versus an individual
  - Pathology is in a black box
  - Poor Diagnostic Accuracy of tests
  - Over-utilization of diagnostic imaging and tests.
  - Increased costs of care with no improvement in patient outcomes
- Need for a change in the Patient Management Model

Clinical Reasoning

- Theoretical Knowledge
  - Understanding of Anatomy; Physiology;
    Biomechanics; Pathologies
- Clinical Information
  - History, Signs & Symptoms
- Hypothesis
- Informed Diagnosis

Patient Management

International Classification of Function (ICF Model)
Patient Centered
Development of Clinical Practice Guidelines

• Goals:
  – Provide a scientific basis for consequences of health conditions.
  – Establish a common language to improve communication
  – Provide a systematic process for uniform care across patients
  – Establish a template to assist in Clinical Reasoning

Godges et al 2008 JOSPT

Clinical Practice Guidelines

• Classification Based System
  – Shoulder Pain and Mobility Deficits
  • Adhesive Capsulitis
  – Shoulder Stability and Movement Coordination Impairments
  • Dislocations, Sprains and Strains
  – Shoulder Pain and Muscle Power Deficits
  • Rotator Cuff Syndrome

Clinical Practice Guidelines

• Clinical Decision Making
  1. Medical Screening
  2. Differentiation of subjective and examination findings
  3. Diagnosing tissue irritability and stability
  4. Identification of best intervention strategies

2006 Boissonnault et al, JOSPT; 2013 Kelly et al JOSPT

Medical Screening

• Screening versus Differential Diagnosis:
  – Screen: The process of dichotomously ruling in/out the presence of red/yellow flags prior to treatment.
    • A “Systems Check” where abnormal findings require a more in-depth look under the hood
    • If normal we move on, if abnormal we DIG DEEPER
  – Differential Diagnosis: Process of integrating and evaluating data obtained from the evaluation and distinguishing the difference between different conditions.
    • The process of identifying the “problem” under the hood

2006 Boissonnault et al, JOSPT; APTA Guide to PT Practice

Why We Perform Medical Screens

• Medical Screening Questionnaire / Past Medical History
  – 13 point System Check
    • Recommended: Primary Care for the Physical Therapist. William Boissonnault. 2005
• Ransford Pain Diagram / Visual Analog Pain Scale / Body Chart
• Functional Outcome Measures
  – Focus on Therapeutic Outcome Score (FOTO)
  – Neck Disability Index
  – Shoulder Pain and Disability Index
  – Quick Dash
  – Patient-Specific Functional Scale
• Psychological Risk Factors
  – Fear Avoidance and Beliefs Work and Physical Activity Questionnaire
  – Tampa Scale of Kinesiophobia
  – Pain Catastrophizing Scale
  – Impact of Events Scale

UE Pre-screening Tools

UWL Cont Ed_01242015_5
**Body Chart / Ransford Pain Diagram**

- Provides
  - Current, Best and Worst pain over past 24 hours
  - Location/relationship of Symptoms on Body Diagram
- Assist clinician in determining:
  - Severity and Irritability of patient symptoms
  - Identification of pain patterns
  - Provides a first look at possible psychosocial mechanisms of pain and patient beliefs
  - Yellow Flags

1976 Ransford AO. Spine.

**Functional Outcome Measures**

- Provides
  - A patient perspective on their quality of life
  - A current perspective of the patients functional level
  - Further information on a patient's pain/pain perception and aggravating factors
- Assists the clinician in determining:
  - Severity of the patients condition on their way of life
  - Potential functional asterisks/comparable signs
  - Patient centered goals
  - Provides a look at possible psychosocial mechanisms of pain and patient beliefs
  - Yellow Flags

**FOTO Example**

- **Functional Intake Summary**
- **Patient's FOTO**

**Functional Status Measure: Physical FS Prin. Measure**

**FOTO Score data:**
- Change Score: Physical FS Prin.
- Change Score: 12
- Statistic:
  - Visits per episode: 9
  - Duration of episode: 38
  - Dollar per episode: $1081
- Satisfaction: 95.6%

**Clinical prediction rules for the prognosis of shoulder pain in general practice**

- 50% of pt's have complete recovery following initial onset presenting to Primary Care
  - After one year this increases to just 60%
- Predictors of persisting symptoms included
  - Duration of Symptoms
  - Gradual onset of symptoms
  - Pain intensity
  - Concurrent Psychological complaints
  - Repetitive movements
  - Concurrent neck pain

Kuijpers et al; Pain 2006

**Psychological Risk Factors**

- Provides
  - A patient look at
    - Beliefs in cause/output of pain
    - Understanding on how their activities, work or movements impact their pain
  - Assesses the possibility of non-mechanical sources of pain
- Assist clinician in determining
  - Determining prognosis of care
    - Fear-avoidance beliefs greatest negative factor on prognosis
    - Patient education
    - Modifying and/or challenging current belief systems
    - Pain education and self management strategies versus biomechanical or medical diagnosis education
  - Interventions
    - Functional based care versus impairment based care
    - Re-enforcing the patients self Locus of Control

2011 Nicholas et al PTJ

**Negative Cognitive Inputs**

- Leeuw et al J Behav med 2007
Clinical Reasoning

If you hear hoof beats, think....

Digging Deeper

Clinical Reasoning when to Refer

• Category I: Immediate referral
  – Presence of pulsatile abdominal masses, sudden onset of chest pain, presence of diaphoresis, dizziness, or feeling faint.
  – Recent bowel and bladder changes / Numbness in perianal region
  – Loss of consciousness or altered mental status
  – Significant presentation of 5 D’s and 2 N’s
  – Unexplained severe neurological deficits
    • Non-monoradiculopathy
    • Signs of a central nervous system disorder (ie, Gullian Barre, etc)
  – Blood in sputum
    – A dangerous mechanism of injury (C-Spine Rules)
  • Findings here have high risk of patient injury and warrant further medical work up to rule out major medical conditions.

Sizer et al 2007 World Inst of Pain

Clinical Reasoning when to Refer

Category II: Further Questioning and pre-cautionary examination

• Subjective Clarification
  – History of
    • Cancer/Smoking
    • Unexplained weight loss/gain >10lbs. last month
    • Infection
    • Hemorrhage
    • Metabolic bone disorder
    • Recent trauma
    • Cardiovascular disorder
  – GI or genitourinary complaints
    • Pain that is increased following meals
  – Pancoast Tumor
    – Men >50 with Hx smoking
    – “Nagging” pain into scapula
    – Numbness along ulnar nerve
  – Septic Arthritis
    – Pain local to AC/SC Joints
    – Hx IV drug use, DM, Trauma
  – Proximal Humeral Fracture
    – Recent Fall
    – Eccymosis
    – Severe Pain/Restricted ROM

Sizer et al 2007 World Inst of Pain; Yung et al J. of Hand 2010
Clinical Reasoning when to Refer

Category II: Further Questioning and pre-cautionary examination

- Compression Fractures
- Subjective Clarification
  - Long-term corticosteroid use
  - Abnormal Pain Patterns
    - Constant, progressive and non-mechanical in nature
    - Severe night pain not affected by position changes or rest
    - Limited improvement with rest or conservative tx.

- Subclavian Vein/Arterial Compression
  - Shoulder and arm pain/numbness ("Pounding")
  - Relief with arm supported
  - Supraclavicular percussion reproduces symptoms

Category III: Further physical differentiation tests and analysis

- Clarification of symptoms
  - Trauma related injuries
  - Fractures / instabilities
  - Symptoms that appear to be referred or radiating from another source
    - Somatic, visceral, or radicular
  - Presence of unexplained weakness or paresthesia
  - Presence of bilateral symptoms / unilateral glove and stocking
- Exam Measures
  - Fracture-specific special tests
  - Neurological compromise
  - Cardiovascular assessment
  - PERFORM THESE FIRST!

Neurological Compromise

- Differentiating radiculopathy versus central signs (Myelopathy)
  - Upper Motor Neuron Testing
    - Hoffman’s
    - Babinski’s test
    - Clonus
    - Inverted Supinator Sign
  - Lower Motor Neuron Testing
    - Dermatomal Assessment
    - Myotomal Assessment
    - Reflexes
      - Hypo versus Hyper-reflexia
- Signs and symptoms
  - Neck Pain (SN: 93%)
  - Non-dermatomal sensory disturbances
  - Non-myotomal weakness
  - Loss of dexterity in hands (SN: 57%)
  - Unsteady/clumsy gait (SN: 53%)
  - Presence of Upper motor neuron lesion (>2 Positive)
    - Hoffman reflex
    - Babinski sign
    - Clonus
    - Inverted supinator sign
    - Hyperreflexia

Fracture Specific Tests

Olecranon-Manubrium Percussion Test

- Screens for Humeral Head Fractures / Dislocation
- Patient seated or standing with elbows flexed at 90°.
- Therapist places the stethoscope bell over the manubrium and percusses each olecranon process.
- A decrease in pitch or the intensity of the affected side indicates a positive test
- May indicate GH fracture and/or dislocation
  - SN: 84% SP: 99%

Spinal Myelopathy

- Any neurologic deficit related to the spinal cord
- May be caused by:
  - Spinal instability
  - Traumatic vs. Systemic
  - Space occupying lesion
  - Cancerous lesion
  - Extrusion of disk material
  - Cysts etc.
  - Severe degenerative
- Signs and symptoms
  - Neck Pain (SN: 93%)
  - Non-dermatomal sensory disturbances
  - Non-myotomal weakness
  - Loss of dexterity in hands (SN: 57%)
  - Unsteady/clumsy gait (SN: 53%)
  - Presence of Upper motor neuron lesion (>2 Positive)
    - Hoffman reflex
    - Babinski sign
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    - Inverted supinator sign
    - Hyperreflexia

2007 Goodman & Snyder Differential Dx for Physical Therapists

2007 Sizer et al World Inst of Pain

2007 Sizer et al World Inst of Pain

2013 Myer et al BJSM

2009 Cook C. JOSPT

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Cervical Radiculopathy

- Cluster of Special Tests:
  - Cervical Rotation <60°
  - Distraction/Positional distraction
  - Spurling’s Test
  - Upper Limb Tension Test
- Ruling out: SN 97%
- Ruling in Radiculopathy
  - % Positive- SP 94%
  - 4/4 Positive- SP 99%
- Probability 90%
- ACQUIRE baseline information for future assessment

Possible Vascular Compromise

- Low Risk
  - Males <45 years
  - Females <55 years
  - And no more than 1 risk factor or symptoms
- Moderate Risk
  - Older than ages above
  - 2 or more risk factors
- High Risk
  - Known cardiovascular or pulmonary disease

Possible Vascular Compromise

- Heart Rate
  - Beats per minute
  - 60-100 BPM
- Respiratory Rate
  - Breaths per minute
  - 15-25 RPM
- Blood Pressure
  - Normal <120/80
  - Prehypertensive 120-139/80-89
  - Hypertensive 140-159/90-99
  - High BP >160/100

Clinical Evaluation

- Component 1: Medical Screening
- Component 2: Differential Evaluation of clinical findings to identify the NATURE of symptoms
  - Mobility deficits?
    - Joint/soft tissue/Neural extensibility?
    - Neuromotor Control deficits?
    - Activation/Coordination/Strength limitation
    - Persistent Pain Mechanisms?
- Component 3: Tissue Irritability
- Component 4: Matching up the appropriate intervention

Clinical Practice Guidelines

- Uncovering the “Russian Doll”
  - Why is your patient here- THEIR primary limitations
    - Patient specific functional scale
    - Functional Asterisks/Comparable Sign
  - Differentiation of Tissue Irritability/Tolerance
    - Should you limit the amount of your examination?
  - Patient Centered Examination
    - Anatomical considerations?
    - Gain a Treatment Threshold
    - Mobility versus Stability

Differentiation of Subjective and Examination Findings
Differentiation of Tissue Irritability

- Clinical Reasoning (SINSS Model)
  - Severity of functional limitation / pain
    - Intensity of the problem / 0-10 VAS scale
    - Min/Mod/Severe
  - Irritability of their condition
    - How long does it take for an activity to be provoked/released
      - Min/Mod/Irritable
  - Nature of the condition / Classification of problem
    - Primary Bone vs Muscle vs Ligamentous/Joint vs Nerve
  - Stage of the condition (Acute vs Sub Acute vs Chronic)
    - Anatomical/pathological factors vs Psychosocial factors
  - Stability of the condition / Progression over time
    - Improving/Stable/Worsening

Shoulder Pain Continuum

Mobility Deficits

Adhesive Capsulitis

RC syndrome (mm power deficits)

Stability Deficits

GH Instability (Neuromuscular control)

"If it's tight, stretch it. If it's weak, strengthen it"

Planning your Examination

Upper Quarter Examination

- Postural screen
- Cervico-thoracic
  - AROM/PROM/ and ROM with overpressure
- UE Functional screen
- Shoulder / Elbow / Wrist or Hand
  - AROM/PROM/ and ROM with overpressure
- Mobility assessment
- Strength assessment
- Special tests
- Palpation

Planning the Examination

- Does the nature of the condition or presence of co-morbidities indicate caution?
  - "Red flag" screening measures / Category III measures
  - Will you limit the amount of examination?
    - Irritable patients should be taken to relieving positions as soon as possible holding some exam measures for another visit or once irritability is controlled.
  - Will you limit the vigor?
    - Moving to a limit of Pain: Stopping at the limit where pain commences
      - Severe/irritable patients
    - Moving to the limit of Motion: Moving to end-range and appreciating end-feel: Less severe/irritable patients
  - Examine to limit of AROM
    - Examination of a patient related functional limitation followed by straight plane assessments gradually increasing the load and specificity
  - Overpressure
    - Assessing End-feel and onset of pain within range
  - Repeated movements
    - Assessing normal rhythm of movement and response to multiple reps
  - Use sustained overpressure, combined movements
    - Assessing multi-plane motion and or sustained holds

Which physical examination tests provide clinicians with the most value when examining the shoulder? Update of a systematic review with meta-analysis of individual tests

review and this update, the use of any single ShFe test to make a pathognomonic diagnosis cannot be unequivocally recommended. There exist some in more than one study. Combinations of ShFe tests provide better accuracy, but marginally so. These findings seem to provide support for stressing a comprehensive clinical examination including history and physical examination. However, there is a great

Clinical Reasoning when to Refer

Category III: Further physical differentiation tests and measures

- Refer and Treat
- Anatomical Considerations
  - AC Joint
  - AC joint separation/instability
  - GH Joint
  - Acute Adhesive Capsulitis
  - UNSTABLE SLAP / Labral Tear
  - ACUTE RTC tear
- Shoulder Dislocation

Treat
- Directing Interventions
  - CT Junction
  - Regional interdependence
  - GH Joint
  - "Impingement Tests"
  - AC Joint

2007 Sizer et al World Inst of Pain

Utilization of Special Tests

- Organized based on your working hypothesis and understanding of tissue irritability
  - Highly Irritable - Minimal if any special testing
    - Tests to Rule Out Sinister Diagnoses
  - Moderately Irritable - Min-Moderate testing to Rule Out competing diagnoses and move to treatment
    - Treatment provides your confirmation
  - Minimally Irritable - Minimal limitations
    - Organized by tests to Rule Out diagnoses followed by provocative tests to Rule In primary location of treatment
    - Special tests become “Asterisks” to retest following treatment

REGARDLESS OF MEDICAL DIAGNOSIS
In search of...

- Severity and Irritability of current symptoms
- Identify Primary Mobility or Stability Limitations
- Recognize contributing Cervical, Thoracic, and Upper Extremity Impairments both proximal and distal
  - Scapulothoracic Joint vs Acromioclavicular Joint vs Glenohumeral Joint limiters
- Qualitative and quantitative findings that may be used to assess both within session improvements and change over specific time span.
  - Asterisk signs
- Differentiation of the Nature of limitations as
  - Bone vs Muscle vs Ligamentous/Joint vs Nerve

Assists in BEST DIRECTING YOUR INTERVENTIONS!

Making the Right Moves

- Systematically understand the patients values and current nature of their condition
  - SINNS
- Gain a Movement Pattern Baseline
  - Identify Comparable Movements / Asterisks
  - Narrow examination to Mobility vs Stability limitations
- Appropriately Plan your Examination based on the patients current condition/irritability
- Understand the proper implementation and use of Special Tests to systematically rule in or out different diagnoses
- Confirm your initial hypothesis with your selected treatment interventions
- Continually reassess patient progress and goals

Shoulder Examination
UW-LA CROSSE
Lab Practice
PT Management of Upper Extremity Disorders

THE UPPER QUARTER EXAMINATION

Upper Quarter Examination

• Level One Screening
  • Fracture Screening
  • Neurologic Screen
  • Space Occupying Lesion
• Level II Differentiation of Tissue Irritability/Function
  • Postural Screen
  • Cervicothoracic Screening
  • Functional Assessment
  • Shoulder AROM/PROM/Overpressures
  • Flexibility Assessment
  • Palpation Assessment
• Level III Differentiation of Best Interventions
Level I Screening

- Fracture Specific Tests
  - Olecranon Manubrium Percussion test
- Neurological Screen
  - Upper Motor Neuron Testing
  - Lower Motor Neuron Testing
  - Space Occupying Lesion
- Space Occupying Lesion
- Cardiovascular Screen

Fracture Screening

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2013 Myer et al BJSM
Neurological Screen

- Differentiating radiculopathy versus central signs
  - Upper Motor Neuron Testing
    - Hoffman’s
    - Babinski’s test
    - Clonus
    - Inverted Supinator Sign
  - Lower Motor Neuron Testing
    - Dermatomal Assessment
    - Myotomal Assessment
    - Reflexes
      - Hypo versus Hyper -reflexia

Upper Motor Neuron Screening

- Babinski sign
- Clonus
- Hoffman’s reflex
- Inverted Supinator sign
- Sensory disturbances in hands (non-dermatomal)
- Non myotomal weakness
- Loss of dexterity in hands
- Unsteady/clumsy gait
- DTR Hyperflexia
Upper Motor Neuron Testing

• Babinski Sign
  – Patient laying in supine or seated at edge of table
  – Therapists supports the patients foot in neutral and applies stimulation to the planter aspect of the foot from a lateral to medial direction with a blunt edge.
  – Positive test is when the 1st MTP moves into extension and fanning of 2-5 toes

• Clonus
  – Patient seated with there feet off the ground
  – Therapist applies a quick stretch into dorsiflexion at the ankle or extension at the wrist and held 2-3 seconds.
  – Positive test is demonstrated by >3 beats into planterflexion.

Hoffman’s Sign

• Patient is seated with hand supported by the therapist.
• Therapist stabilizes the proximal MCP and PIP joints into extension. With the opposite hand the DIP joint is brought into extension and then flicks the DIP into flexion.
• A positive test is noted by adduction of the thumb and flexion of the fingers
Inverted Supinator sign

• Patient is in a seated position
• Therapist places the patient's slightly pronated forearm on his forearm or the patient's lap to assure relaxation. Therapists then applies a series of quick strikes near the styloid process of the radius at the attachment of the brachioradialis tendon.
• The test is performed in the same manner as a brachioradialis tendon reflex test.
• A positive test is indicated by Finger flexion or slight elbow extension.

Lower Motor Neuron Screening

• Dermatomes
• Myotomes
• Lower Motor Reflex Testing
• Cranial Nerve assessment (as needed)
  – ACQUIRE baseline information for future assessment
Dermatome Testing

- Looking for dermatomal pattern for isolated nerve root versus central signs
- Testing different tracts
  - Vibration
  - Pin Prick
  - Light touch
  - Temperature

Myotomal Assessment

- Upper Extremity
  - C4- Shoulder Elevation
  - C5- Shoulder Abduction
  - C6- Elbow Flexion
  - C7- Elbow Extension
  - C8- Thumb Abduction
  - T1- Finger adduction

- Lower Extremity
  - L2-3- Hip Flexors
  - L3-4- Knee Extensors
  - L4- Ankle Dorsiflexors
  - L5- 1st MTP Extension
  - L5-S1- Ankle Plantarflexors
  - S1-S2- Ankle Evertors

- Perform first isometrically in a patient position of disadvantage
- Progress to repetitions of 5 with eccentric holds assessing for progressive weakness
Lower Motor Reflex Testing

• Upper Extremity
  – C5- Biceps Brachii
  – C6- Brachioradialis
  – C7- Triceps

• Lower Extremity
  – L4- Quadriceps/ Patellar
  – S1- Acchilles

• Perform multiple beats to assess increasing response
• Compare
  – Side to side
  – Upper versus lower limb
• Rated as Hyper or Hypo
  – Hypo versus Hyperreflexia
    • Hypo- typically LMN (Absent/diminished)
    • Hyper- typically UMN (Brisk to clonus)

Level II: Differentiation of Tissue Irritability/Function

• Postural Screen
• Cervicothoracic Screening
• Functional Assessment
• Shoulder AROM/PROM/Overpressures
• Flexibility Assessment
• Palpation Assessment
Postural (Static) Assessment

- Forward head?
  - Auditory meatus position anterior to lumbar spine
- Rounded shoulders?
  - Acromian position anterior to lumbar spine
- Thoracic kyphosis:
  - CT junction
  - T1-T4 (flattened thoracic kyphosis)
  - T5-T10
- Muscle atrophy
- What is posture’s influence on the shoulder complex?

Cervical Motion:
AROM and PROM with Overpressure

- Cervical Flexion/Extension
- Rotation
  - With Overpressure
- Side-bending
  - With overpressure

Quantity and Quality of Movement
Thoracic Motion: AROM and AROM with Overpressure

- Thoracic Rotation Right
  - With Overpressure

- Thoracic Rotation Left
  - With Overpressure

**Quantity and Quality of Movement**

Thoracic Mobility Assessment

**Patient Position:** Prone lying with cervical spine in neutral.  
**Therapist Position:** Standing next to the patient, with hands at a 90° angle to each other, hypothenar eminence over the lamina of thoracic vertebrae. Provide a “skin twist.” With equal pressure over each hand, apply a PA pressure to the spine. Pressure is applied gradually to achieve end range motion. Identify the distance between first and second resistance. Assess thoracic mobility and/or pain reproduction at multiple segments.
First Rib Mobility Assessment

- **Patient Position:** Supine with head supported. This may be screened in sitting however activation of scalenes may inhibit true assessment.
- **Therapist Position:** Seated at the head of the patient.
  - Palpation: Palpate bilaterally to assess for elevation and/or tenderness.
  - Mobility: Assess the inferior mobility of first rib by providing a inferior medial force over the first rib.

### Cervical-Thoracic Screen

#### Cervical Rotation Lateral Flexion Test

- **The purpose** is to assess the mobility of the 1st rib.
- **Description:** Pt sitting. Examiner passively rotates the cervical spine away from the side being tested. While maintaining this position, the spine is gently flexed as far as possible, moving ear toward chest.
- **Positive test:** 1st rib is hypomobile on the on the opposite side of rotation
**Functional Motion Assessment**

- **Functional Screen** –
  - Hand to opposite scapular
  - Hand behind head: Assess vertebral level
  - Hand behind back: Assess vertebral level

**Quantity and Quality of Movement**

**Shoulder Examination**

**Straight Plane Shoulder Motion**

- **AROM→PROM→PROM with Overpressure**
  - Flexion
  - Scaption
  - IR and ER at 0°
  - IR and ER at 90° (inclinometer)
  - Horizontal flexion

- **Scapular Dyskinesia (Abnormal Movements)**
  - “Winging”
  - Dysrhythmias (Aberrant motion)
Scapular dyskinesia relevant??

- Scapular assist test
  - Assist scapular upward rotation and assess SYMPTOMS (pain) (Rabin A. 2006)

- Scapular reposition test
  - Assist scapular ER and posterior tilt and assess STRENGTH (Tate A. 2008, Smith J. 2002)

Flexibility

- **Pec minor**: posterior force to coracoid
- **Latissimus Dorsi**: arm elevation with GH ER and posterior pelvic tilt
- **Scalenes**: SB of c-spine and stabilize first rib
- **Upper trap**: SB of c-spine and stabilize acromion
Scapular Mobility

- Upward/downward rotation
- Anterior and posterior tilt
- Internal/External Rotation

Acromioclavicular (AC) Joint Mobility

- AP Assessment
- Clavicular Rotation
- Inferior glide
Glenohumeral Joint

- Inferior glide
- Anterior glide
- Posterior glide

Shoulder Examination

Palpation

- Scalenes
- Subclavius
- Pec minor
- Posterior cuff
- Subscapularis (not pictured)
- Lattisimus dorsi (not pictured)

Cervical-Thoracic Screen
Strength Assessment

Shoulder flexion
Shoulder scaption

Shoulder IR and ER at 0°
Shoulder IR and ER at 90°
Mobility Deficits of the Shoulder Complex

Contents:
- Define mobility deficits of shoulder complex
- Examination tools to identify mobility deficits
- Interventions to address mobility deficits

Shoulder Pain Continuum

ICF Diagnosis of shoulder pain with Mobility Deficits:
- Middle aged and older
- Gradual onset of pain and stiffness
- Affecting daily activities (sleeping, reaching, dressing, etc)
- Loss of motion in multiple planes (esp. ER & IR)
- Overpressure presents with capsular end feel and pain
- Accessory joint mobility restrictions
- Hx of neck pain
- Secondary soft tissue considerations

Conditions associated with mobility deficits
- Frozen shoulder/adhesive capsulitis
- Rotator cuff pathologies
- Post immobilization due to surgery/fracture/trauma
- C.N.S. involvement (Post stroke)
- Post thoracic or cardiac surgery
- Lengthy duration of intravenous infusion

Component 2 and 3: Considerations for Rehab

Assessment tools
- Prescreening tools
- Posture screen
- Motion/Joint mobility/Soft tissue/neural
  - What regions do we consider??
  - Straight plane vs. combined movement
  - Physiologic end feel
  - Accessory motion/joint play
  - Palpation
  - Flexibility
  - Neurodynamic mobility
- Strength and neuromotor control
Addressing mobility deficits of the shoulder complex requires assessment of irritability of tissue.

**MULTI-MODAL PT APPROACH**

- **Shoulder Pain**
- **Education**
- **Modality**
- **Manual Therapy**
- **Self Stretching**

**Based on findings....**

**Soft Tissue Mobilizations**

**Manual Therapy Intervention Tools**

- Soft tissue techniques
- Joint thrust and non-thrust mobilization techniques to upper quarter
- MWM techniques
- Manual and self stretching techniques
- Neuromotor control/strengthening (to be discussed later)
- Etc

**Evidence is....**

- Few studies ID within session changes of ER following STM and stretching of the shoulder (esp subscap) (Clewley 2014, Al Dajah 2014, Godges 2003)
- A systematic review revealed low quality evidence for STM in effecting pain, function and ROM (van den Dolder 2012)

**1. Soft tissue techniques**

- Common symptomatic muscles of upper quarter:
  - Pec minor/subclavious
  - Sub scap
  - Upper trap/scaleness
  - Posterior cuff/teres major
- Instrumented assisted vs. manual
2. **Thrust and non-thrust joint mobilization techniques of the upper quarter**

How does this work?

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**Biomechanical Theory**

- Altered biomechanics can lead to tissue pathology.
- Mobilization techniques may restore normal joint “arthrokinematics” and “osteokinematics” thus reducing stress on symptomatic structures.

**In other words, increasing optimal joint play of the joints of the upper quarter will restore normal mechanics to the shoulder complex.**

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**Neurophysiological Theory**

**Differing Views**

(Suecki DG. 2011)

- **Biomechanical Mechanisms/ THEORIES**
- **Neurophysiologic Mechanisms/ THEORIES**

**Clinical Relevance??**

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**INTEGRATED OPTIONS FOR JOINT MOBILIZATIONS**

- **PATIENT EDUCATION**
- **Provide a positive outlook**
- **Thrust techniques to the mid and upper thoracic region**
- **Thrust and non-thrust techniques to the CT region, cervical region & 1st rib**
- **Non-thrust techniques to the scapulo-thoracic and AC joint**
- **Non-thrust and MWM techniques to the shoulder complex**
- **Manual and self-stretching to the soft tissue.**

---

**In Theory...** Manual Therapy is Associated with:

- Increased afferent discharge. Manual therapy “bombards the central nervous system with sensory input from the muscle and joint proprioceptors” (Colloca CJ. 2003)(Pikkar 2001)
- A central response to how pain is perceived. (Bullock. 2008)
Don’t take my word for it…
What does the evidence say?

**Within Session** effects of CERVICO-THORACIC techniques...

- Subgroup of patients MAY exist who benefit most from CT interventions (Mintken P. PT. 2010)
- Increase in pain free active ROM after thoracic manipulation (avg of 38.4° of shoulder flexion) (Stunce JB. 2009)
- Reductions in pain and disability in 48 hour period in subjects with SIS (Boyles RE. 2009)
- Shoulder painful arc and pain intensity significantly decreased following side glide mobilizations to C5-C7 region (McCleachie L. 2009)
- Increased isometric force of the lower trapezius following mid thoracic manipulation (Ciolli J. 2004)

Over a period of time...

- Improvements noted in ROM (spec IR) with the inclusion of joint mobilization and stretching of the GH joint (Manske R. 2010, Costa A. 2012, Tyler T. 2010)
- PT with inclusion of high velocity, low amplitude thrust techniques “to improve overall joint function and decrease any restrictions in movement at single or multiple segmental levels in the cervical and upper thoracic spine and adjacent ribs” was superior to usual MEDICAL care at 12 weeks and 52 weeks post-tx (Bergman G, Ann Int Med. 2004)
- PT with inclusion of “manual therapy techniques specifically applied to movement limitations in the upper quarter that had been identified as relevant to the patient’s problem during the initial examination” was superior to EXERCISE ALONE for pain and strength at short and long term follow up. (Bang MD. JOSPT. 2000)

AC Joint Intervention

- Pts. who likely benefit most from AC joint mobilizations include:
  - Pain with overhead motion
  - Pain with crossover motion (HZ flexion with IR)
  - Pain with provocation tests
  - Pain with palpation
  - + AC provocation test
- A significant improvement in outcomes noted when manual therapy to the AC joint was included (Harris KD. JOSPT. 2012)

Scapulo-Thoracic Intervention

- Pts who may most benefit from specific joint mobilizations of the scapulo-thoracic region:
  - Noted apprehension to passive and active motion
  - Elevated muscle tone/guarding
  - Prolonged period of immobilization

First Rib Intervention

- Pts who may most benefit from specific joint mobilizations of the 1st rib:
  - Hypomobility of 1st rib
  - Referral pain into shoulder with mobility assessment
  - Positive Cervical Rotation Lateral Flexion Test
Glenohumeral Interventions

- Pts. who likely benefit most from specific joint mobility deficits include:
  - Painful shoulder
  - Limited active motion especially ER at side that decreases as shoulder moves into abduction
  - Hypomobility of GH joint in multiple planes
  - Aberrant motions during elevation
  - Painful arc

Evidence for Including Shoulder Mobilizations and MWM

- Small difference between “high grade” and “low grade” mobilization interventions (Vermeulen K. 2006)
- MWM offers a variation to graded mobs for effective intervention (Kachingwe AF. 2008)
- Direction of mobilization not as important as once believed (Johnson A. 2007)
- Improvement in self ROM was directly tied to compliance of HEP (Tanaka K. 2010)

Keys to GH mobilizations

- Graded mobilizations used based on tissue irritability
- Avoid pushing through pain that creates increased muscle tone/guarding
- Incorporate patient involvement whether it be contract/relax OR active motions
- Incorporate STM with the techniques
- Always follow up with self stretching/ mobilizations OR AROM activities

Regarding Manual Therapy...

- 1st step: Identify patients likely to benefit from manipulations/mobilizations (thorough evaluation)
- 2nd step: Identify an functional asterisk sign (ex: painful or limited motion)
- 3rd step: JUST DO IT!
- 4th step: Reassess asterisk sign to assess effectiveness
- 5th step: Reinforce clinic treatment with self ROM and mobilization techniques for home and follow up with NRE/STRENGTHENING

SOAPAAPAAPAAPAPA

- Within vs. Between Session changes
- Need to continually reassess asterisk sign to determine:
  - Pain levels...If pain levels increase after treatment and stay elevated...likely too aggressive
  - ROM change...IF ROM worsening, reduce vigor of technique
  - Functional limitations...Encourage patient to use the shoulder within tolerance
What should we tell our patients?

We are producing forces that barrage the nervous system with a variety of inputs.

These inputs may help to “reset” the pattern of pain you are in and allow you to resume more normal movement patterns which we know are beneficial to full and permanent recovery.

“HELP TO SPEED THE PROCESS ALONG”

In summary

- Consider incorporating manual therapy techniques into a multi-modal approach of addressing mobility deficits of the shoulder
- Match appropriate techniques with impairments assessed
- Begin proximally (CT region) and work distally toward region of symptoms (central mechanism?)
- Consider irritability of the tissue when performing techniques. Alter techniques accordingly based on asterisk sign
Manual Therapy Techniques of the Upper Quarter

Skills Practice

Upper Quarter Techniques

• Shoulder complex soft tissue techniques
• Scapulothoracic mobilization techniques
• AC mobilization techniques
• GH mobilization techniques
• Shoulder complex self ROM/Stretching/ Strengthening
**Shoulder complex:**

*Soft tissue techniques*

Instrumented Assisted or Pin and Stretch techniques

- Posterior – Rhomboids, upper trap and posterior cuff
- Antero-Lateral - Biceps tendon and Brachii muscle group
- Anterior – Pec major/minor
- Anterior - Subscapularis

**Rhomboids, Upper trapezius and Posterior Cuff Mobilization**

- Side lying with pillow supporting arm
  - Begin with muscle in a shortened position progressing to a lengthened position
  - Progress to prone then sitting
Pec Major/Minor Mobilization

• With pads of thumbs, gently slide along ribs deep to the pec major to encounter the lateral border of the pec minor
• Apply static pressure or oscillation, gently lift up the pec minor or perform contract/relax

Subscapularis Mobilization

• With pads of thumb or fingers, gently apply pressure along the anterior scapula
• Apply static pressure or oscillation, move along the mm belly or perform contract/relax
**Scapulo-Thoracic Intervention**

- Pts who may most benefit from specific joint mobilizations of the scapulo-thoracic region:
  - Noted apprehension to passive and active motion
  - Elevated muscle tone/guarding
  - Prolonged period of immobilization

**First Rib Intervention**

- Pts who may most benefit from specific joint mobilizations of the 1st rib:
  - Hypomobility of 1st rib
  - Referral pain into shoulder with mobility assessment
  - Positive Cervical Rotation Lateral Flexion Test

**Scapular-Thoracic Mobilizations**

- Side lying scapular upward/downward Rotation
  - Scapular mobilization
  - Stretch
  - Lower trap/Serratus Anterior NMRE
- Side lying shoulder sweep with scapular ER/adduction mobilization
- Supine scapular posterior tilt mobilization

**1st Rib Mobilizations**

- Supine 1st Rib Non-thrust and Thrust Mobilization
**Side lying Scapular Upward/Downward Rotation**

- Scapular mobilization: Support arm between therapist arm and rib cage and passively move scapular with hand contact over medial and lateral border
- Stretch: perform a stretch at end motions
- Lower trap/serratus NMRE: Perform isometrics holds of lower trap and serratus anterior

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**Supine Scapular Posterior tilt mobilization**

- **Patient Position:** Supine
- **Therapist Position:** Standing. Wrap hand closest to patient under scapula grabbing the acromion. Other hand over the coracoid process
- **Procedure:** Apply a posterior tilt to the scapula along with scapular retraction
Side lying shoulder sweep with Scapular ER/ADD mobilization

- **Patient Position**: Side lying
- **Therapist Position**: Standing behind the patient supporting the involved limb. Mobilizing hand contacts the lateral border of the scapula.
- **Mobilization**: As the patient performs a shoulder sweep, identify the restriction. With mobilizing hand move the scapula in the ER/adduction. Provide a HVLA through the mobilizing hand while supporting the involved limb.

Supine 1st Rib Non-thrust and Thrust Mobilization

- **Patient Position**: Patient supine
- **Therapist Position**: Behind patient, one hand supporting the occiput. With other hand, place the radial side of the radial side of the 2nd MCP joint over the superior first rib
- **Procedure**: With hand supporting the occiput, passively move the cervical spine by sidebending toward and rotating away from the side of first rib to be mobilized. With mobilizing hand, provide a inferior/medial force to the first rib. Perform oscillations at end range OR perform end range HVLA thrust into restriction.
AC Joint Intervention

- Pts. who likely benefit most from AC joint mobilizations include:
  - Pain with overhead motion
  - Pain with crossover motion (HZ flexion with IR)
  - Pain with provocation tests
  - Pain with palpation
  - + AC provocation test

- A significant improvement in outcomes noted when manual therapy to the AC joint was included (Harris KD. JOSPT. 2012)

AC Joint Special Tests

**AC Joint Cleared**
- Negative Finding
  - Cross body adduction test
    - SN: 0.77-1.0
  - No tenderness of ACJ
    - SN: 0.95-0.96
  - Negative Paxinos test
    - SN: 0.79

**AC Joint Involved**
- Positive Finding
  - Active compression test
  - Cross body adduction test
  - AC resisted horizontal extension
- 3/3 positive
  - +LR of 8.3
- 2/3 positive
  - +LR of 7.4

Powell et al. JMMT. 2006
AC joint mobilization techniques

- Caudal Glide (Supine, prone and 4-point)
- Sitting AP mobilization
- Clavicular Rotation (Clavicle Wiggle)

AC Joint Caudal Mobilization

- **Patient Position:** Supine in open packed position varying the degree of shoulder abduction or flexion. Move then into a loaded position.
- **Therapist Position:** Standing with thumbs contacting distal clavicle. Using ones body provide a caudal glide.
AC Joint Sitting AP Mobilization

- **Patient Position:** Sitting with arm at side or in various degrees of glenohumeral IR, flexion or abduction.
- **Therapist Position:**
  Standing next to patient with anterior hand on clavicle and posterior hand on acromian. Apply a graded AP mobilization.

AC Joint Supine Clavicular Rotation

- **Patient Position:** Supine with arm supported.
- **Therapist Position:**
  Standing on involved side directly over the patient. Using a lumbrical grip, grasp the mid shaft of the clavicle. Provide a rotational force through the clavicle.
GH joint mobilization techniques

- Supine GH Posterior Mobilization/Stretch into IR
- Prone GH Posterior Mobilization/Stretch into IR
- Supine GH AP MWM IR/ER
- GH Posterior Shoulder Stretch with Horizontal Flexion
- Supine GH Anterior Mobilization/Stretch into ER
- Prone GH Quadrant Mobilization
- GH Inferior/Posterior Mobilization/Stretch into Abduction/Flexion
- Standing MWM Elevation

Supine GH Posterior Mobilization/Stretch into IR

- **Patient position:** Supine with arm abducted to 90° with arm in neutral or internal rotation
- **Therapist position:** Standing next to pt with foot on stool. Patient’s arm supported on knee or supported by non-treatment hand. Hypothenar eminence of treatment hand over the anterior humeral head. Elbow in line with the direction of the force
- **Procedure:** Provide a posterior directed force in a posterior-lateral direction (in plane of the glenoid fossa). Move into further IR to provide a greater stretch to the capsule.
- **Alternative method:** Perform a hold-relax technique at end motion
Prone GH Posterior Mobilization/Stretch into IR

- **Patient position:** Prone with arm in maximal internal rotation (arm behind back if possible).
- **Therapist position:** Standing next to patient with treatment hand over medial border of the scapula. Other hand controlling the elbow.
- **Procedure:** Lift up on elbow till scapula approximates to thorax. Provide an anterior directed force to the medial border of the scapula. Gently push down on elbow.
- **Alternative method:** Place patient hand under ASIS.

Supine GH AP MWM IR/ER

- **Patient position:** Supine with arm abducted to 90° with elbow resting on knee of therapist.
- **Therapist position:** Sitting next to patient with foot in the belt loop.
- **Procedure:** Place belt around anterior humeral head. Provide a posterior force by gently pulling down on the belt with foot. Ask pt to perform AROM or AAROM into internal OR external rotation.
Supine GH Anterior Mobilization/Stretch into ER

- **Patient position:** Supine in hooklying position with arm abducted to 90° with arm supported in external rotation
- **Therapist position:** Standing perpendicular to arm. With both hands, grasp proximal to the glenohumeral joint with patient’s forearm supported by therapist’s arm
- **Procedure:** Provide a distraction force to the joint while providing an anterior directed force to the glenohumeral joint. May move patient into further external rotation to provide a greater stretch. (2nd figure)
- **Alternative method:** At the maximal stretch into external rotation, ask patient to rotate knees away from therapist

Prone GH Quadrant Mobilization

- **Pt position:** Prone with arm supported on table at varying degrees of elevation
- **Therapist position:** Mobilizing hands contacting proximal GH joint
- **Procedure:** Provide a posterior to anterior graded mobilization into direction of restriction
**GH Inferior/Posterior Glide – Stretch into Abduction/Flexion**

- **Patient position:** Supine in hooklying with arm into varying degrees of abduction or flexion
- **Therapist position:** Standing at the head of the patient. Patient’s arm supported by non-treatment hand contact with upper arm and forearm between therapist upper arm and rib cage. Web space of treatment hand over the superior humeral head. Elbow in line with the direction of the force
- **Procedure:** Provide a distraction force with the non-treatment arm. Provide an inferior directed force with the treatment hand if patient in abduction. Provide a posterior-inferior directed force with the treatment hand if patient in flexion. Move patient into further end motion to provide a greater stretch to the capsule.

**Standing GH MWM Elevation**

- **Pt position:** sitting upright with belt looped over anterior humeral head with arm in 90° of elevation
- **Therapist position:** Standing behind patient, supporting the arm with belt looped around buttock
- **Procedure:** Gently apply a posterior force on the belt as the patient actively elevates the arm over head
Altered Neuromotor Control and Muscle Power of the Shoulder Complex

Content:
• Brief review of anatomy
• Examination of shoulder for patients with altered mm function
• Ther Ex of shoulder complex
• Bringing it all together (phases of rehab)

Cervico-thoracic-scapular complex
(Upper cross syndrome)

Short (Tonic) Muscles:
• Upper trapezius
• Levator scapulae
• Suboccipitals
• SCM
• Scalenes
• Latissimus dorsi
• Pec major
• Pec minor
• Subscapularis

Lengthened (Weak) Muscles:
• Deep neck flexors
• Serratus anterior
• Rhomboids
• Mid and lower trapezius
• Posterior rotator cuff (external rotators)

1. Axio-scapular Muscles
• Levator scapula
• Upper trapezius
• Middle trapezius
• Lower trapezius
• Rhomboids
• Serratus anterior
• Pec minor

Must understand what these muscles do work together to facilitate “coupled motion” of scapular upward rotation

Scapular Dyskinesia
• “Observable alteration in scapular position and motion relative to the thorax” (Kibler, 2003)
• Common faults: (Ludewig P, 2009)
  – Increased anterior tilt
  – Increased IR
  – Decreased upward rotation
• Consequences:
  – Decreased subacromial space
  – Decreased RC length tension
  – Altered GH stability
  – May be associated with pain

Motion of the scapula
Borich MR. JDPT. 2006

1. Significance of upward rotation, external rotation and posterior tilting?
2. What muscles control these three components of scapular motion?
3. What muscles would limit these components?

2. Axio-humeral
• Pec Major
• Latissimus Dorsi

FUNCTION?
**Scapulo-humeral**
- Deltoid
- Rotator cuff
  - SS
  - IS
  - Teres minor
  - Subscapularis
- Teres major
- Long head of biceps
- Triceps
- Coracobrachialis
- Function?

**IR/ER REVIEW** –
“Proximal Stability to Promote Distal Mobility”
- **INTERNAL ROTATION**
  What are primary *internal rotators*? Where do they attach?
  Proximal stability stems from...?
- **EXTERNAL ROTATION**
  What are primary *external rotators*?
  Where do they attach?
  Proximal stability stems from...?

**CLINICAL RELEVANCE??**

**Muscle power deficits (RC Syndrome):**
**Most common subjective findings**
- MOI: Insidious vs. traumatic
- Location of symptoms
  - Lateral upper arm (insertion of deltoid)
  - Anterolateral upper arm (biceps tendon)
  - Inferior to posterior acromium
- Symptoms aggravated with overhead activity or reaching across or behind back
- Painful arc or catching sensation with active elevation

**Muscle power deficits (RC Syndrome):**
**Most common objective findings**
- Painful arc or catching sensation with active elevation
- Pain with overpressure into flexion and/or hz flexion (Neer impingement)
- Pain and or weakness with resisted ER (Hawkins RJ et al, 1983)
- Weakness with shoulder elevation (Drop arm test) (Park, 2005)
- Scapular dyskinesia: change in motion/pain with scapular alteration tests (McClure, 2012)
- Palpable tenderness over RC insertion
- Isolated GH or AC mobility deficits
- Neuromotor control deficits of axioscapular muscles

**Shoulder Pain Continuum**
- **Mobility Deficits**
- **Stability Deficits** (Neuromuscular control)

“*If it’s tight, stretch it. If it’s weak, strengthen it*”

Scapular dyskinesia relevant??

- Scapular assist test
  - Assist scapular upward rotation and assess SYMPTOMS (pain) (Rabin A. 2006)

- Scapular reposition test
  - Assist scapular ER and posterior tilt and assess STRENGTH (Tate A. 2008, Smith J. 2002)

Component 2 and 3: Considerations for Rehab

Concern of Rotator Cuff Tear??

- Rotator Cuff Tear
  - Resisted ER
  - Painful arc sign
  - Drop arm sign

  • 3/3 positive
    - 91% probability
    - +LR of 15.57

  • 3/3 negative
    - 9% probability
    - -LR of .16

  Park et al. JBJS. 2005

What if a cuff tear is present??

Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study

John E. Kuhn, MD, MS*; Warren R. Dunn, MD, MPH; Rosemary Sanders, BA; Ol An, MS; Keith M. Baumgarten, MD, Julie Y. Bishop, MD, Robert H. Brophy, MD, James L. Carey, MD, MPH; Brian G. Holleyay, MD; Grant L. Jones, MD; C. Benjamin Ma, MD; Robert G. Marx, MD, MS; Eric C. McCarty, MD; Sourav K. Podder, MD; Matthew V. Smith, MD; Edwin E. Spencer, MD; Armando F. Vidal, MD; Brian R. Wolf, MD, MS; Rick W. Wright, MD, for the MOON Shoulder Group

J Shoulder Elbow Surg (2013) 22, 1371-1379

The search for the pathoanatomical structure???

- Does it help guide our treatment??
  - Example: If you ID an “impingement”, what is the impinged structure OR what is the movement disorder that may be leading to the tissue irritation?

- How effective are the tests at ruling in specific pathologies??
  - Poor specificity of most tests

- Can we agree on the terminology??
  - Tendinitis, tendinosis, impingement, etc

PROTOCOL

- Education booklet
- Exercises:
  - Postural
  - AAROM
  - Anterior and posterior shoulder stretching (daily)
  - RC and ST strengthening (3x/week)
  - “Manual Mobilizations” as needed
- At 6 weeks, deemed to be:
  - Cured (DC)
  - Better (6 more weeks of PT)
  - No better (surgery)
**Results**

**MULTI-MODAL PT APPROACH**

**Shoulder Pain Continuum**

- **Mobility Deficits**
  - Adhesive Capsulitis

- **Stability Deficits** (Neuromuscular control)
  - RC syndrome (mm power deficits)
  - GH Instability (stability and neuromotor control deficits)

**“If it's tight, stretch it. If it's weak, strengthen it”**

**Stability and NM Control Deficits**

**Most common subjective findings**

- YOUNG and athletic
- MOI: traumatic - Fall on outstretched arm
- MOI: Repetitive overhead activities
- Location of symptoms: no different
- Catching sensation with active elevation (aberrant motion)
- History of shoulder subluxation or dislocation

**Most common objective findings**

- Normal motion to excessive motion
- Generalized laxity in shoulder and other joints (positive Beighton's index)
- Sulcus sign
- Catching sensation with active elevation
- Apprehension with overpressure into flexion and/or ER with ABD (Apprehension test)
- Pain decreases with external stability during ER with ABD (Relocation Test)
- GIRD: GH IR Deficit
- Scapular dyskinesia: change in motion/pain with scapular alteration tests. May need to fatigue
- Neuromotor control deficits of axioscapular mm
- Decreased kinesthetic awareness

**Conditions associated with Stability and NM Control Deficits**

- GH joint instability/dislocation
- AC joint separation/instability
- SLAP Lesions
- Peripheral neuropathies (esp. long thoracic nerve)
MULTI-MODAL PT APPROACH

Treatment Progression

- Proprioceptive / kinesthetic training
- Neuromuscular training
  - Proactive ➔ Reactive
- Functional / specific training
  - Position of most stability ➔ least stability
- DO NOT STRETCH!!

Conservative management of secondary impingement presents a much greater rehabilitation challenge and requires greater duration of treatment and adherence of treatment for successful outcome

So what are the best exercises to address altered muscle function??

**Lower Trapezius**

- FIRST: Activation of lower trap at various positions of the arm and various postures of the patient (inhibition of upper trap)
- Manual resisted
- Surface EMG of LT revealed three best exercises (Ekstrom RA. 2003)
  - Prone horizontal ext and ER ("T" Exercise)
  - Prone ER at 90
  - Prone Scaption/elevation ("Y" Exercise)
- Low UT/LT ratio (Cools AM. 2007, McCabe RA. 2007)
  - Prone horizontal ext and ER ("T" Exercise)
  - Standing Bilateral ER with band resistance
  - Sidelying flexion
  - Sidelying ER

**Serratus Anterior**

- Surface EMG of Serratus (Decker MJ. 1999, Hardwick DH. 2006)
  - Push up Plus
  - Band hug
  - Band punch
  - Dumbbell scaption (esp at 120 and above)
- Issue with push ups (Lunden JB. 2010)
  - Increased IR and limited scapular upward rotation

**Posterior Rotator Cuff**

  - Sidelying or standing ER at 0° ABD
  - Standing ER at 45° scaption
  - Prone and standing ER at 90° ABD
- Consider appropriate progression
  - Begin at 0° and move to 90°
  - Mode of Resistance??
Posterior Rotator Cuff Isotonics
SAFEST vs BEST???

Where is the resistance at its greatest relative to where the posterior cuff is at its weakest?

MUST CONSIDER DELTOID ACTIVATION

Supraspinatus

EMG studies (Reinhold MM, 2004, Boettcher CE, 2009)

- Standing scaption
- Standing ER at 0 ABD
- Prone horizontal ext and ER
- Prone ER at 90 ABD
- Standing ER at 90 ABD

Empty Can vs. Full Can...
Once and For All
Boettcher CE, 2009; Reinhold MM, 2007

- Empty, Full, Full Prone all same % MVIC
  - BUT only Full minimized Deltoid activity
- Empty can places SS at mechanical disadvantage
  - Increases force production SS, BUT also tensile stress
- Empty may biomechanically decrease the subacromial space
  - Empty can tensions posteroinferior GH joint capsule+IS
  - Increases scapular anterior tilt + IR

Should you work through UT hiking?

- In short... NO!
- Why is this happening?
  - Increase tone UT
  - May be tight inferior capsule or tone of pec minor
  - Inadequate RC function
  - Inadequate scapular upward rotator function
  - Habit

Anterior Cuff Strengthening
(Decker MJ, 1999)

Push-Up+
Band Diagonal
IR High+Low
Band Hug

And the winner is...
In Summary…
For strengthening alone, what 4-5 exercises might you prescribe a pt.?

• Serratus strengthening
• I’s, and or T’s
• ER Progression
• Scaption
• Low + High IR

Putting It All Together…
Phases of Rehabilitation

• Shoulder patients do not respond to a “cookie cutter” approach to rehabilitation.
• Each patient requires a personalized plan based on their current status, their personal needs /beliefs, outside influences, irritability of symptoms and other variables
• A GENERAL FRAMEWORK is provided for you to determine an appropriate rehabilitation plan
• This is not intended to be a “continuum”: The stage of the patient is dependent on presentation during examination

Phase 1
High irritability/max protection

Presentation:
• High severity of pain
• High tissue irritability or low threshold for injury
• High level of dysfunction
• High level of perceived functional limitation (ex: ADL’s)
• Symptoms easily provoked
• May have associated anxiety/Fear Avoidance Beliefs (FAB)

Goals:
• Minimize levels of stress to affected tissues
• Protect tissue and promote healing
• Maintain motion within acceptable range
• Prevent muscle atrophy
• Strategies to decrease pain
• REDUCE ANXIETY/FAB
• EDUCATION

Phase 1 - Shoulder

• Education
• Manual therapy and self mobilization to thoracic region and cervical region for pain reduction
• Scapular mobilization to initiate shoulder complex motion
• STM to shoulder complex
• Shoulder and scapular AROM or AAROM in available range (Stretch into pain or no pain??)
• Periscapular mm activation: Options??
• Exercises for pain relief/stretching
• Initiate cuff strengthening ??

“The emphasis on rotator cuff rehabilitation in patients with most shoulder injuries…should occur later in the rehabilitation protocol, after proximal stability is established.” - Kibler

Education

• Downplay any serious pathology (if indicated)...minimize fear
• Advice on staying as active within tolerance
• Sleeping postures
• Lifting and reaching

PROM Activities of Shoulder (“Get them Moving”)

• Self mobilization to Thoracic and cervical spine
• Scapular clocks
• Pendulum Exercises
• Self PROM
• Gentle stretching
Periscapular Muscle Activation

- Initiate **ACTIVATION** of appropriate mm and **INHIBITION** of appropriate mm.
- Primary focus:
  - Lower trapezius (mm activation)
  - Posterior cuff (isometrics if indicated)

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Early Rhythmic Stabilization

*Reinhold MM, 2010*

**Goal:** Activation with proximal stability...

Not strength

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### Phase 2

**Moderate irritability/moderate protection**

**Presentation:**

- Less severe pain
- Moderate tissue irritability
- Increased tolerance to activity
- Moderate level of perceived functional limitation (ex: ADL's)
- Emphasis to restore motion, strength and function

**Goals:**

- Enhance ideal movement patterns to minimize stress on tissue
- Restore motion, strength, and function
- Enable to perform ADL’s
- Balance/proproprioeption
- REDUCE ANXIETY
- EDUCATION

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Phase 2 - Shoulder

- Education: sleeping, lifting, etc...
- Address cervico-thoracic, ST, AC AND GH mobility impairments as needed
- Shoulder and scapular ROM in available range
- Muscle flexibility
- Progressive axio-scapular strengthening
- Progressive cuff strengthening
- Initiate perturbation training

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**REVIEW – Shoulder Complex Mobilizations**

- Gradually progress in forces
- Assess patient response (Asterisk sign)
- Always follow up with self ROM and stretching

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Moving them along –

- Lower trapezius progression
- Serratus progression
- Posterior cuff progression
- Supraspinatus progression
- Internal rotator strengthening
**Phase 3**

**Low irritability/minimal protection**

**Presentation:**
- Lower levels of pain intensity but more persistent
- Low tissue irritability or high threshold for injury
- High levels of stress applied and progressed
- Symptoms not as easily provoked
- Symptoms more chronic in nature

**Goals:**
- Enhance neuromuscular control during high level activities.
- Enhance endurance, dynamic stability, power, speed, etc.
- Restore function
- Improve conditioning
- Downplay symptoms if needed: “Hurt not harm”

**Phase 3 - Shoulder**

- Functional strengthening
- Higher level isotonics
- Exercise to **enhance endurance**
- OKC and CKC Rhythmic Stabilization
- Kinesthetic and proprioceptive training
- Progressive core stabilization
- Cardiovascular conditioning

**Advanced Shoulder Exercise**

- Rhythmic Stabilization Progression
- PNF Progression
- Body Blade Exercises
- Closed Kinetic Chain Exercises
- Plyometric Training

**Proprioception training of the shoulder**

 suitability with **NM control deficits** display:
- Decreased proprioception
- Suppressed RTC + Scapulothoracic muscle
- Co-activation → force couple disruption

- Key role of rehab is restoration of joint stability
- Specific rehabilitation aimed at restoring muscle and musculotendinous receptor output is needed to return patients to function

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**QUESTIONS**

*I have inverted all of my self-esteem in this PowerPoint presentation. It is all that I am and all that I will be. It is a digital reckoning of my value.*

*Did they catch the chemist who made your slides?*
Home Exercise and Manual Exercise Progression for Shoulder Complex

HEP: Range of Motion

1. Codman’s exercise
   a. Front-back
   b. Side-side
   c. Clockwise-counter clockwise

2. Cane exercise
   a. Flexion
   b. Scaption
   c. External Rotation
      i. At side
      ii. At 90/90
   d. Extension/Internal Rotation

3. Self-range of motion (table slides)
   a. Flexion
   b. Scaption
   c. External rotation

4. Internal rotation
   a. Sleeper stretch
   b. Towel stretch

5. Pulley exercises
   a. Flexion
   b. Scaption

6. Thoracic: Refer to thoracic content

Notes:________________________________________________________________________
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______________________________________________________________________________
1. Prone Lower Trap Facilitation:
   - **Purpose:** Facilitate lower/middle trap activation and inhibit upper trapezius
   - **Patient position:** Prone with arm in various degrees of abduction with arm supported.
   - **Therapist position:** On opposite or same side of the patient’s upper extremity. Assess lower and upper trapezius

   ![Prone Lower Trap Facilitation Images]

   - **Procedure:** Ask patient to perform scapular protraction by isolating lower trapezius activity and minimizing lower trapezius activity.
   - **Common compensations:**
     - Scapular elevation: Activation of upper trapezius
     - Scapular depression: Activation of latissimus dorsi
   - **Facilitation procedures:**
     - Place scapula in position of retraction and ask patient to hold that position
     - Apply small resistance onto the posterior acromion while asking patient to hold. Resistance is applied in the direction opposite the direction of the fibers of lower trapezius.
     - Ask patient to eccentrically contract the middle/lower trapezius allowing the scapula to move into protraction
     - Ask patient to perform active assisted scapular retraction
     - Ask patient to perform active scapular retraction
     - Resist scapular retraction
2. **Rhythmic Stabilization**
   a. Patient supine with shoulder in varying degrees of flexion / scaption
      i. Rhythmic stabilization to upper extremity
         1. Proximal → distal
         2. Non-random sequence → random sequence
         3. Rapid change in direction → longer holds of contractions
   b. Patient supine with shoulder in 90/90 position in varying degrees of external rotation
      i. Rhythmic stabilization to forearm
         1. Upper arm supported → upper arm unsupported
   c. Patient standing with shoulder in 90/90 position in varying degrees of external rotation
      i. Rhythmic stabilization to upper arm and/or forearm
         1. Upper arm supported → upper arm unsupported
         2. No resistance → resisted external rotation with theraband

Notes: 

3. **Manual Resistance PNF Strengthening**
   a. D1 Pattern
      i. Concentric flexion – concentric extension
      ii. Concentric flexion – eccentric flexion
      iii. Concentric extension – eccentric extension
   b. D2 Pattern
      i. Concentric flexion – concentric extension
      ii. Concentric flexion – eccentric flexion
      iii. Concentric extension – eccentric extension
   c. Progress to theraband resistance while bridging on exercise ball

Notes: 

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**Home program for strengthening**

**Scapular Strengthening**

1. Scapular retraction (lower and middle trapezius)
   a. Facilitation of lower trap in different positions (Refer to other sheet)
   b. Theraband
      i. Double arm external rotation
      ii. Double arm rows
      iii. Single arm rows

   ![Double arm ER](image1)
   ![Double arm rows](image2)
   ![Single arm rows](image3)

c. Prone activities:
   i. Prone elevation (external rotation) (Y’s)
   ii. Prone horizontal extension (neutral or external rotation) (T’s)
   iii. Prone extension (neutral or external rotation)(I’s)

   ![Y’s](image4)
   ![T’s](image5)
   ![I’s](image6)

2. Scapular protraction
   a. Chest press plus
   b. Push up with plus
      i. wall, table, prone plank on knees, prone plank on toes
   c. Dynamic hug

   ![Chest press plus](image7)
   ![Push up plus - table](image8)
   ![Push up plus – prone plank on knees](image9)
   ![Push up plus – prone plank on toes](image10)
   ![Dynamic Hug](image11)
Isometric shoulder activity (not pictured)
1. Flexion
2. Elevation/Scaption
3. External Rotation
4. Internal Rotation

Rotator Cuff Strengthening

1. Scaption
   a. To 90°
   b. Beyond 90°
2. Flexion
   a. To 90°
   b. Beyond 90°
3. posterior rotator cuff (ER)
   a. Sidelying arm at side
      i. To neutral
      ii. Beyond neutral
   b. Theraband arm at side
      i. To neutral
      ii. Beyond neutral
   c. Prone 90/90 position
      i. With upper arm supported
      ii. With upper arm unsupported
   d. 90/90 position
      i. Arm supported
      ii. Arm unsupported
e. I’s, Y’s, T’s (see above)
f. Prone horizontal extension/ER/ elevation

Start position  Horizontal Extension  ER  Elevation

Notes:________________________________________________________________________
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4. Anterior rotator cuff (Internal rotation)
   a. Theraband arm at side
   b. 90/90 position
      i. Arm supported
      ii. Arm unsupported

Notes:________________________________________________________________________
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