TREATING THE THORACIC SPINE: AN EVIDENCE-BASED APPROACH

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OBJECTIVES

1. Demonstrate the importance of thoracic spine mobility and relate how a lack of motion can affect function throughout the spine and upper kinetic chain.

2. Analyze thoracic spine mobility and classify differences in spinal versus segmental motion loss to determine a therapeutic intervention.

3. Apply static and dynamic thoracic spine joint mobilizations to improve range of motion.

4. Build a therapeutic exercise program to maximize the manual therapy intervention.
DEFINING THE PROBLEM

• Thoracic spine and rib pain is often thought to be self-limiting in nature\textsuperscript{1,2}

• Thoracic spine serves as region of force transmission, transferring load between lower and upper extremities\textsuperscript{1-4}

• Due to the proximity of the thoracic spine to the cervical, lumbar, and shoulder regions, dysfunction in the thoracic spine can influence pain, mobility, and stability across these areas\textsuperscript{1-3,5-7}
DEFINING THE PROBLEM

• Thoracic kythosis and hypomobility is common deficit\textsuperscript{11,15-18}
  - Prolonged sitting posture
  - Front side training dominance/preference
• Thoracic spine immobility can contribute to many different problems
  - Difficulty/painful rotation
  - Lumbar spine or cervical spine pain
  - Shoulder pain/limited mobility

NORMAL MOVEMENT ASSESSMENT

• Accepted normative physiological motion values:8-10
  • Flexion: 20° to 45°
  • Extension: 25° to 45°
  • Sidebending: 20° to 40°
  • Rotation: 35° to 60°

• Passive Intervertebral Movement (PIVM):11-14
  • Segmental assessment technique to determine how each vertebrae moves on another
CLINICAL QUESTION 1

• Is gross spinal motion analysis or segmental spinal motion analysis a more accurate measure to identify mobility deficits in active adults with pain?

<table>
<thead>
<tr>
<th>P</th>
<th>Active adults</th>
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<tbody>
<tr>
<td>I</td>
<td>Gross Spinal Motion OR Spine Goniometry</td>
</tr>
<tr>
<td>C</td>
<td>Segmental Spinal Motion OR PIVM</td>
</tr>
<tr>
<td>O</td>
<td>Loss of motion OR Decreased mobility</td>
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</table>
CLINICAL QUESTION 1

- Goniometry\textsuperscript{19-21}
  - Poor to fair inter-rater reliability
  - Fair to good intra-rater reliability

- PIVM\textsuperscript{14,22-24}
  - Poor to fair inter-rater reliability
  - Fair to good intra-rater reliability
GROSS MOBILITY ASSESSMENT

• Thoracic spine mobility
  • **Note:** Quality of motion, Amount of motion, Degree of rotation, Mechanical symptoms, Diminishment or exaggeration of spinal curves
SEGMENTAL MOBILITY ASSESSMENT

• PIVMs
  • Passively flex/extend the trunk
  • Feel for restricted inter-spinous process movement
  • Used to judge local movement and classify as hypermobile, normal, or hypomobile
SEGMENTAL MOBILITY ASSESSMENT

• Spring Testing
  • Hypermobile
  • Normal
  • Hypomobility
SEGMENTAL MOBILITY ASSESSMENT

• Positional palpation
  • Flexed, neutral, and extended position
  • Is the segment neutral vs. rotated to the right or the left
RIB MOBILITY ASSESSMENT

• Rib mobility will play a role in thoracic mobility
• Must answer which is the dysfunctional segment?
• Rib motion review:
  • Pump handle
  • Bucket handle
  • Caliper
LAB

• Work with a partner or in a small group to assess thoracic spine mobility
  • Can you identify areas of decreased mobility grossly?
    • Gross ROM
  • Can you identify areas of decreased mobility segmentally?
    • PIVMs
    • Segmental PAs
    • Positional palpation
• Can you identify areas of decreased rib cage mobility?
  • Upper ribs, middle ribs, lower ribs
CLINICAL QUESTION 2

• In patients who lack thoracic spine mobility, are manual therapy mobilizations, alone, as effective as manual therapy mobilizations in combination with soft tissue stretching for improving patient function?

<table>
<thead>
<tr>
<th>P</th>
<th>Active adults</th>
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<tbody>
<tr>
<td>I</td>
<td>Joint Mobilization</td>
</tr>
<tr>
<td>C</td>
<td>Joint Mobilization with Stretching</td>
</tr>
<tr>
<td>O</td>
<td>Improved function OR Improved mobility</td>
</tr>
</tbody>
</table>
CLINICAL QUESTION 2

• Several high quality studies support the use of manipulation\textsuperscript{26-28,31,32,34,35}
  • Increased GROC
  • Decreased SANE
  • Improved Neck Disability Index, Oswestry, and DASH scores

• Is manipulation allowed in your practice act?
• What is the role of evidence in our current educational reform and curricular design?
CLINICAL QUESTION 2

• Manual therapy interventions can lead to a decrease in pain and improvement in function in the thoracic spine and adjacent regions\textsuperscript{25-35}

• Combination of manual therapy and exercise improved thoracic spine pain reported\textsuperscript{36-40}

• Optimal interventions for the management of primary thoracic pain have yet to be determined
STATIC MOBILIZATION

• Mostly *low-level* evidence to support the use of mobilization\(^{29,33,36,39}\)
• Manipulation > Mobilization
• PA glides
• PA rotational glides
DYNAMIC MOBILIZATION

- Mulligan Mobilization with Movement\(^{41}\)
MUSCLE ENERGY\textsuperscript{42,43}

- Group dysfunctions (Type I) involve 3 or more segments in a row
  - Dysfunction is usually due to a long muscle crossing the area: quadratus lumborum, latissimus dorsi, erector spinae
- Segment dysfunctions (Type II) involve a single vertebral unit
  - Most commonly seen
MUSCLE ENERGY: GROUP VERSUS SEGMENT DYSFUNCTION

• Group dysfunctions treated with mobility exercises and other manual therapies
• Segmental dysfunctions treated with Muscle Energy
SEGMENTAL ASSESSMENT EXAMPLE #1

Flexed: T5 → T6 → T7 → T8 → T9
Neutral: T5 → T6 → T7 → T8 → T9
Extended: T5 → T6 → T7 → T8 → T9
SEGMENTAL ASSESSMENT EXAMPLE #2

Flexed

T5
T6
T7
T8
T9

Neutral

T5
T6
T7
T8
T9

Extended

T5
T6
T7
T8
T9
SEGMENTAL ASSESSMENT EXAMPLE #3

Flexed

Neutral

Extended
TREATING TYPE II DYSFUNCTIONS

• Patient positioning
  • Place them in a seated position with legs off the end of table
  • Stand to the side of the patient where you are going to sidebend them toward
  • Patient will cross that arm over their chest
TREATING TYPE II DYSFUNCTIONS

• Finding the barrier (1 of 2)
  • The trunk is flexed or extended until motion is felt in the involved segment
    • If the prominent transverse process was found in flexion, the trunk should be extended until the segment moves
    • If the prominent transverse process was found in extension, the trunk should be flexed until the segment moves
TREATING TYPE II DYSFUNCTIONS

• Finding the barrier (2 of 2)
  • Maintain trunk flexion or extension while moving the patient into sidebending until the segment you are monitoring moves
  • Maintaining this position, add passive rotation into you until you once again feel the segment start to move
TREATING TYPE II DYSFUNCTION

• Treatment
  • Patient actively tries to rotate back toward a neutral position while examiner holds position
    • Minimal force is needed
    • Contraction held for 3-5 seconds
    • Examiner “re-establishes” the barrier with further rotation
    • A total of 3 contractions are performed
    • Be sure not to rush the treatment → time must be allowed for musculature to relax
TREATING TYPE II DYSFUNCTION

• Re-assess
  • Segmental motion
  • Gross motion (comparable sign)
• Work with a partner or in a small group to treat thoracic spine mobility
  • Practice segmental static mobilizations
    • PA
    • PA rotational
  • Practice MWM dynamic mobilizations
    • Flexion
    • Extension
    • Rotational
  • Try muscle energy segmental positioning
THERAPEUTIC MOBILITY EXERCISE

• Proliferation of corrective exercises targeting thoracic spine in last 5-10 years
• Case studies have been published on effectiveness of exercise to improve thoracic mobility$^{2,36,39}$
THERAPEUTIC EXERCISE FOR FLEXION/EXTENSION
THERAPEUTIC EXERCISE FOR ROTATION
CLINICAL BOTTOM LINE

• Assessment of motion is clinician dependent
• Manipulation has demonstrated the best outcomes
• Manual therapy in conjunction with exercise is effective
• No evidence on exercise alone to treat mobility
QUESTIONS?

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