Cervical and Thoracic Joint Mobilizations Featuring HVLA Techniques

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Course Outline

Class Component

- Introduction & Objectives
- Overview of HVLA mobilization
- Indications and Contraindication
- Cervical/Thoracic Biomechanics
- Joint Mobility Testing
- VBI, Upper Cervical Stability Testing
- CPR, Patient Selection, Screening Tools
- Cervical and Thoracic Screens
- Tips for problem solving
- Case Review

Lab Component

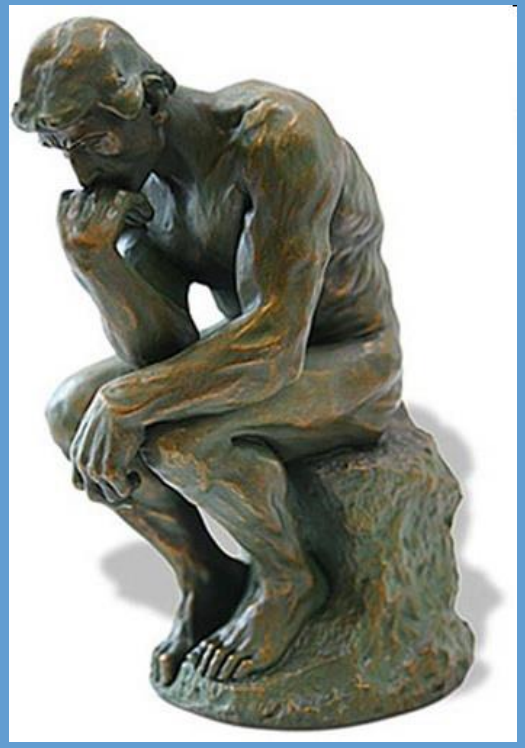
- Thoracic
  - Gapping Supine
  - P-A Prone
- Rib
  - Prone Rib P-A Thrust
  - Supine Rib Distraction
  - 1st rib seated thrust
  - 2nd rib seated thrust
- CT Junction
  - CTJ Seated Distraction
  - Prone Chin-Pivot Thrust
- Cervical
  - Mid-Cervical sidebend thrust
  - Upper Cervical Distraction

Introduction & Objectives

Introduction & Objectives

- The participant will identify the history of thrust mobilization, current APTA policy, and the evidence available for techniques
- The participant will identify safety issues, indications, and contraindications for use of HVLA mobilizations
- The participant will identify clinical presentations, such as specific dysfunctions/pathologies, and when to apply the HVLA techniques
- The participant will demonstrate how to appropriately perform HVLA techniques on a lab partner, for multiple spinal joint regions

MAMTC



Why Manual Therapy?

- Before learning anything new it is important to ask why?

- Brief introduction to include:
  - Name
  - Years of experience
  - Exposure to manual therapy
  - Reason for interest in this course

Overview of History of Manual Therapy

Manual Therapy Defined

- “A clinical approach utilizing skilled, specific hands-on techniques, including but not limited to manipulation/mobilization used by physical therapists to diagnose and treat soft tissue and joint structures for the purpose of :
  - Modulating pain
  - Increasing ROM
  - Reducing or eliminating soft tissue inflammation
  - Inducing relaxation
  - Improving contractile and non-contractile tissue repair extensibility and/or stability
  - Facilitating movement
  - Improving function

- Stanley Paris

Overview of History of Manual Therapy

Early Evidence

460-385BC

- Hippocrates
- "The Father of Medicine"
  - Described a combination of traction (using levers) and pressure (manipulation) performed in prone on a table
  - Noted that these treatments should be followed by exercise
  - Observed in Roman times as resonance medicine

18th Century

- Use of spinal manipulation was becoming less accepted among physicians
  - Bonesetters became the primary manipulators of 18th and 19th centuries in USA and Britain
  - **This gave rise to two other professions….**

Overview of History of Manual Therapy

Early Evidence

Osteopathy-"Law of the Artery"

- A.T. Still, 1874
- Still observed that when restricted joint motions were restored manually, certain disease conditions improved
- "I proclaimed then and there that all nerves depend wholly on the arterial system for their qualities such as sensation, nutrition and motion, even though by the law of reciprocity they furnish force, nutrition and motion to the artery itself."

Chiropractic-"Law of the Nerve"

- D.D. Palmer, 1895
- A vertebra out of alignment caused pressure on nerves, changing nerve impulses, and affecting visceral function leading to disease
- Credited with the terms:
  - Spinal subluxation (diagnosis)
  - Spinal adjustment (treatment)

Overview of History of Manual Therapy

Physical Therapy

- Founded in Britain in 1899 as “Physiotherapy”
- PT established in USA in 1921
  - Originally known as the “American Women’s Physical Therapeutic Association”
  - Goal: “to make available efficiently trained women to the medical profession”

Early PT Education

- Exercise, massage, manipulation, modalities
  - James Cyriax
    - Popularized the term “end feel”
    - Trained PT’s and felt that they were the most apt professionals to learn manipulative techniques
  - James Mennell
    - First to use the terms “manual therapy” and “joint play”

Overview of HVLA Mobilizations

Definitions

Mobilization and Manipulation are defined as:

Guide to Physical Therapy Practice

- "A continuum of skilled passive movements to the joints and/or related soft tissue that are applied at varying speeds and amplitudes, including small amplitude/high velocity therapeutic movement."

Dorland's Medical Dictionary

- "In physical therapy, the forceful passive movement of a joint beyond its active limit or motion"

Overview of HVLA Mobilizations

APTA Policy

- ***Guide to Physical Therapist Practice***
  - "Mobilization and manipulation are an integral part of the direct interventions listed under the section entitled, "Manual Therapy Techniques."
  - ***Guide*** describes PT scope of practice
  - Thrust joint manipulation/mobilization (HVLA) are **only** performed by PT's and cannot be delegated to PTA's
- **APTA Board of Directors**
  - Minimum required skills of entry-level PT's include thrust and non-thrust mobilization/manipulation

Overview of HVLA Mobilizations

Definitions

- HVLA = High Velocity, Low Amplitude
  - Applied as a thrust/impulse at physiological barrier/limit to motion
  - Must be performed **very quickly** and **precisely**
  - Typically <1/8” of amplitude
  - Subsequent joint cavitation

- Maitland Scale: Grade 5 Mobilization
  - AKA- “joint manipulation”
  - Terms are interchangeable as per APTA

Overview of HVLA Mobilizations

Proposed Effects

- Mechanical
  - Restore proper joint mechanics/joint play
  - Stretch/rupture intra-articular adhesions
  - Release of intra-articular inclusions (i.e. meniscus)
  - Alter positional relationships (of bones)
- Psychological
  - Key is patient selection
- Neurophysiological
  - Type III Mechanoreceptor activation
  - Reflex muscular inhibition
- Hydraulic
  - Changes in synovial fluid viscosity

Overview of HVLA Mobilizations

Proposed Effects

- Nitrogen normally dissolved in synovial fluid
- With HVLA, the joint surfaces are separated so fast that capsule cannot fill voluminous void
- Nitrogen gas forms into a bubble in the joint cavity to accumulate increased joint volume
- Bubble explodes, resulting in an audible cavitation or “pop”
- Can take minutes to hours for the gas to re-dissolve back into fluid

THE POP!

Overview of HVLA Mobilizations

Proposed Effects

- THE “POP”
  - According to newest research performed on MCP joints of hand with rapid cine MRI
  - Popping sound occurs due to inception of joint cavity rather than collapse of pre-existing bubble
  - Tribonucleation: process where opposing surfaces resist separation until critical point reached, then rapid separation occurs and sustained gas cavities formed
  - Contrast with prior theory; supports much older, original theory from 1947

Indications/Contraindications/Precautions

Contraindications

not exhaustive list

- Fracture
- Anything that can weaken bone
  - Osteoporosis
  - Neoplasm
  - Osteomyelitis/infection
- Ligament tear/rupture→ instability
  - Alar, Transverse, and apical ligament
- Acute rheumatoid arthritis exacerbation
  - Increased laxity in the upper cervical spine
- Post-surgical
  - i.e. THA/ORIF

Contraindications

not exhaustive list

- Presence of other serious pathology
  - SCI/CVA
  - Active cancer
- Excessive pain/resistance (Fx?)
- Severe multi-directional spasm
- Joint ankylosis

Contraindications

Would you perform HVLA mobilizations to this spine?

http://www.trauma.org/archive/spine/images/cspine-bifacet.jpg

Stoddard's Warning Signs

- **1.** Malignancy within the last 2 years
- **2.** Onset of back pain late in life with no history of symptoms
- **3.** Serious loss of spinal function, shock, vomiting after trivial spinal injury
- **4.** Intense pain requiring morphine for more than 48 hours
- **5.** Deformity and muscle spasm in an area other than lower cervical or lumbar regions
- **6.** Constitutional signs that accompany back pain, such as fever, weight loss, malaise, excess weakness.
- **7.** Loss of power too widespread to be a single nerve root lesion.
- **8.** Loss of sphincter control
- **9.** Continuous pain unrelated to posture.
- **10.** Normal erythrocyte sedimentation rate does not exclude disease entirely.

Precautions

not exhaustive list

- History of Cancer
- Pregnancy
  - Effects of relaxin hormone up to 6 weeks after nursing
- Chronic Pain disorders
- Psychological history
- Hunch/feel
- Emotionally dependent patients
- Age/general health
- Pt. inability to relax
- Hypermobility
  - Typically in C3/4, C4/5, C5/6

Indications

not exhaustive list

- Hypomobile joint
  - 5 characteristics
- Presence of joint dysfunction
- Neurophysiological effects secondary to pain
  - Tonic and Phasic Muscles
  - Effect on Sympathetic Truck
- Psychological effect
  - Perception of efficacy

Must get Patient Consent

A.M. Break

10 minutes

Cervical/Thoracic Facet Joint Biomechanics

Cervical/Thoracic Facet Joint Biomechanic

- Segmental motion is defined by motion of the upper level on the lower level
  - Ex: Up-and-forward at C3-4 = motion of the C3 vertebra moving on the C4 vertebra
- Cervical/Thoracic Flexion:
  - Bilateral facets move up-and-forward
- Cervical/Thoracic Extension:
  - Bilateral facets move down-and-back
- Cervical/Thoracic Rotation and Sidebending:
  - Down-and-back on side of rotation
  - Up-and-forward on the side away from rotation

Lab Component

Thoracic and Rib Mobility Testing

Testing Thoracic Joint Mobility

P-A Spring Test-Prone

- P-A pressure applied over the spinous process (SP) through the hypothenar eminence
- Assessing for amount & quality of motion is compared between segments

Testing Thoracic Joint Mobility

Positional Fault Testing-Prone

- Can also be performed seated
- Palpate the TrPr's on each side
- Feel for one side being more superficial or deeper than the other
  - L Rotation of segment if TrPr is superficial on the left

Testing Rib Joint Mobility

1st Rib-Sitting

- Palpation
  - Palpate over the 1st rib bilaterally and compare rib depth/height
  - More superficial rib indicates an elevation
  - Can also have pt inhale/exhale- to feel for motion symmetry or restriction

- Joint Mobility Testing
  - With the web space between the thumb and index finger glide the rib in an inferior direction
  - Compare bilaterally to appreciate hypomobility

Palpation of 1st Rib- Sitting

Testing Rib Joint Mobility

2nd Rib Palpation

- Palpate over the 2nd rib bilaterally to appreciate a posterior or superior orientation
- Indicating the rib is either elevated or posterior

Testing Rib Joint Mobility

Upper and Lower Rib-Prone

Upper Rib Testing

- Stabilize the TP's closest to you with the cranial hand, fingers point caudally
- Place the pisiform of the caudal hand just inside the rib angle, with the 5th finger along the rib
- Force is applied in an anterior/lateral/superior

Lower Rib Testing

- Stabilize the TP's closest to you with the caudal hand, fingers point cranially
- Place the pisiform of the cranial hand just inside the rib angle, with the 5th finger along the rib
- Force is applied in an anterior/lateral/inferior

Testing Rib Joint Mobility

Vertebral Artery Insufficiency & Cord Compression

Vertebral Artery Insufficiency

Signs/Symptoms

- Drop attacks
- Dizziness
- Difficulty Swallowing
- Facial/lip paresthesia reproduces with active or passive movements
- Lateral nystagmus reproduced with active or passive movements
- Double vision or blurred vision
- Slurred speech (Dysarthria)
- Neck pain and headaches

Signs/Symptoms of Spinal Cord Compression

- Bilateral or quadrilateral limb paresthesia
  - Upper cervical cord compression = bilateral or quadrilateral extremity paresthesia
  - Lumbar cord compression = lower extremity paresthesia
- Hyper-reflexia (DTR's)
- Positive Clonus
- Positive Babinski (LMN) or Hoffman's (UMN)
- Loss of bowel/bladder control

Upper Cervical Stability Tests- Transverse Ligament

- Sharp Purser Test
  - Patient sitting with the head slightly flexed
  - With one hand stabilize the SP of C2
  - With the other hand push through the patients forehead in an A-P direction
  - Positive test:
    - Translation of C1 on C2
    - Click/clunk
    - Cardinal signs/symptoms (reduction)

Upper Cervical Stability Tests-
Transverse Ligament

Upper Cervical Stability Tests
Alar Ligament

- Alar Ligament
  - Tested in supine
    - Palpate the C2 SP with one index finger
    - With the other hand, cup the occiput
    - Slightly sidebend the head
  - Positive Test:
    - You DO NOT feel the SP of C2 immediately kick-out to the *contralateral side* of sidebending

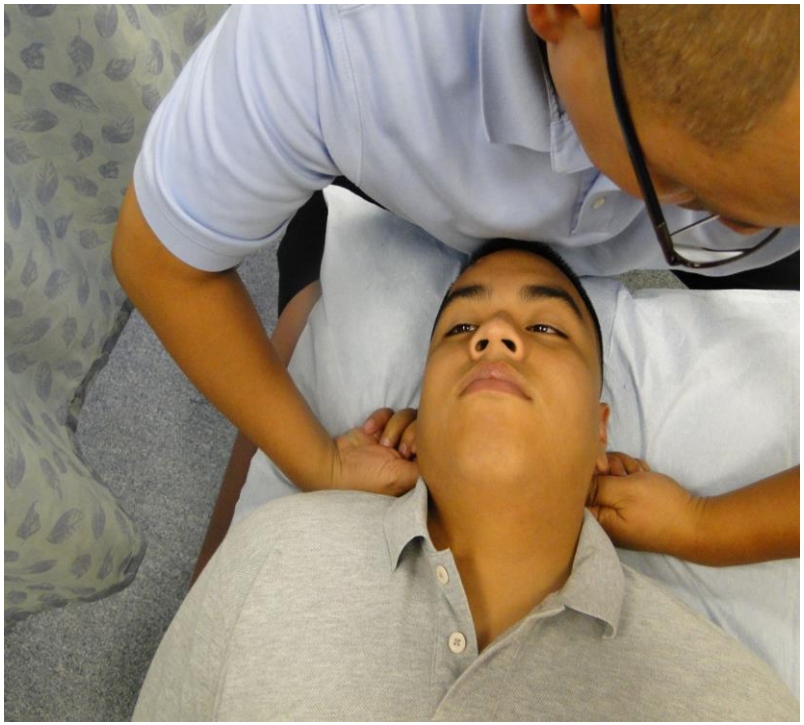
Upper Cervical Stability Tests
Alar Ligament

Upper Cervical Stability Tests
C1 Fracture Test

- "Jefferson Fracture" Burt Fracture of C1 Ring
- Tested in supine
  - Stabilize bilateral C1 TrPr's using pincer grips
  - With both hands, provide a compressive force to the TrPr's of C1
  - Positive Test:
    - Movement
    - Crepitus
    - Cardinal signs/symptoms

Upper Cervical Stability Tests

C1 Fracture Test



Vertebral Artery Test

- Patient in supine
- Fully rotate the head to either side but do not place the head/neck into extension
- Hold for at least 10 seconds
- Return to neutral and wait at least 10 seconds for latent symptoms
- Positive test
  - Any of the symptoms of VBI

Vertebral Artery Test

Lab Component

Cervical Joint Mobility Testing

Cervical Joint Mobility Testing

O-A Joint Mobility

- Lower to mid-cervical spine in neutral
- Grasp both sides of the head
- Axis of movement is through the nose, with no movement in the mid or lower cervical spine
- Sidebend at the O-A joint bilaterally and appreciate the amount and quality of motion
- Flexion and extension will have more available range than sidebending, again appreciate amount and quality of motion

Cervical Joint Mobility Testing

O-A

Cervical Joint Mobility Testing

C1-2

- Completely flex the lower and mid-cervical spine
- Rotation of the head then performed passively
  - ~45 deg. of motion L/R
- Test bilaterally and compare amount of motion

Cervical Joint Mobility Testing

C1-2

Cervical Joint Mobility Testing

Side-glides C2-7

- Patient supine, PT stands/sits at patient's head
- Keeping the wrists extended, the hands cup around the neck
- Radial sides of bilateral index fingers (2nd MCP's) contact the articular pillars of cranial vertebra
- Radial side of one hand (via 2nd MCP) provides a lateral force through the cranial vertebra
- Compare end-feel, amount and quality of motion
- If restriction is felt, check side glide at that level in semi-flexion and semi-extension to differentiate closing vs opening restriction

Cervical Joint Mobility Testing

Side Glides: Semi-Flexed

Cervical Joint Mobility Testing

Side Glides: Semi-Extended

Clinical Prediction Rules

Clinical Prediction Rule

Thoracic HVLA with Neck Pain

- Developed by Cleland et al in 2007
- **Not validated** by Cleland et al in 2010
- Designed to identify patients with neck pain most likely to demonstrate favorable outcomes from thoracic spine manipulation
- Considered applicable if 3/6 criteria are met
  - +LR of 5.5
  - The probability of improvement in patients with 3/6 positive criteria = 86%

Clinical Prediction Rule

Thoracic HVLA with Neck Pain

- The criteria (6 components):
  - Duration of symptoms: < 30 days
  - Location of symptoms: no symptoms distal to shoulder
  - FABQ: PA subscale <12
  - Looking up does not aggravate symptoms
  - Diminished upper thoracic kyphosis (T3-T5)
  - Cervical Extension ROM of <30 deg.

Proper Patient Selection & Cervical Thoracic Screen

Proper Patient Selection

- **Absolutely crucial** to maximize likelihood of successful outcome
- Screen for Fear Avoidance Beliefs (FABQ)
- Screen for secondary gain issues
  - Hx of MVA, previous litigation
  - Worker's compensation
- Body part specific outcome measures can be helpful
  - Oswestry, DASH, NDI, etc.
- When in doubt- **DON'T PERFORM HVLA!!!**

Fear Avoidance Belief Questionnaire

Waddell

- 2 subscales
  - Physical activity (PA) or FABQPA: Questions 1-5
  - Work (W) or FABQW: Questions 6-16
- Only validated for patients with low back injuries
- Questions scored from 0-6
- Higher the total score, the more likely that pain avoidance behavior is present
- Not all questions are counted when scoring
  - PA: 2, 3, 4, and 5
  - W: 6, 7, 9, 10, 11, 12, and 15
- Score of more than 19 on the work subsection is considered “positive”

Cervical/Thoracic Screen

- Subjective
  - Method of injury
  - Specific location of pain
  - Specific type of pain (sharp, dull, pinching, burning, etc.)
  - Stoddard signs
  - Exacerbating/Alleviating factors (positions, activities, hot/cold, meds, etc.)
  - Red Flags
  - Prior medical/surgical history
  - Social lifestyle (smoking, alcohol, activity level)

Cervical/Thoracic Screen

List not all inclusive

- Objective
  - Posture
  - Upper quarter screen (DTRs, Myotomes, Dermatomes)
  - Range of Motion – observe the spine during motion; look for patterns of limitation
  - Neurodynamic Testing – ULTT, Slump Test
  - VBI and upper cervical stability tests
  - Cervical and thoracic joint mobility testing

Lab Component

Cervical Thoracic Joint HVLA Joint Mobilization

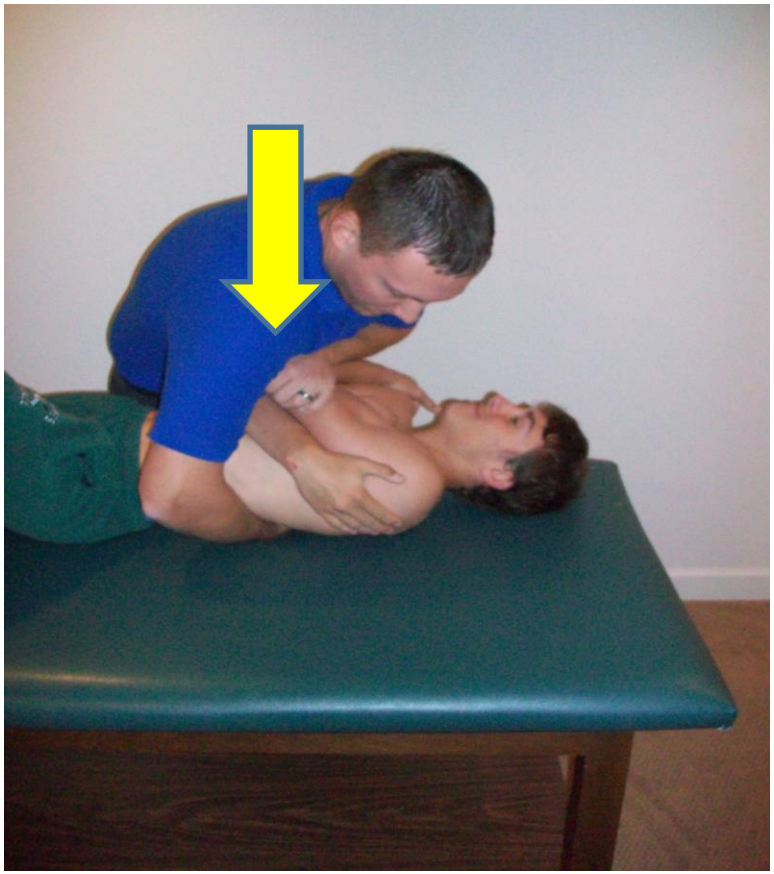
Thoracic & Rib HVLA Joint Mobilization

Supine Thoracic Gapping

- Patient lays supine with both arms in a tight “bear hug” position
- Roll the patient onto his/her side
- Make a loose fist, with the DIP’s extended
- Place the desired segment between the index finger and thumb
- Roll the patient back to supine
- Flex the patients elbows down to the treatment level
- Thrust through the patient’s arms in an A-P direction after taking up the slack

Thoracic & Rib HVLA Joint Mobilization

Supine Thoracic Gapping



Thoracic & Rib HVLA Joint Mobilization

Prone Thoracic P-A

- Patient prone, PT on the side of the prominent TrPr
- Place the manipulator's dip of the caudal hand on the prominent TrPr, fingers facing you
- Place the manipulator's dip of the cranial hand on the opposite TrPr, fingers facing away from you
- Rotate your hands so that the caudal hand is facing a cranial direction and the cranial hand is facing caudal direction
- Thrust is provided in a cranial/anterior direction on the prominent TrPr and the other hand in a caudal direction

Thoracic & Rib HVLA Joint Mobilization

Prone Thoracic P-A

Thoracic & Rib HVLA Joint Mobilization

Prone Rib P-A

- Patient in prone
- Caudal hand stabilizes the vertebrae
- The pisiform of the cranial hand placed on the rib angle of the involved level
- Thrust with the cranial hand in an anterior and slightly caudal direction

Thoracic & Rib HVLA Joint Mobilization

Prone Rib P-A

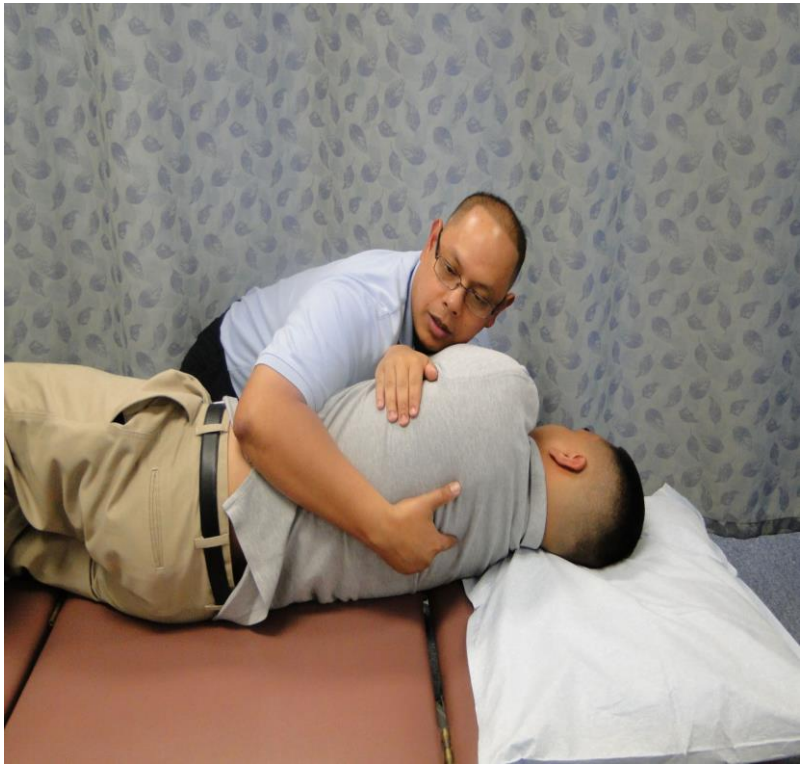
Thoracic & Rib HVLA Joint Mobilization

Supine Rib Distraction

- Patient supine, arms in a tight “bear hug” position
- Roll the patient over onto the involved rib (you must roll past supine
- Use a “gun grip” with the index finger placed along the involved rib with the finger tip at the interspinous space
- The involved rib angle is placed between the index and middle finger
- Flex the patient’s arms down to the involved level
- In a quick, fluid motion, roll the patient over and thrust through the patient’s arms in an A-P direction

Thoracic & Rib HVLA Joint Mobilization

Supine Rib Distraction



Thoracic & Rib HVLA Joint Mobilization

Seated 1st Rib

- Patient sitting, PT stands behind the patient
- Your arm away from the treatment side is placed on the patients head and your forearm rests on the side of the head
- Sidebend the head towards the treatment side to relax the scalenes
- The webspace of the treatment hand is placed on the 1st rib, with your elbow pointing towards the ceiling
- Thrust is provided in an inferior/medial direction

Thoracic & Rib HVLA Joint Mobilization

Seated 1st Rib

Thoracic & Rib HVLA Joint Mobilization

Seated 2nd Rib – Inferior Glide

- Patient sitting
- PT stands opposite the treatment side
- Reach over the patient's head with the your arm that is towards the front of the patient
- Rotate/sidebend the head away with your forearm
- Place the manipulator's dip on the 2nd rib, then place your other hand over the treatment hand
- Thrust in a caudal direction

Thoracic & Rib HVLA Joint Mobilization

Seated 2nd Rib – Inferior Glide

Thoracic & Rib HVLA Joint Mobilization
CTJ Seated Distraction

- Patient in sitting with their hands clasped behind their neck.
- PT behind the patient
- Lace your hands through the patients arms in a “Full Nelson” hold
- Scoop the patient back into you to provide some flexion
- Thrust is cranial/towards the ceiling
- Be sure not to force the patient’s head into flexion during the thrust

CTJ Seated Distraction

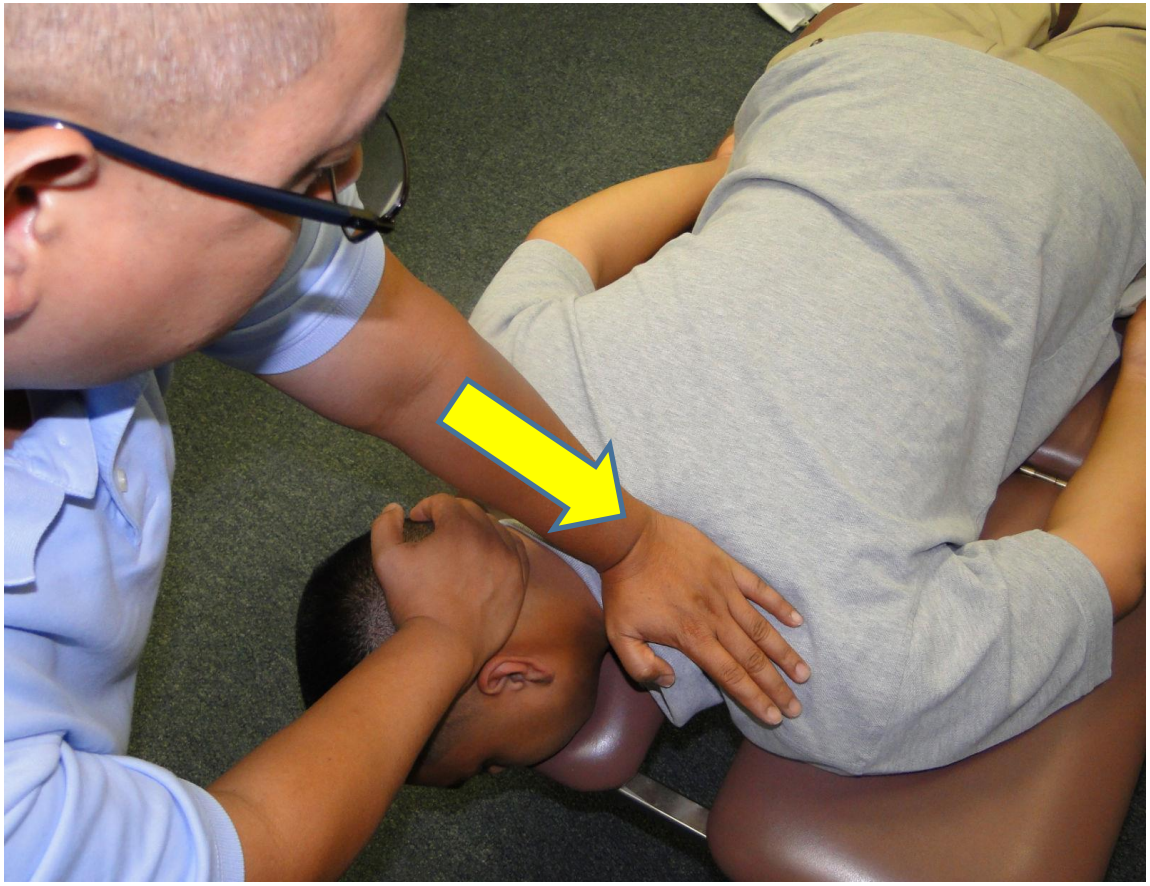
Thoracic & Rib HVLA Joint Mobilization

Prone Chin-Pivot

- Patient prone with the chin placed at the very end of the table
- PT stands at the head of the patient
- Pivot the head away from the treatment side with the hand on the treatment side (to take up the soft tissue barrier)
- With the hand away from the treatment side place the pisiform on the involved TrPr
- Thrust in an anterior and slightly inferior direction
- Be sure not to push the head into further rotation

Thoracic & Rib HVLA Joint Mobilization

Prone Chin-Pivot



Cervical HVLA Joint Mobilization

Mid-Cervical Side-Bend Thrust

- Patient supine; PT at head of table/bed
- Cradle the neck/head with both hands

  2nd MCP of both hands to make contact with articular pillars of desired level
- Sidebend the head and neck towards the treatment side

  down to the level
- Rotate away from the treatment side, using manipulating hand
- Side-glide into the restriction w/ manip. hand
- Add slight extension of desired level
- Trust with manip. hand in a LATERAL direction

Be sure not to lose any of the components along the way!

Cervical HVLA Joint Mobilization

Mid-Cervical Side-Bend Thrust

Cervical HVLA Joint Mobilization

Upper Cervical Distraction

- Patient supine
- PT stands on the treatment side
- Cradle the head with the cranial arm, patient's head resting on the forearm and hand cupped around the chin
- Sidebend the head towards the treatment side, just enough to create a "shelf" for hand placement
- Slightly rotate away from the treatment side
- Webspace of the caudal hand on the inferior side of the involved occiput or TP
- Trust with the caudal hand in a cranial direction
- Be sure not to pull from the cranial hand!

Cervical HVLA Joint Mobilization

Upper Cervical Distraction

Patient Case Studies

Case Study #1

- 38 y/o male with no significant PMHx
- No s/s of VBI, cord compression, or upper cervical instability
- Referred to PT with Dx: cervical strain
- MOI: patient woke up 3 days ago with “stiff neck” & while getting dressed, he quickly turned neck and it "locked up"
- CC: Tightness in the L side of the neck & superior shoulder, tingling into the left 4th & 5th fingers, occasional headache
- Aggravating factors: looking up & to the L, lifting L arm
- Easing factors: heat, rubbing the neck/shoulder, sitting with a pillow behind the neck
- FABQ (PA): 10

- Does this patient appear to be a candidate for HVLA mobs.?
- What else do you need to know?
- What mob(s). would you choose?

Case Study #2

- 26 y/o female with no significant PMHx
- Upper cervical stability testing WNL, no signs of cord compression
- VBI testing = +dizziness, HA, & feelings of nausea
- MOI: patient was involved in altercation with a client, who pulled her and twisted her head around aggressively
- Referred to PT with Dx: cervical sprain
- CC: severe pain & tightness t/o neck, occasional dizziness & nausea
- Aggrevating factors: any neck movements, dizziness with looking up
- Easing factors: not moving the neck
- FABQ (PA): 14

- Does this patient appear to be a candidate for HVLA mobs.?
- What else do you need to know?
- What mob(s). would you choose?

Case Study #3

- 79 y/o male; PMHx- polymyalgia rheumatica, CHF, Afib (on coumadin)
- No cardinal S/S or signs of cord compression
- Cleared by PCP- “no contraindications to manual PT”
- Plain films- long standing DJD, no Fx’s
- MOI- several week H/O “stiff neck”; no specific MOI
- Denies any paresthesias, or pain with cough/sneeze

- Does this patient appear to be a candidate for HVLA mobs.?
- What else do you need to know?
- What mob(s). would you choose?

Characteristics of a Hypermobile Joint

Hypermobility

- Defined as an increase in a joint's neutral zone
- Characteristics (S & S) of spinal hypermobility
  - Increased segmental mobility
  - Full physiological motion
  - Pain and/or tightness with prolonged stretch
  - Stiffness helped by exercises
  - Tendency for joint locking
  - Aberrant motion
  - Frequent self-manipulators
  - Excellent but short term relief with HVLA
  - Difficulty with sustained postures

Hypermobility

- Beighton Scale (clinical Scale for generalized hypermobility)
  - 4/9 criteria is a + test
    - Hands flat on floor with knees straight
    - Both thumbs touch forearms (+1 per thumb)
    - Both little fingers past 90 degrees ext. (+1 per finger)
    - Both elbow and knees hyperextend (+1 each per elbow and knee)

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