Physical Therapy Evaluation and Management of the Cervico-Thoracic Region

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A little about Us

A little about You

• Physical Therapists vs. Physical Therapy Assistants vs. Students?
• Settings?
  – Outpatient
  – In-patient rehab vs. Acute Care
  – Home Care
  – Specialty areas
• Manual Therapy Experience?
• What do you hope to get out of this course?

Objectives

• Become aware of the classifications of cervical pain that exists in the literature.
• Critically evaluate the science of evaluation and treatment of the cervico-thoracic region through the application of appropriate clinical reasoning skills.
• Perform a cervico-thoracic evaluation utilizing the principle of symptoms reproduction through the application of stresses and special tests.
• Demonstrate psychomotor competency of performing different special tests and manual therapy techniques of the cervico-thoracic region to enhance outcomes of treatment.
• Integrate effective therapeutic exercises and patient education in the intervention of individuals with cervico-thoracic dysfunction.
• Formulate an opinion on the value of several different interventions of the cervico-thoracic region according to the most recent literature.

Primary Objective!!

Numerous approaches to rehabilitation have been advocated. As evidence evolves, more guidance is available to enhance clinical decision making.

Patients cannot be looked at as a homogenous group, they are often divided into classifications based on specific signs and symptoms.

In other words....

Intervention requires a “MULTI-MODAL APPROACH” based on the patient’s impairments, limitations and participation restrictions with consideration of patient values.
Why this course?

- 22-70% of population experiences neck pain
- High rates of recurrence
- 37% reported symptoms >12 months
- 42% will miss >1 week of work
- Workers compensation costs second only to back pain

Neck Pain in Physical Therapy

4849 PT Initial Visits

Examination and Classification of Neck pain is CRITICAL to set up appropriate treatment for the appropriate patient

We cannot treat everyone with Neck Pain as a HOMOGENOUS GROUP

Development of a “Treatment-based Classification”

Original study by Delitto A, et al:

Significant evolution over the last 15 years

What about patients with neck pain?

Proposal of a Classification System for Patients with Neck Pain
Childs JD, et al. JOSPT. 2004

Clinical commentary that proposed a classification of system with 5 categories
**Proposed Categories**

1. **Mobility**
   - Recent onset of symptoms, no radiculopathy
2. **Centralization**
   - Radicular signs and symptoms
3. **Exercise and conditioning**
   - Chronic symptoms, no radiculopathy
4. **Headache**
   - Primary complaint of cervicogenic headache
5. **Pain control**
   - Acute onset of symptoms related to trauma

**Further Evolution**

Preliminary Examination of a Proposed Treatment-Based Classification System for Patients Receiving PT Interventions for Neck Pain.


274 patients:
113 received intervention that matched their classification
161 received intervention that did not match their classification

**Results**

Those that received the matched intervention displayed:
- Greater change in the NDI
- Greater change in the pain rating scale
- Greater % who achieved minimal detectable change in the NDI
Summary

- A treatment-based classification for neck pain continues to be evolving in the literature.
- Classification systems are designed to reduce variability and treat patients in a more standardized and cost-effective manner.
- In doing so, we are developing a measurable process that can be improved upon and lead to more successful treatment outcomes.
- PTs are at the forefront of this literature and it is up to us to promote it!

Examination of the Cervical Spine

Afraid to stress the neck?

Components to the Examination/Evaluation

- Component 1: Medical Screening
- Component 2: Differentiation of MS impairments associated with tissue pathology/disease
- Component 3: Diagnosis of tissue irritability
- Component 4: Intervention strategies based on findings

Component 1: Medical Screening

Must answer a fundamental question:

*Is PT appropriate for this patient?*

If **YES** – 2 options:
1. Tx appropriately
2. Tx and refer (non-urgent)
If **NO** – 2 options:
1. REFER back to MD (urgent)
2. No treatment (inappropriate to treat)

Medical Screening vs. Differential Diagnosis:

- **Screen:** The process of 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

Pre-screening

- Medical Screening Questionnaire
  - Recommended: Primary Care for the Physical Therapist. William Boissonnault. 2005
- Visual Analog Scale
- Ransford pain diagram
- Neck Disability Index
- Psychological Risk Factors
  - Fear Avoidance and Beliefs Work and Physical Activity Questionnaire
  - Tampa Scale of Kinesiophobia
  - Pain Catastrophizing Scale
Ransford Pain Diagram

- Used to identify pain patterns
- Specific classifications have common pain patterns
- Yellow flags:
  - Total arm symptoms
  - Bilateral upper extremity symptoms
  - Drawings showing "expansion" and "magnification"
  - Circles areas of pain
  - Use of arrows
  - Draws outside the lines

Neck Disability Index

- Disease Specific Health Related Quality of Life Questionnaire
- Very effective in assessing patient’s current status and eventual outcome
- Test-retest reliability: .89 (Vernon. JMPT, 1991)
- Scoring
  - Each section scored on a 6 point scale (0-5)
  - The score is doubled and interpreted as a percentage of the patient perceived disability (the higher the score the greater the disability)
- Minimally Clinical Important Difference (MCID): 5-7 points (Stratford, Phys Canada, 1999)

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
  - Assess the possibility of non-mechanical sources of pain output
- 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

Fear Avoidance Beliefs Questionnaire (FABQ)

- Does not indicate a red flag instead someone who may have a guarded prognosis
- Assesses the patients beliefs about the influence of activity on neck pain
- Pain related fear is thought to be more debilitating than the pain itself
- Specific fear-avoidance beliefs about work are strongly related to work loss due to neck and back pain

Fear Avoidance Beliefs Questionnaire

- 2 subscales
  - Physical Activity Subscale (FABQPA): Questions 1-5
  - Work Subscale (FABQW): Questions 6-16
- Scoring
  - FABQPA: Sum of 2, 3, 4 and 5 ONLY
  - Concern: >14 (likely to avoid activity)
  - FABQW: Sum of 6, 7, 9, 10, 11, 12, and 15 ONLY
  - Concern: >34 (less likely to RTW)
Red Flags:

• Signs or sxS associated with SERIOUS MEDICAL CONDITION that requires either IMMEDIATE medical attention or referral within 24-48 hours.
• Refer to Sizer P, (categories of “red flags”)

Yellow Flags:

• Signs and sxS associated with continuing with exam but with caution

Each cautionary or warning flag must be viewed in the context of the whole person, given his or her age, gender, past medical history, and current clinical presentation.

Red Flags of the CT region

• Blood in sputum
• Loss of consciousness or altered mental status
• Neurological deficit not explained by peripheral or nerve root radiculopathy
• Pathological changes in the bowel and bladder
• Progressive neurological deficit

Medical Screening

1. Post Trauma – Need for radiographs (Refer to lecture notes)
2. Upper Cervical Laxity/Instability
   – Ligamentous testing
3. Cervical Myelopathy
   – Upper and lower motor neuron testing
4. Cervical Artery Insufficiency
   – Cervical ROM with a gradual progression of forces
   – Cranial nerve assessment

Screening for pathology

1. History of trauma: Fear of Fracture – Need for imaging
2. Upper Cervical Instability
3. Cervical Myelopathy
4. Cervical Artery Disease

1. When is radiologic testing needed?
   Criteria for C-Spine radiographs in presence of cervical trauma

Stiell IG, et al. The Canadian C-Spine rule vs. the NEXUS low-risk criteria in patients with trauma. NEJM. 2003; 349(26): 2510-2518

Canadian C-Spine Rule
Specificity: 45.1
Sensitivity: 99.4

The Canadian C-Spine Rule
If suspect need for imaging, What to ask for?

• Open mouth view (sidebending?)
• Lateral Flexion/Extension stress view
• CT Scan???

Testing for Ligamentous Testing of Upper Cervical

• Sharp Purser Test (Utivlugt G. 1988)
  - Sensitivity: .69
  - Specificity: .96
  - + likelihood ratio: 17.25
  - - likelihood ratio: .32
• Alar Ligament Test (aka: Lateral sheer test) (Kaale B. 2009)
  - Sensitivity: .69-.72
  - Specificity: .96-1.00
  - +LR: 18.0-inf
  - -LR: .30

Cervical Myelopathy Testing

• Upper motor neuron testing
  – Babinski
  – Clonus
  – Hoffman’s Sign
  – Inverted Supinator Sign
• Lower motor testing
  – Reflex Testing
  – Dermatome Assessment
  – Myotome Assessment

2. Upper cervical laxity/instability

• Beware of the following:
  – History of trauma
  – RA (~25%)
  – Congenital skeletal dysplasias (ex: Marfan’s syndrome, Down’s syndrome)
  – Pregnancy
• Symptoms:
  – Neck pain
  – Limited ROM
  – Nausea and/or dizziness
  – Occipital pain/headaches
  – Cervical myelopathy

3. Cervical Myelopathy (Cook C. JOSPT. 2009)

• May be caused by:
  – Cervical instability (traumatic vs. systemic)
  – Space occupying lesion
  – Severe degenerative changes (central canal stenosis)
• Signs and symptoms
  – Bilateral symptoms
  – Sensory disturbances in hands (non-dermatomal)
  – Non myotomal weakness
  – Loss of dexterity in hands
  – Unsteady/clumsy gait
  – UMN findings

Diagnostic Accuracy of Tests (Cook C. JOSPT. 2009)

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
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<tbody>
<tr>
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<td>97.00</td>
<td>90.00</td>
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<td>95.00</td>
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<td>Hoffman's Sign</td>
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<td>98.00</td>
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<tr>
<td>Inverted Supinator Sign</td>
<td>91.00</td>
<td>86.00</td>
<td>92.00</td>
<td>88.00</td>
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*Values in parentheses represent sensitivity, specificity, and positive and negative predictive values with 95% confidence intervals.
**4. Cervical Artery Disease**

Significant overlap of symptoms of MS head and neck pain

Kerry et al JOSPT, 2009

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**RECOMMENDATIONS for Screening**

(Kerry et al. JOSPT, 2009)

**Clinical Recommendations**

- Identify warning signs
- Assess sustained rotation of cervical spine
- Assess sustained extension of cervical spine
- Cranial nerve assessment
- Cardiac assessment (increased HR and BP)
- Doppler US

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**Cervical Artery Disease – Warning Signs**

**5D’s And 3 N’s**

1. Drop attacks (sudden fainting)
2. Dizziness (related to neck movement)
3. Dysarthria (difficulty swallowing)
4. Dysphasia (difficulty swallowing)
5. Diplopia (double vision)
   - Ataxia
   - Nystagmus
   - Nausea
   - Numbness

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**CAD: Cranial Nerve Assessment**

<table>
<thead>
<tr>
<th>cranial nerve</th>
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**VBI TESTING**

(Kerry et al. JOSPT, 2009)

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**Component 2:**

**Differentiation** of MS impairments associated with tissue pathology/disease

**Diagnostic Classification:**

- Acute neck pain
  - Neck pain with Mobility Deficits
  - Neck pain with Radiating symptoms
  - Neck pain with Headaches
  - Neck pain with movement coordination impairments

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UW-L CT Course - 9
Prevalence

- Radiating pain: 41%
- Movement Coordination Deficits: 21%
- Headaches: 11%
- Acute/Pain Control: 7%
- Mobility deficits: 20%

Inter-Rater Reliability
- High at 98% (Kappa: .96, 95% CI: 0.88-1.0)
Fritz & Brennan, PTJ 2007

Upper Quarter Examination
(Refer to “Clinical Decision Making Framework” Algorithm)

Standard Elements
- Postural Assessment
- Cervical and Thoracic and Upper Quarter
  - AROM and ROM with overpressure
- Mobility assessment
- Flexibility
- Palpation

Differentiating Elements
- Neurological screen
- Neurodynamic mobility
- Upper cervical ROM/Mobility assessment
- Specific palpation
- Muscle recruitment/endurance/strength

Cervical/Thoracic Range of Motion: Understanding Movement Assessment

- Active versus Passive Movement
  - Mobility Deficits
    - Soft Tissue Extensibility
    - Joint Mobility
  - Stability or Motor Control Dysfunction
    - Muscle Strength Deficit
    - Neuromotor Sequencing/Timing Deficit
    - Static or Dynamic Control Deficit
- Pay attention to your end-feels!
  - Physiological and Accessory
    “The Devil is in the Details!”

Cervical/Thoracic Mobility Assessment: Understanding Movement Assessment

Component 3:
Diagnosis of Tissue Irritability
Guides how vigorous to examine and intervene

“Ability to aggravate and ease sx’s”

High irritability ➧ High irritability
Moderate irritability ➧ Moderate irritability
Low irritability

Component 4:
Match Intervention Strategies
Impairment-Based Intervention Approach

Options for treatment:
1. Neck Pain with Mobility Deficits ??
2. Neck Pain with Radiating Pain??
3. Neck Pain with Headaches??
4. Neck Pain with Movement Coordination Deficits??

High irritability ➧Moderate irritability ➧Low irritability

Component 4:
Match Intervention Strategies
Impairment-Based Intervention Approach

Options for treatment:
1. Neck Pain with Mobility Deficits ??
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3. Neck Pain with Headaches??
4. Neck Pain with Movement Coordination Deficits??

High irritability ➧Moderate irritability ➧Low irritability
Let’s get our hands dirty
Component 1:  
Medical Screening

- **Post Trauma** – Need for radiographs (Refer to lecture notes)
- **Cervical Myelopathy**  
  – Upper and lower motor neuron testing
- **Cervical Artery Insufficiency**  
  – Cervical ROM with a gradual progression of forces  
  – Cranial nerve assessment
- **Upper Cervical Laxity/Instability**  
  – Ligamentous testing
Cervical Myelopathy Testing

• Upper motor neuron testing
  – Babinski
  – Clonus
  – Hoffman’s Sign
  – Inverted Supinator Sign

• Lower motor testing
  – Reflex Testing
  – Dermatome Assessment
  – Myotome Assessment

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 their 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.
Upper Motor Neuron Testing

- **Hoffman 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

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)
Dermatome Assessment

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

Myotome 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
Cervical Artery Disease
(Kerry et al. JOSPT. 2009)

Clinical Recommendations

• Identify warning signs
• Assess sustained rotation of cervical spine
• Assess sustained extension of cervical spine
• Cranial nerve assessment
• Cardiac assessment (increased HR and BP)
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Cervical Artery Disease
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Upper Cervical Instability/Laxity Ligamentous Testing:

**Sharp Purser Test**

- **Purpose**: To assess for upper cervical spine instability (C1-C2)
- **Description**:  
  1. Pt seated. Flex occiput on C2, assess sx’s.  
  2. Examiner provides anterior force over spinous process of C2. With other hand provides a posterior force to forehead.  
- **Positive test**:  
  1. Sx’s produced with capital flexion of occiput  
  2. Sx’s resolved with anterior pressure of C2  
  3. Percievable clunk during part 2.  

  - Sensitivity: .69  
  - Specificity: .96  
  - + LR: 17.25  
  - - likelihood ratio: .32  

(Utivlugt G. 1988)

Upper Cervical Instability/Laxity Ligamentous Testing:

**Alar Ligament Testing**

- **Purpose**: To assess for upper cervical spine laxity/instability (C1-C2)
- **Description**: Pt supine. Examiner places finger on side of spinous process of C2. Gently sidebend c-spine away from side being palpated. Should feel spinous process push into palpating finger. Gently push spinous process to midline  
- **Positive test**: When sidebending the spine, the spinous process is not palpated moving into the finger OR the examiner is able to displace the spinous process medially with pressure.  
  
  - Sensitivity: .69-.72  
  - Specificity: .96-1.00  
  - +LR: 18.0-inf  
  - -LR: .30  

(Kaale B. 2009)
Component 2 and 3: Standard Elements of Examination
“Identifying Impairments and Irritability”

1. Postural assessment
2. ROM assessment (AROM/ROM with overpressure)
   – Cervical
   – Thoracic
   – Upper quarter
3. Thoracic mobility
   – PA mobility
4. Mid Cervical mobility
   – Lateral glides
5. Flexibility
6. Palpation for tenderness

Postural 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 and neck pain?
**“FORWARD HEAD – ROUNDED SHOULDER POSTURE”**

**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)

Cervico-thoracic-scapular complex
(Upper cross syndrome)

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**Cervical AROM & PROM with Overpressure**

- Cervical Flexion/Extension

- Rotation
  - With Overpressure

- Side-bending
  - With overpressure

**Quantity and Quality** of Movement
Thoracic AROM & PROM with Overpressure and Mobility Assessment

- Thoracic Rotation Right
  - With Overpressure

- Thoracic Rotation Left
  - With Overpressure

- Posterior-Anterior (PA) Mobility

*Quantity and Quality of Movement*

Upper Quarter screen

- Functional Screen – Apley’s Test
  - Hand to opposite scapular
  - Hand behind head: Assess vertebral level
  - Hand behind back: Assess vertebral level

- Shoulder motion: In both sitting and supine
  - Flexion (inclinometer)
  - Scaption
  - IR and ER at 0°
  - IR and ER at 90° (inclinometer)
  - Horizontal flexion

*Quantity and Quality of Movement*
Cervical Segmental Mobility Assessment

• **Purpose:** Assess mid cervical mobility
• **Patient Position:** Supine
• **Therapist Position:** Sitting at patient’s head
• **Procedure:** Flex c-spine to level assessing. With radial side of second digit, assess mobility from right to left and left to right at several levels
• Positive if pain is reproduced or mobility is determined to be restricted

Palpation for tenderness

• Suboccipital
• Upper trapezius
• SCM
• Cervical erector spinae
• Scalenes
• Levator Scapulae
• Subclavious
• Pec Minor
Flexibility

- Upper Trap
- Levator Scap
- Scalenes
- Pec minor
Physical Therapy Management of Cervico-Thoracic Pain

Neck pain with Mobility Deficits

ICF Diagnosis of Neck Pain with Mobility Deficits
“Pattern Recognition”

- **Acute** symptoms
  - <30 days - 12 weeks
- **Younger** (<60 y/o)
- No radicular symptoms (distal to shoulder) OR signs of root compression
- Often has neck pain AND interscapular pain
- **Restricted** neck range of motion
- Poor recruitment and/or endurance of neck and scapular muscles

Component 1 and 2: Medical Screening and Examination

1. **Standard Medical Screening** (as previously described)
2. **Standard Elements of Examination**
   - Cervical and Thoracic AROM/PROM Assessment
   - Cervical and Thoracic Segmental Mobility
   - Soft tissue assessment
   - Flexibility assessment

Component 3: Tissue Irritability

- **High Irritability**
  - High level of pain and self-reported disability
  - Sa’s easily provoked
    - Pain **before** end ranges, AROM and PROM limited
    - Neck pain before feeling end feel
    - Takes a long time for symptoms to resolve once irritated
- **Moderate Irritability**
  - Moderate level of pain and self-reported disability
  - Sa’s not as easy to provoke
    - Pain **at** end ranges of AROM and PROM
    - Neck pain at end feel assessment
    - able to alleviate symptoms when get out of provocative positions
- **Low Irritability**
  - Low level of pain and self-reported disability
  - Sa’s minimal but may have periods of increased pain
    - Pain with overpressure into end ranges of AROM and PROM
    - Neck pain with overpressure
    - Able to alleviate with change in position

Prevalence

- **Radiating pain**
- **Movement Coordination Deficits**
- **Mobility deficits**
- **Headaches**
- **Acute/Pain Control**

- **Inter-Rater Reliability**
  - High at 98% (Kappa: .96, 95% CI: 0.88-1.0)
  - Fritz & Brennan, PTJ 2007

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- **Low Irritability**
  - Low level of pain and self-reported disability
  - Sa’s minimal but may have periods of increased pain
    - Pain with overpressure into end ranges of AROM and PROM
    - Neck pain with overpressure
    - Able to alleviate with change in position
**Component 4: Primary Interventions**

- Patient Education
- Manual Techniques
  - Thoracic Thrust & Non-Thrust mobilizations
  - Cervical Thrust and Non-Thrust Mobilizations
  - Soft tissue mobilization techniques
- Ther Ex
  - Self mobilizations/ROM/ Stretching exercises
  - Progress to neuromuscular control

**Development of a CPR for Thoracic Manipulation in the treatment of mechanical neck pain**

**Development of the Rule**
- Cleland et al PTJ 2007
  - Symptoms <30 days
  - Age
  - No symptoms distal to the shoulder
    - Non-radicular
  - Looking up does not aggress symptoms
  - FABQ <12
  - Low fear of movement
  - Diminished upper thoracic kyphosis
  - Hypermobile thoracic spine
  - Cervical extension ROM <30
  - Hypomobile upper thoracic and cervical

**Validation of the Rule**
- Cleland et al PTJ 2010
  - Results NOT Validated... ALL patients benefited

4 or more out of 6 variables provides a 93% probability of success

**Conclusions about Thoracic Thrust Techniques**

- Within session changes in neck motion (Krauss et al, JMMT 2008)
- More effective than non-thrust techniques (Cleland et al PTJ 2007)
- Favored in systematic review pooled data for short term improvements (Cross et al. JOSPT. 2011)
- As effective as cervical techniques for neck pain (Brown, et al. PT Review, 2014)
- No Harm in performing thoracic thrust mobilization

**Risk To Reward Ratio?**


- “Cervical manipulation and mobilisation produced similar changes. Either may provide immediate- or short-term change; no long term data are available.” (Gross A. Cochrane Review. 2010)

- Minimal difference in outcomes when comparing thrust to non-thrust techniques (Perez, et al. MT. 2014, Boyle, et al. JOSPT 2010)
What are we doing?

**Biomechanical VS**

- Fixing a biomechanical fault?
  - Validity not proven
    - Seffinger et al. Spine 2004
    - No change in joint position
    - Tullberg et al. Spine 1998
    - Not specific to a segment
    - Ross et al. Spine 2004
    - Successful outcomes not linked to specific technique
      - Oxford et al. 2002, JOSPT; Kent et al. JMPT 2005

- The answer is likely... NO

**Neurophysiological**

- Multiple Neurophysiologic Mechanisms
  - Gate theory of pain
  - Stimulation of spinal reflex to alter muscle activity
  - Stimulation of pain centers in brain
  - Treatment expectation and placebo
  - Bialosky et al. BMC MSK Disorders 2008,
  - Bialosky et al. JOSPT 2008

How Manual Therapy Works

**Summary**

- Integration of systems
- Addresses multiple different impairments
- Explains why we see benefits with interventions in different regions
- No longer thought of an isolated mechanism

Moving Beyond Joint Mobilizations?

- Patient education!!!
- Soft tissue massage
  - Manual
  - Instrumented
- Self mobilization techniques
- Self stretching
- Neuromuscular re-education, strengthening and endurance exercises

In Summary

- Identify pattern of pain associated with mobility deficits
- Joint mobilization and other manual therapy acts on several different mechanisms both in the Thoracic and Cervical Spine
- Creates a better environment for other multimodal interventions
- Assists in a speedier recovery
- Helps reduce elevated pain and fear
- Leads to ultimate cost savings
Neck Pain with Mobility Deficits: Thoracic Spine and C-T Region
“Pattern Recognition”

- **Subjective complaints:**
  - Acute and/or chronic pain
  - Non radicular pain or radicular/referred pain
  - Neck and shoulder symptoms
  - Intermittent/unilateral pain
  - Loss of motion/feels restricted in one or multiple directions

- **Objective findings:**

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<tr>
<td>Diminished upper thoracic spine kyphosis</td>
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<tr>
<td>Limited motion of cervical and thoracic spine in one or more directions</td>
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<td>General hypomobility of mid-upper thoracic and cervical spine</td>
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<td>Shoulder ROM restrictions</td>
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Evaluation Components

• Component 1: Medical Screening
• Component 2: Standard Elements of Exam
• Component 3: Assess Irritability
• Component 4: Match Intervention Strategies

Component 2 and 3:

• Standard Elements of the exam
• Special attention to:
  – PA mobility assessment of thoracic and c-spine
    • Pain
    • Mobility
  – Sideglide mobility assessment of the c-spine
• Palpation assessment
• Flexibility assessment
COMPONENT 4: INTERVENTIONS

- EDUCATION
- Thrust and non-thrust mobilizations to the thoracic, cervico-thoracic and cervical spine
- Manual and self stretching
- Soft tissue mobilizations
- Self mobilizations, SNAGS
- Neuromotor control exercises

Thoracic and CT Joint Mobilizations

- Prone Position
  - Prone Thoracic PA Thrust and Non-thrust Mobilization
  - Prone Cervico-thoracic PA thrust and non-thrust mobilization

- Supine
  - Supine AP Thoracic Thrust Mobilization- Extension Bias
  - Supine AP Thoracic Thrust Mobilization- Flexion Bias
  - Supine AP Cervico-thoracic Thrust mobilization

- Seated
  - Seated Mid Thoracic Gapping Thrust mobilization
  - Seated (PA) Thoracic Non-thrust Mobilization
  - Seated Cervico-thoracic Gapping thrust mobilization
Prone Posterior-Anterior (PA) Thoracic Thrust and Non-thrust Mobilization

- **Patient Position:** Prone lying with cervical spine in neutral. Hands under head OR at side
- **Therapist Position:** Standing next to patient. Caudal hand pointed to the patient's head placed on the side of the spine you are standing next to. Have cranial hand pointed away from therapist over the opposite side of the spine. Hypothenar eminence of each hand is over transverse process of spinal level to be mobilized. Shoulders are over the hands.
- **Procedure:** Provide a “skin twist.” With equal pressure through both hands, apply a PA pressure to the spine.
- **Thrust:** Apply a high velocity, low amplitude (HVLA) thrust by shifting body weight in a PA direction.

Prone Cervico-thoracic PA Mobilization

- **Patient Position:** Prone lying with cervical spine in neutral. Hands at side
- **Therapist Position:** Standing at the head of the patient with hypothenar eminences over the transverse processes in line with the plane of the joint.
- **Procedure:** Provide a “skin twist.” With equal pressure through both hands, apply a PA pressure to the spine.
- **Thrust:** Apply a high velocity, low amplitude (HVLA) thrust by shifting body weight in a PA direction.
Supine Anterior-Posterior (AP) Thoracic Thrust Mobilization- Extension Bias

- **Patient Position**: Supine with hands behind shoulder blades with towel between arms and chest (patient is “hugging the towel”)
- **Therapist Position**: Standing next to patient, wrap manipulative arm across the patient’s body. The spinous process of the thoracic spine falls between the thenar/hypothenar eminence and the middle phalanges of the hand. Place the hand at the general level of the upper thoracic region with a “skin twist”.
- **Procedure**: With use of body and opposite hand, apply a downward force through the patient’s upper body taking up the slack in extension, rotation and sidebending. Perform a HVLA thrust by providing force through the patient’s upper body/arms

Supine AP Thoracic Thrust Mobilization- Flexion Bias

- **Patient Position**: As previous technique
- **Therapist Position**: As previous technique
- **Procedure**: Place cephalad hand behind the patient’s head and passively flex the patient’s cervical spine to focus the force over the manipulating hand. With use of body (inferior ribs over elbows), apply a downward force through the patient’s upper body taking up the slack in extension, rotation and sidebending. Perform a HVLA thrust by providing force through the patient’s upper body/arms
Supine AP Thoracic Thrust Mobilization - Flexion Bias

- **Patient Position:** As previous technique
- **Therapist Position:** As previous technique
- **Procedure:** With use of body and opposite hand, apply a downward force through the patient’s upper body taking up the slack in extension, rotation and side bending. Ask patient to bridge. When the force feels isolated to region under caudal hand, perform a HVLA thrust by providing force through the patient’s upper body/arms.

Supine AP Thoracic Thrust Mobilization - Flexion Bias with Foam Roll

- **Patient Position:** Hands behind neck as far down as possible, sitting at first
- **Therapist Position:** Hands over each elbows maintaining cervical extension and guiding patient over foam roll.
- **Procedure: Roll** patient onto foam roll, fulcrum thoracic spine over the foam roll, body (inferior ribs over elbows), apply a downward force through the patient’s upper body taking up the slack in extension. Perform a HVLA thrust by providing force through the patient’s upper body and arms.
Supine Anterior-Posterior Cervico-thoracic Thrust mobilization

- **Patient Position:** Supine with hands around C-T junction
- **Therapist Position:** Hand and forearm across pt elbow and mobilizing hand at C-T junction pulling down on skin.
- **Procedure:** Place force over pt elbows to flex c-spine to focus the force over the manipulating hand. With use of body, apply a downward force through the patient’s upper body in the line of the humerus. Perform a HVLA thrust by providing force through the patient’s upper body/arms.

Seated Mid Thoracic Gapping Thrust Mobilization

- **Patient Position:** Seated with hips at the edge of the table and arms across their chest (hugging themselves)
- **Therapist Position:** Standing behind the patient with their pec contacting the region to be mobilized. Grasp the patients opposite elbows to take up the slack (use additional towels as needed).
- **Procedure:** Pull the patient into your chest with your body. Perform a J-stroke (pull and light lift). At end range provide a HVLA thrust.
Seated Posterior-Anterior (PA) Thoracic Non-thrust Mobilization

- **Patient Position:** Sitting with hands clasped behind neck
- **Therapist Position:** Standing on patient’s left side. Support patient’s elbows in the left forearm. Place hypothenar eminence of the right hand over the segment to be treated. (can be switched to other side if more comfortable)
- **Procedure:** Through control of the elbows, flex the patient through the lumbar spine. Apply pressure through the right hand while extending the patient’s thoracic spine. Extension of the spine is achieved through a fulcrum of the right hand over the thoracic spine. Modify by adding rotation in either direction.

Seated Cervico-Thoracic Gapping Thrust Mobilization

- **Patient Position:** Seated with hips at the edge of the table and hands on the neck and elbows APART.
- **Therapist Position:** Standing behind the patient with their pec contacting the region to be mobilized. Loop your arms through the patients arm pits and cover the patients hands.
- **Procedure:** Pull the patient into your chest with your body squeezing your elbows together. Perform a J-stroke (pull and light lift). At end range provide a HVLA thrust.
Seated Cervico-Thoracic Gapping Thrust Mobilization

- **Patient Position:** Seated with hips at the edge of the table and hands on the neck and elbows TOGETHER.
- **Therapist Position:** Standing behind the patient with their pec contacting the region to be mobilized. **Reach in front of patient and grasp elbows.**
- **Procedure:** Pull the patient into your chest with your body squeezing your elbows together. Perform a J-stroke (pull and light lift). At end range provide a HVLA thrust.

Supine Thoracic Self Mobilizations
Thoracic Self Mobilizations

Sitting Thoracic Extension

Side lying Shoulder Sweep

Cervico-Thoracic Self Mobilizations

Sitting CT self Snag

Sitting patient assisted CT rotation
Mid-Cervical Spine Joint Mobilizations

- Prone
  - Prone Central PA non-thrust mobilizations
  - Prone Unilateral PA non-thrust mobilizations
- Supine
  - Supine Lateral glide thrust and non-thrust mobilizations
  - Supine Upslope gapping thrust and non-thrust mobilizations

Prone Central PA Non-thrust Mobilizations

- **Patient Position**: Prone lying with cervical spine in neutral. Hands overhead with pillow below shins.
- **Therapist Position**: Standing at the head of the patient with three points of contact- Thumbs in contact with spinous process while index finger and hand contact the transverse process bilaterally.
- **Procedure**: Providing firm contact with a light skin twist. Using your body lightly unload the joint being assess into a AP direction then reload into a PA assessing pain and quality of motion.
Prone Unilateral PA Non-thrust Mobilizations

- **Patient Position**: Prone lying with cervical spine in neutral. Hands overhead with pillow below shins.
- **Therapist Position**: Standing at the head of the patient with three points of contact- Thumbs in contact with the articular pillar while index finger and hand contact the transverse process bilaterally.
- **Procedure**: Providing firm contact with a light skin twist. Using your body lightly unload the joint being assess into a AP direction then reload into a PA assessing pain and quality of motion. Change your angle of PA from medial to lateral assessing motion.

Supine Lateral Glide Non-Thrust and Thrust Mobilizations

- **Patient Position**: Supine
- **Therapist Position**: Sitting at patient’s head with forearms supported on the table and patient’s head supported in hand to facilitate movement
- **Procedure**: With the mobilizing hand, place the radial side of the 2nd MTP joint over the articular pillar of the cervical spine. Place rest of mobilizing hand in contact with the patient’s neck. Passively sidebend the cervical spine around the mobilizing hand into resistance of movement. Apply a gentle overpressure with mobilizing hand in a medial/inferior direction. Add siderglide and rotation to cervical spine to achieve end range. Oscillate or maintain pressure of mobilizing hand at end range. Provide a HVLA thrust at end range.
Supine Upslope Gapping Non-Thrust and Thrust Mobilization

- **Patient Position**: Supine head supported on pillow in slight flexion
- **Therapist Position**: Sitting at patient’s head with forearms supported on the table and patient’s head supported in hands. Mobilizing hands 2nd McP contacts the articular pillar, supporting hand supports the patient's head.
- **Procedure**: With the mobilizing hand, place the radial side of the 2nd MTP joint over the articular pillar of the cervical spine. Place rest of mobilizing hand in contact with the patient’s head/neck. Passively sidebend the cervical spine around the mobilizing hand into resistance of movement while simultaneously rotating in an opposite direction. Add sideglide and rotation to cervical spine to achieve end range with the mobilizing hand. Oscillate or maintain pressure of mobilizing hand at end range. Provide a HVLA thrust at end range.

Mid-Cervical Soft Tissue Mobilizations

- **Muscles**
  - Upper trap, levator scap, cervical erector spinae, scalenes
- **Techniques**
  - “Clearing”
  - IASTM “Clearing” along the scalenes
  - Pin and stretch
- **Positions**
  - Supine or Sidelying with mm in shortened position or lengthened
  - Sitting in various positions
Mid-Cervical Self Mobilizations/Stretching

- Mid Cervical Self Snag
- Mid Cervical Self ROM
- Upper Trapezius Stretch
- Levator Scapulae Stretch
Physical Therapy Management of the Cervico-Thoracic Region

Neck pain with Radiating Pain

Prevalence

- Radiating pain: 41%
- Movement Coordination Deficits: 20%
- Mobility deficits: 21%
- Headaches: 11%
- Acute/Pain Control: 7%

Inter-Rater Reliability
- High at 98% (Kappa: 0.96, 95% CI: 0.88-1.0)

Fritz & Brennan, PTJ 2007

Component 1: Medical Screening
- Progressing hard neuro signs
- UMN findings
- Constant symptoms in UE that do not resolve with distraction and other conservative management
- Bilateral symptoms
- Potential causes???
  - Cervical myelopathy
  - Chemical irritation from a disc sequestration

Possible need for medical attention/intervention?

Disc Sequestration - Chemical Pain

- Human discs: contain high levels of phospholipase A2 (PLA2)
- PLA2 has a large inflammatory potential and has been found to be a neurotoxin
- In the presence of disc sequestration, PLA2 leaks into the epidural space in the vicinity of the nerve roots
- Potential reason for radicular symptoms in individuals with disc herniations is due to the exposure of the nerve root to PLA2 (Ozaktay A. et al. Spine. 1988)

Disc Sequestration - Chemical Pain

- Presentation:
  - Progressing hard neuro signs
  - Constant symptoms – not alleviated by cervical distraction
  - UE pain dominant
  - Numbness/tingling
- Medical intervention???
  - “Patients with cervical radicular symptoms that do not resolve by mechanical means may benefit from a burst dose of a glucocorticoid due to the inflammatory condition that may exist from the disc herniation” (Lee HM. Spine. 1998)
ICF Diagnosis of Neck Pain with Radiating Pain Pattern Recognition
Childs et al JOSPT 2008

SUBJECTIVE
• Neck pain with associated pain in UE
• Nerve related pain (dermatome or peripheral nerve pattern): “lancinating”
• UE paresthesias, numbness and weakness

OBJECTIVE
• Aggravated by extension and/or motion to the same side
• + ULTT (Most sensitive)
• Alleviated with cervical distraction/traction
• Possible hard neuro signs (altered reflex: most specific)

Component 2:
Examination
• Standard Elements of examination
PLUS Differentiating Elements
• Screening for “Space occupying lesion”
• Neurodynamic mobility assessment (lab)
• Assess for neurological findings
  – Reflexes
  – Myotome
  – Dermatome

Component 3:
Tissue Irritability
• High Irritability
  – High level of pain and self reported disability
  – Distal sx's easily provoked
    • Pain before end ranges, AROM and PROM limited
    • UE pain before feeling tension during the ULTT
    • Unable to alleviate with traction
• Moderate Irritability
  – Moderate level of pain and self reported disability
  – Distal symptoms minimal
    • Pain with overpressure into end ranges of AROM and PROM
    • UE pain with overpressure during ULTT
    • Able to alleviate with change in positions
• Low Irritability
  – Low level of pain and self reported disability
  – Distal symptoms minimal
    • Pain with overpressure into end ranges of AROM and PROM
    • UE pain at the point of feeling tension during the ULTT
    • Able to alleviate with change in positions

Component 4:
“Multimodal Approach”
• Mechanical traction
• Manual traction AND manual traction with retraction
• Centralization techniques
• Thoracic manipulation (Norlander S. Scan J Rehab Med. 1998)
• Cervical mobilizations (with neurodynamic mobilization) (Coppieters MW. JOSPT. 2003)
• Neuromuscular re-ed and endurance exercises

Predictors of Short term outcome in people with clinical diagnosis of cervical radiculopathy.
Cleland JA. PT. 2007

- Age < 54 y/o
- Dominant arm not affected
- Looking down does NOT worsen symptoms
- Receive a multimodal treatment approach (traction, manual therapy and cervical flexor strengthening)

In a retrospective analysis: 3 out of 4 of these variables indicates an 85% likelihood of success of treatment

What do we have control over???
Joint mobilization/manipulation you say… for radiculopathy???

- What have we learned thus far:
  - A subgroup of patients with neck pain exists that will benefit from thoracic manipulation (Cleland JA, 2007)
  - Thoracic manipulation improves neck ROM (Krauss J, J Manip Ther)
  - Thoracic manipulation results in “superior clinical benefits” for patients with acute neck pain (Gonzalez-Iglesias J, 2009)

Specific to Radiculopathy (Boyles R. JMMT, 2011,)
- Lack of high quality evidence
- Tendency towards the use of manual therapy
- Not sure which techniques are most effective

What about Centralization techniques?
- TRUE centralization in the cervical spine not as prevalent…15% (Werneke MW, 2008)
  - Prevalence decreases with chronicity and age
  - Prognosis is enhanced if present
- Unlike Lumbar spine, lack of centralization was NOT associated with functional status or number of visits
- In other words….there are other options to the “McKenzie Approach” to treating radiculopathy

Other Options: Cervical sideglides with ULTT
- “Close down” or “open up” the side of symptoms in supine position (unweighted)
- Assess effectiveness with ULTT
- Physiologically:
  - Improve mobility of joint structures around the nerve

WITHIN SESSION CHANGES NOTED
(Coppitiers MW, et al. JOSPT. 2003)
- Increased ROM of elbow
- Decreased pain intensity
- More motion prior to provocation of symptoms

BETWEEN SESSIONS CHANGES WHEN COMPARED TO NDM?
(Chandran S. 2015)
No significant differences over 2 weeks between cervical sideglides and NDM

KEY POINT:
Follow up with Neurodynamic Mobilization (Gliding vs. Tensioning)

- Gliding
  - High irritability
  - As place tension on tissue distally, remove tension proximally (nerve never is tensioned)

- Tensioning
  - Low irritibility
  - Gently have patient move into resistance and back off (pressure on/off proximally or distally)
How about Traction???
So many variables...not enough answers

• Frequency: daily vs. 2-3x/week (Home traction vs. clinic traction)
• Duration: 15 minutes
• Angle of pull: 15° -25°
• Amount of pull: Incremental based on pt comfort
• Constant vs. Intermittent (45-60”, 10-15” off)

Is there a subgroup of patients identified who may benefit MOST from traction
Raney NH. Eur Spine J. 2009

• 5 Variables
  — Age > 55 years old
  — Peripheralization noted with lower cervical mobility testing
  — + shoulder abduction sign
  — + ULTT for median nerve
  — Relief of symptoms with manual traction

In other words...

Evidence for Traction

• Issues:
  — TX unlikely effective if used alone. Must use in combination of other interventions
  — Research must focus on SUBGROUPING OF PATIENTS (heterogenous vs homogenous population)
  — Variation in Parameters

• Most recent evidence:
  — Mechanical TX with exercise has been found to decrease disability score and pain intensity compared to only exercise in a subgroup of patients (Fritz, 2014)

Take home message:

• Treat cervical radiculopathy with a multimodal approach addressing:
  — Thoracic mobility
  — Cervical mobility
  — Neurodynamic mobilization beginning with gliding and progressing to tensioning
  — Traction
  — Deep cervical flexor and trapezius strengthening

• Continually be aware of red/yellow flags especially if not responding to conservative care

What if patient is negative on four tests for radiculopathy
Consider Peripheral Nerve Tension Irritation
AKA: Brachialgia

• Clinical findings:
  — Symptoms on ulnar side of forearm
  — Aggravated with SB and/or rotation away
  — First rib hypomobility
  — Active trigger points in scalenes, pec minor and/or subclavius
  — Possible venous or arterial signs
  — Negative signs for space occupying lesion
Brachialgia - Examination

- What 1st?
- Posture?
- Mobility assessment
  - Thoracic, cervical spine
  - 1st rib: Spring test and Cervical rotation/lateral flexion test
- Palpation of muscle?
- Flexibility of muscle?
- Muscular recruitment?
- ULTT tests: Median bias vs. Ulnar bias
- Specific TOS Special Tests: POOR RELIABILITY, VALIDITY AND....

First Rib Involvement??

- Spring Test: In supine or sitting
  - Compare side to side for pain, elevation and mobility
- Cervical Rotation/Lateral Flexion Test:
  [Lindgren KA. 1990]:
  - Compare side to side motion and pain

Interventions:

- Posture
- STM: scalenes, pec minor, subclavius
- Mid and Upper Thoracic Manipulation
- Mid Cervical mobilizations
- First rib mobilization/manipulation
- Scalene and pec stretching
- Neurodynamic mobilizations
- Upper trap inhibition/Lower

QUESTIONS??
Neck pain with Radiating Pain: Cervical Radiculopathy Pattern Recognition

Subjective:
- Radicular symptoms distal to the elbow
- Symptoms aggravated or alleviated by cervical motion
- Typically worse with “closing down” (ex: rotation and SB toward side of symptoms)

Objective:

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<td>Cervical rotation &lt; 60º</td>
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<td>Distraction alleviates symptoms</td>
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<td>Spurling Test</td>
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<td>Upper limb tension Test</td>
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<tr>
<td>Symptoms increased with rotation and sidebending toward side of symptoms</td>
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<td>Non-progressive neurological signs (sensation, weakness, reflexes)</td>
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Component 2 and 3: Evaluation Components

• Standard elements
• Differentiating elements
  – Screen for “Space Occupying Lesion”
    • Special tests
  – Neurodynamic Exam
    • Median Nerve
    • Ulnar Nerve
    • Radial Nerve
  – Neurological Exam (must assess baseline)
    • Reflexes, Myotomes, Dermatomes

Screen for “Space Occupying Lesion”

The presence of positive findings of four variables significantly increased the likelihood the patient presented with cervical radiculopathy:

1. Ipsilateral cervical rotation <60°
2. ULTT (for median nerve)
3. Distraction test
4. Spurling’s test

All four tests positive: .99 specificity and a +LR of 30.3
Neurodynamic Exam - Median Nerve

• **Purpose:** To identify reproduction of symptoms, loss in ROM of >10 deg or both.

• **Patient Position:** Supine without a pillow - do not allow patient to cross legs.

• **Therapist Position:**
  – Stabilize shoulder girdle with one hand (not allowing it to elevate)
  – Move arm into Glenohumeral abduction to 90-110° with thigh
  – Use opposite hand to move patients wrist and fingers into extension with forearm supination with elbow flexed to 90°
  – Move upper extremity into glenohumeral external rotation and elbow extension until symptoms or resistance.
  – Sensitize with Cervical sidebending to for relief and away for increased symptoms.

Neurodynamic Exam - Ulnar Nerve

• **Purpose:** To identify reproduction of symptoms, loss in ROM of >10 deg or both.

• **Patient Position:** Supine without a pillow - do not allow patient to cross legs.

• **Therapist Position:**
  – Stabilize shoulder girdle with one hand (not allowing it to elevate)
  – Move arm into Glenohumeral abduction to 90-110° with thigh
  – Use opposite hand to move patients wrist and fingers into extension with forearm pronation with elbow flexed to 90°
  – Move upper extremity into glenohumeral external rotation abduction and elbow flexion and pronation until symptoms or resistance.
  – Sensitize with Cervical sidebending to for relief and away for increased symptoms.
Neurodynamic exam - Radial Nerve

• **Purpose:** To identify reproduction of symptoms, loss in ROM of >10 deg or both.

• **Patient Position:** Supine without a pillow- do not allow patient to cross legs.

• **Therapist Position:**
  - Stabilize shoulder girdle with one hand or thigh (not allowing it to elevate)
  - Move arm into elbow extension with arm at side
  - Use opposite hand to move patients wrist and fingers into flexion with forearm pronation
  - Move upper extremity into glenohumeral internal rotation and abduction until symptoms or resistance.
  - Sensitize with Cervical sidebending to for relief and away for increased symptoms.

COMPONENT 4
INTerventions

• EDUCATION!!!!
• Posture
• Joint mobilization
  • Supine Cervical Manual Traction
    – With Rotation
  • Supine Cervical Lateral glides in upper limb tension position
  • Supine Cervical Retraction (with extension)
• Neurodynamic mobilization
  • Neurodynamic gliding
  • Neurodynamic tensioning
• Self mobilization
• Take home traction (if necessary)
• Eventual strengthening
Supine Cervical Manual Traction

- **Patient Position**: Supine with head supported on the table
- **Therapist Position**: Sitting at the patient’s head with forearms resting on the table and hands under patient’s head
- **Procedure**: Place one hand in contact with the occipital protuberance, grasping the entire Occiput. The other hand lies on the contact hand to support it and aide in the distraction. Hypothenar eminence of both hands over mastoid of pt. Lock elbows into side. Apply a distraction force to the cervical spine by leaning back and pulling on the occiput. Keep the patient’s head on the table.
- **Alternative Method**: Same procedure as described above, except, place cervical spine in maximal flexion OR maximal flexion, sidebending and rotation.

Supine Cervical Lateral glides in upper limb tension position

- May be performed with continual assessment of upper limb neurodynamic motions of UE if exhibits positive upper limb neurodynamic testing. (Coppetiers MW. 2003)
Supine Cervical Retraction

- **Patient Position**: Supine with the head and upper thoracic spine off the edge of the table (first picture)
- **Therapist Position**: Sitting at patient’s head. Support the head with the one hand. The opposite hand supports the chin, the 2nd digit on the anterior chin and the 3rd digit on the inferior chin.
- **Procedure**: Provide distraction force to the cervical spine by leaning back and pulling gently with the hand under the patient’s head and the 3rd digit under the chin. Gently move the patient into retraction by allowing the head to drop. Guide the movement with the 2nd digit on the chin.
- **Note**: Continually assess patient’s symptoms while performing this technique. It is not uncommon for them to feel a noticeable stretch in the upper cervical and upper thoracic region. They should not experience a peripheralization of symptoms.

Neurodynamic Mobilization (Gliding vs. Tensioning)

**Gliding**
As place tension on tissue distally, remove tension proximally (nerve never is tensioned)

**Tensioning**
Gently have patient move into resistance and back off (pressure on/off proximally or distally)
BRACHIALGIA: Pattern Recognition

**Subjective:**
- Cervical and shoulder pain
- Possible radicular symptoms distal to the elbow (commonly on ulnar side). Aggravated by motion of SB and rotation away from side of symptoms OR by shoulder motion
- Possible vascular symptoms
- Engage in sustained postures through day

<table>
<thead>
<tr>
<th>Objective</th>
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</thead>
<tbody>
<tr>
<td>Cervical rotation lateral flexion test</td>
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<tr>
<td>First rib elevated and hypomobile</td>
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<tr>
<td>Tenderness in scalene</td>
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<tr>
<td>Tenderness in pec minor</td>
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<tr>
<td>Symptoms increased with rotation and sidebending away from symptoms</td>
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<tr>
<td>Negative special tests for space occupying lesion</td>
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</tr>
</tbody>
</table>

Component 2 and 3 Evaluation Components

- **Standard elements**
- **Differentiating elements**
  - First Rib Mobility assessment
    - Spring test
    - Cervical Flexion/Lateral Rotation Test
  - Specific palpation
    - Scalenes, subclavius, pec minor
  - Neurodynamic Exam (esp ulnar N)
  - Vascular Assessment (pulses)
First Rib Mobility

• **Spring Test:**
  In supine or sitting
  – Compare side to side for pain, elevation and mobility

• **Cervical Rotation/Lateral Flexion Test:**
  (Lindgren KA. 1990):
  – Compare side to side motion and pain

---

Palpation

Scalenes

Pec Minor

Subclavius
Component 4: Interventions

- Education!!!
- Posture!!!
- Soft tissue mobilization
- Joint mobilization techniques
  - Mid thoracic, CT and cervical mobilizations
  - Supine 1st rib thrust and non-thrust mobilization
- Manual stretching techniques
  - Manual stretch to scalene
  - Manual stretch to pec minor
- Self stretching and self mobilization
- Neurodynamic mobilizations
- NEUROMOTOR TRAINING
  - Lower trap
  - DNF

Soft Tissue Mobilization

Scalenes

Pec Minor

Subclavius
Supine 1\textsuperscript{st} 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 2\textsuperscript{nd} 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.

Manual Stretch of the Scalenes

- **Patient Position:** Supine
- **Therapist Position:** Sitting with one hand supporting the patient’s occiput. With other hand, stabilize the superior aspect of the first rib
- **Procedure:** Gently apply a depression force to the first rib, sidebend the patient’s neck away from the 1\textsuperscript{st} rib until a passive resistance is noted and apply a slight rotation toward the rib. May ask patient to perform a deep inhalation while stretching. Take up resistance as patient exhales.
Manual Stretch of the Pec Minor

- **Patient Position**: Supine
- **Therapist Position**: Standing with one heel of hand over coracoid process and elbow in line of fibers of the pec minor.
- **Procedure**: Gently apply a force to the coracoid in a posterior lateral direction. Apply a contract/relax technique by asking patient to protract the scapula and relax.

---

Manual Stretch of the Pec Minor - 2

- **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.
Self Pec Minor Stretch

Self Manual Stretch of Scalenes and 1st Rib Mobilizations
Physical Therapy Management of the Cervico-Thoracic Region

Neck pain with Headaches

Prevalence

- Inter-Rater Reliability
  - High at 98% (Kappa: .96, 95% CI: 0.88-1.0)
  - Fritz & Brennan, PTJ 2007

Prevalence - Cervicogenic Headaches

- Prevalence of Headache types
  - 0.4-2.5%
- 10-15% of individuals with chronic headaches
- 4:1 Female to male ratio
  - 66-84% are female
- 72-100% of subjects with HA’s have had previous cervical/thoracic pain


Component 1: Medical Screening

Rule Out Fracture
Rule Out Ligamentous Instability
Rule out Cervical Artery Insufficiency

Identify Vestibular versus Cervicogenic Contributions

Vestibular/Oculomotor
- Why ask why???

- Requires a balance of Afferent Input on Efferent Outputs
  - Cervico-ocular Reflex
  - Cervico-collic Reflex
  - Vestibuloocular Reflex
  - Optokinetic Reflex
  - Tonic Neck Reflex

Treleaven et al 2008. Man Ther; Kristjansson et al JOSPT 2009
The Challenge

• Is this problem primarily...
  – Vestibular?
  – Visual?
  – Musculoskeletal?
  – All of the above???
• Collaboration
  – Vestibular Therapist
  – Optometrist
  – Neuromuscular Physical Therapist

When to Refer to Vestibular Therapy?

• Subjective Reports
  – Blurred Vision / Dizziness / Balance difficulties / Headaches / Nausea / Vomiting / Motion Sensitivity / “Spinning Sensations”
  – Visual Complaints: Depth Perception/Going up/down steps/Bumping into things
• Objective Findings
  – Oculomotor exam: Noting Nystagmus within 30 degrees during H-Pattern
  – Balance Exam: Abnormal Rhomberg/Tandem/SL Balance with EO/EC.
  – Abnormal Head Thrust / Hall Pike Dix Special Tests

When to Refer to Optometry?

• Subjective Reports
• Objective Findings
  – Observation: Pupil Irregularity / Strabismus
  – Tests: Abnormal H-Pattern
    • Accommodative Dysfunction: Absence of pupil constriction when bringing object closer to eyes
    • Convergence Dysfunction: Absence of eyes staying focused on object as it approaches eyes

When the Patient belongs in Therapy:

• Subjective Reports:
  – Symptoms consistent with cervicogenic headaches or neuromotor control deficits.
• Objective Findings:
  – Presence of other mobility or stability findings consistent with neck pain
  – Symptoms consistent with Cervicogenic Dizziness
    • Abnormal H-Pattern with neck rotated in either direction with normal straight forward testing
    • Neck Motion causes dizziness
      – Positive Modified Neck Torsion Nystagmus Test
      – Trunk on fixed head (Cervicogenic Dizziness)
    • Abnormal Joint Reposition Testing

Neck Pain with Headaches Pattern Recognition

• Unilateral headache with neck/sub-occipital area symptoms that are aggravated with movement
• Headache produced or aggravated with provocation of the ipsilateral posterior cervical myofascia and joints
• Restricted cervical ROM
• Restricted cervical segmental mobility
• Abnormal/Substandard performance on the Cranial Cervical Flexion test

Can be PRIMARY COMPLAINT or SECONDARY COMPLAINT

Childs et al JOSPT 2008
Why you ask...

- Common referral pattern
  - Muscular (Trigger Points)
    - Sternocleidomastoid
    - Erector spinae
    - Suboccipitals
    - Upper trapezius
    - Levator Scapula

- Common referral pattern
  - Articular
    - OA
    - AA
  - Neural (Trigeminal Nerve)

Component 2 and 3: Neck Pain with Headaches:

- Standard Elements of exam

- Differentiating elements
  - Soft tissue tenderness and flexibility (esp suboccipitals and SCM)
  - Upper Cervical AROM Assessment
  - Upper Cervical Mobility
    - OA Mobility
    - Cervical Flexion Rotation Test
  - Deep cervical flexor endurance testing/activation

Cervical musculoskeletal impairment in frequent intermittent headache: Part 1: Subjects with single headaches

- Purpose: To identify tests and measures to distinguish between different types of headaches
- Age: 18-55 with a one year history of headaches
  - N=304 subjects
- Classified by headache type
  - Migraine
  - Cervicogenic
  - Tension-type
- Control group

- Evaluated
  - Cervical ROM
  - Symptomatic Joint Dysfunction
  - Cervical Muscle strength
  - Cross sectional area of extensor muscles
  - Diagnostic Ultrasound
  - Cervico-cervical Flexion test
  - EMG analysis of activity
  - Cervical Kinaesthetic Sense
  - Joint Repositioning Error

Outcomes

- Reported Neck Pain
  - Cervicogenic: 100%
  - Migraines: 59.1%
  - Tension-Type: 57.6%

- Joint Dysfunction
  - Levels CD-CA
  - Significantly higher in the CH group (P <0.001)

- Kinaesthetic Sense
  - No differences between groups

Graph from Part 2 Study

UW-L CT Course - 59
Gross Cervical ROM

Conclusions:

- Clinical Indicators for Cervicogenic Headaches:
  - Restricted ROM
  - Associated palpable tenderness of joint mobility
  - Impaired Cranio-cervical Flexion test
    - 100% Sensitivity
    - 94% Specificity
  - No other musculoskeletal evidence for migraine and tension type headaches.
- Part II - Patients with Multiple headache types
  - Consistent results

Component 4: Best Treatment
Neck Pain with Headaches

- Education & Posture!!!
- Thoracic and mid cervical thrust and non-thrust mobilization
- Upper Cervical Mobilizations
  - OA
  - AA
- Soft Tissue Mobilization & Stretching
- Self mobilizations (SNAG)/ ROM exercises
- Deep cervical flexion and peri-scapular strengthening

Treatment - Jull et al. Spine. 2002

- Manual therapy
  - Low velocity and high velocity mobilizations to patient specific cervical spine mobility restrictions
  - 30 Minute treatments
- Manual Therapy and Therapeutic Exercise
  - 30 minutes of combined treatment
- Control
  - No Interventions
- Therapeutic Exercise
  - Low Load endurance activities to train cervicocascal muscles
  - Cranio-cervical flexion exercises-longus capitis and collis in supine
  - Serratus anterior and lower trapezius exercises in supine
  - HEP 2 times daily
- Postural Education
  - Sitting with Neutral Spine
  - Retraction and abduction of scapular spine
  - Elongation of cervical spine with longus collis activation.
  - Throughout day

Outcomes - Jull et al. Spine. 2002

- A Randomized Controlled Trial of Exercise and Manipulative Therapy for Cervicogenic Headache
- Subjects:
  - 200 Patients with headaches
- Treatment groups:
  - Manual Therapy
  - Exercise Therapy
  - Manual Therapy + Exercise
  - Control
- Duration
  - 6 wks treatment (8-12 visits)
  - Follow up 7 weeks, 3, 6 and 12 months.
- Outcomes
  - HA Frequency, duration and intensity
  - Neck pain and disability
  - Pain with neck movements or palpation
  - Posture
  - Cranio-cervical Flexion Test

SPINE Volume 27, Number 17, pp 1835-1843
Outcomes - Jull et al. Spine. 2002

- Additional treatment
  - 24% overall
  - 12% MT + Ex
  - 19% Ex alone
  - 21% MT
  - 46% control
- 50% or better resolution of symptoms
- 76% reported a decrease in headache frequency in all treatment groups
- 35% had complete relief
- 10% chance better outcome with combined MT and Ex.

Medication Utilization at 12 month follow-up
- Decreased by 93% in MT + Ex
- Decreased 100% in MT and Ex groups individually
- Number needed to treat
  - 2 for a 50% reduction in symptoms
  - 3-4 for 100% reduction in symptoms.
  - Closer to 1.0 the better

Self Mobilizations - RCT

- Subjects: 32 individuals with cervicogenic headaches
- Treatment Groups (12 week HEP)
  - C1-2 Self Snag
  - Placebo Self Snag
- Outcomes
  - Immediate change in Flexion-rotation test ROM of 15 degrees (p<0.001)
  - Significant decrease in Headache Severity index at 4 weeks and 12 months follow up

Hall et al. JOSPT. 2007

Activation, Strengthening and Endurance exercises

Deep Neck Flexor Progression

Lower Trap Progression

MORE TO COME

In Review....

- Assess impairments associated with HA's
- Address impairments with manual therapy
- Address deep cervical neuromuscular re-education and endurance
- Postural Education
- Often a multimodal and disciplinary approach
Physical Therapy Management of the Cervico-Thoracic Region

Neck pain with Headaches

LAB

Neck Pain with Primary Headache Pattern Recognition

- **Subjective complaints:**
  - Unilateral headache with neck/sub-occipital area symptoms that are aggravated with movement (often associated with other neck pain)
  - Headache produced or aggravated with provocation of the ipsilateral posterior cervical soft tissue and joints

<table>
<thead>
<tr>
<th>Objective findings</th>
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<tbody>
<tr>
<td>Limited cervical rotation and/or retraction</td>
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<tr>
<td>Cranial Cervical Flexion Test</td>
<td></td>
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<tr>
<td>Hypomobility of cervical spine</td>
<td></td>
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<tr>
<td>Headaches aggravated with cervical motion</td>
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<td></td>
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<tr>
<td>Tenderness to suboccipital muscles</td>
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<tr>
<td>Weak deep cervical flexors</td>
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</tbody>
</table>
Component 2 & 3: Examination

- Standard Examination
- Differentiating elements
  - Superficial to deep palpation examination
  - OA Mobility
  - AA mobility (Cervical Flexion Rotation Test)
  - DNF activation/endurance

Palpation for tenderness

- Suboccipitals
- Upper trapezius
- SCM
- Cervical erector spinae
- Scalenes
- Levator Scapulae
OA Mobility Assessment

• **Purpose:** Assessing OA Mobility
• **Patient Position:** Supine
• **Therapist Position:** Seated or standing at the patients head. Hands grasping the side of patients head with index fingers contacting the mastoid processes.
• **Procedure:** Induce a flexion/extension moment about the external auditory meatus assessing OA mobility. Can combine with sidebending and/or rotation. Note any restrictions or pain responses.

Cervical Flexion Rotation Test

• **Purpose:** Assessing AA Mobility and HA referral
• **Patient Position:** Supine with head supported by therapist.
• **Therapist Position:** Standing at patients head, head supported on belly. One hand is contacting the AA joint to induce rotation, the other supporting the patient forehead.
• **Procedure:** Passively maximally flex the patients head. Rotate the patients head about the AA joint assessing ROM, symptoms and end feel. Compare side to side.
Neck Pain with Headaches: Interventions

- STM and stretching
  - Soft tissue clearing along the suboccipitals
- Suboccipital release
- Suboccipital stretch
- Upper cervical mobilization techniques
  - Upper Cervical AA Muscle Energy Contract-Relax Stretching
  - Upper Cervical Rotation Distraction Non-Thrust Mobilization
- Deep neck flexor activation and endurance
- Self Mobilizations/ Stretching

Suboccipital STM/Release

- **Purpose:** Decrease tone in suboccipital mm
- **Suboccipital Release**
  - **Therapist position:** At patient head with pads of fingers inferior to occiput of patient (IP joints flexed OR MCP joint flexed)
  - **Procedure:** Allow weight of head to fall into fingers. Apply a gentle traction to the occiput
- **Suboccipital STM:** “Clearing” along the occiput to address trigger points in the suboccipital muscles
Suboccipital Stretch

- **Patient Position**: Supine with head supported on the table
- **Therapist Position**: Sitting at the patient’s head. Place one hand proximal to the occiput and the other hand over the patient’s forehead.
- **Procedure**: Provide a traction force with hand under the occiput and inferior force to the occiput. The intent is to provide a flexion to the upper cervical spine.

Upper Cervical Atlanto-Axial Muscle Energy Contract-Relax Stretching

- **Patient Position**: Supine with head supported on the table
- **Therapist Position**: Standing at the patient’s head with the patient’s head supported in the therapist’s hands
- **Procedure**: Passively flex the cervical spine to end range. May rest the patient’s head against therapist stomach. Gently rotate the cranium to end range as pain allows. Stop at the resistance. Ask patient to *gently* rotate the head into the opposite direction, performing an isometric contraction. Hold the contraction for approximately 6 seconds. When patient relaxes, take up the slack in the motion if appropriate.
Upper Cervical Rotation Distraction Non-Thrust Mobilization

- **Patient Position:** Supine with head of the edge of the table supported by the therapist’s arm
- **Therapist Position:** Sitting at the patient’s head. Right arm is supporting the patient’s head with the hand wrapped gently around the chin
- **Procedure:** Maximally rotate the patient’s head to the right while supporting the head in the therapist forearm. Back off at end range. Sidebend by bringing left ear to chest. With left hand, contact the mastoid process with the radial border of the 2nd MCP joint. Slide cervical spine to the right and place a superior (distraction) force. Perform to the opposite side.

Mid-Cervical Self Mobilizations/Stretching

- Mid Cervical Self Snag
- Mid Cervical Self ROM
- Upper Trapezius Stretch
- Levator Scapulae Stretch
Upper Cervical Self Mobilizations

- Self Snag
- Cervical Retraction
- Retraction with rotation into restriction
- Self Traction
Physical Therapy Management of the Cervico-Thoracic Region

Neck pain with Movement Coordination Impairments
(With potential persistent pain with Affective/Cognitive Issues)

Prevalence
- Inter-Rater Reliability
  - High at 98% (Kappa: 0.96, 95% CI: 0.88-1.0)
  Fritz & Brennan, PTJ 2007

Pattern Recognition
- Longer duration of symptoms
  - Greater chronicity (>12 weeks)
  - Often linked to a precipitating trauma/whiplash
- No radicular signs and symptoms
  - May have REFERRED pain
- Lower pain and disability scores
  - Able to carry on with most of activity but in discomfort
- Lacks acute pain (however may have acute on chronic symptoms)
- Affective and cognitive issues associated with persistent pain

Prognosis of Neck Pain?
- 50-85% do not gain full resolution
  - Carroll et al Spine 2008
- Greatest recovery in pain and disability in the first 6.5 weeks following injury
  - Hush et al APMR 2011

Why you say?
- Poor Prognostic variables
  - Older age (Middle age the worst)
  - Poor health or preexisting pain
  - Poor psychological health (Greatest Impact)
  - Odds ratio from 2-6.0 for developing chronic neck pain
    - Carroll et al Spine 2011

Fear Avoidance Model of Pain
Vlaeyen JW. Pain. 2000
Catastrophizing

- Negative pain coping style
- “Pain is beyond their control” and will inevitably result in the worst possible outcome
- Can measure it: Pain Catastrophizing Scale – Sullivan. 1995

Pain Related Fear and Anxiety

- Pain related fear: Focused on current pain
- Fear related anxiety: “What will happen in the future?”
- What are patients’ personal beliefs about how physical activity and work will affect their pain

HYPERVIGILANCE and AVOIDANCE

- Hypervigilance: enhanced state of sensory sensitivity accompanied by an exaggerated intensity of behaviors
- Avoidance: much less willing to engage in activity
- Leads to disuse, depression, and further disability

Impaired Wiring

- Central Sensitization – Loss of inhibitory mechanisms that are often replaced with further excitation and sensitivity
  - Leads to impaired motor output
- Peripheral Sensitization – Increased sensitivity of peripheral nerves

Motor Adaptation

- Changes motor and sensory systems
- Recurrence of pain may be due to change in movement patterns due to fear (develop restricted movement patterns)

Impaired Motor Control-SCM during neck flexion

Increased EMG activity of SCM during CCF Test

Hodges et al Pain 2010

Jull et al Man Ther. 2004
Impaired Motor control–Upper Extremity Functional Tasks

- Upper Trap
- Sternocleidomastoid
- Anterior Scalenes

Falla et al. Spine 2004

Impaired Muscle Function – cont.

- Cervical Extensor muscle Atrophy/Fatty infiltrate
  - Multifidi
  - Sub occipitals
  - O’leary et al JOSPT 2009
- Impaired Strength and Endurance
  - Deep neck flexors and extensors
  - Harris et al PTJ 2005
  - Lower trapezius and scapulothoracic Muscles
  - Peterson et al. JOSPT 2011

Component 2 & 3: Examination

- Standard Elements
- Differentiating Elements
  - Psychosocial and Psychological Measures
  - Flexibility Assessment
  - Neuromotor control Assessment
    - DNF activation
    - Deep Neck Flexor Endurance Test
  - Balance and Proprioception
    - Joint Position Error Testing
  - Ergonomic Assessment

Component 4: Best Treatment

- Movement Coordination Impairments
  - Primary Interventions
    - Education
      - Pain Sciences
      - Ergonomics
    - Graded Exposure
    - Thoracic Thrust & Non-Thrust mobilizations
    - Soft Tissue Stretching
    - Deep cervical flexion and peri-scapular strengthening
    - Sensorimotor Training
  - General Interventions
    - Cervical Thrust and Non-Thrust Mobilizations
    - Upper Cervical Mobilizations
    - Self mobilizations/ROM exercises

Pain Science Education

- Patients with chronic WAD
- Provided two sessions of Pain Neurophysiology education
  - “Explain Pain”
  - Differences between Acute and Chronic Pain
- Significant improvement in NDI, TSK, Passive Coping, photophobia, Pain pressure thresholds, pain free movement

Education

- DOWNPLAY the mechanical and anatomical explanations of neck pain (aka: deemphasize anatomical facors)
- Encourage patients to resume normal activities, teaching them coping, while downplaying catastrophizing
- Shift focus away from decreasing or abolishing pain and GET THEM MOVING
- Education that neck pain is a common condition, not a “disease”

Van Oosterwijck et al. JRRD 2011

Burton AK. Spine. 1999
Supporting Research to Downplay

• Savage RA. Eur Spine J. 1997:
  – 32% of asymptomatic people had pathological lumbar spine anatomy
  – 47% of symptomatics had same anatomy
• Elfring A. Spine. 2002
  – Asymptomatic disk herniations progressed to DDD without any change in status
• Boos N. Spine. 2000
  – Asymptomatic people with disc herniations followed for 5 years
  – Type of job and psychological aspects of work were more powerful of predicting need for medical care than the disk abnormalities

POOR CORRELATION BETWEEN FILMS AND SYMPTOMS

Management of Patients with Pain Related Fear

• Graded Exercise/Exposure Programs
  – Goal: Increase patient’s tolerance to exercise/activity while minimizing their fear of performing the activity
  – Reduce the probability of symptoms associated with chronic neck pain
  – Goal is NOT to abolish or even decrease pain
  – Involves increasing amounts of physical activity under supervised conditions
    • Lindstrom I. PT. 1992, George SZ. Spine. 2003

Treatment- Exercises for Mechanical Neck Disorders

• 2009 Cochrane Review- Authors’ conclusions
  – The evidence summarized in this systematic review indicates that there is a role for exercises in the treatment of acute and chronic mechanical neck disorder and neck disorder plus headache.

But WHAT exercises is the question?

What is the Appropriate Intervention?

• Activities to enhance:
  – MOTION/FLEXIBILITY
  – MOTOR CONTROL and MUSCLE RECRUITMENT
  – STRENGTH AND ENDURANCE
• Muscles
  – Deep neck flexors
  – Cervical Extensors
  – Parascapular muscles

Why the deep cervical flexors?

• Multiple reasons:
  – Mechanism of injury with Whiplash Associated Disorders
  – Tendency to “stretch weakness” with forward head posture
  – Vulnerable to pain inhibition
  – Important component to minimize the extensor action of the SCM
  – Consistently found to be weak, and/or inhibited leading to further accessory muscle over activation and tonic pain.

In Summary...

• Patients with long standing symptoms may have associated pain related fear
• Address patients impairments and DOWNPLAY anatomical factors. Shift focus from pain to function (“hurt not harm”)
• Manual therapy for short period of time may be of benefit
• Address deep cervical flexors and scapulothoracic activation, strength, proprioception and endurance
• Utilize graded exercise program if appropriate
Physical Therapy Management of the Cervico-Thoracic Region

Neck pain with Movement Coordination Impairments

LAB

#### Neck Pain with Movement Coordination Impairments: Pattern Recognition

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<tr>
<th><strong>Subjective:</strong></th>
<th><strong>Objective:</strong></th>
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<tbody>
<tr>
<td>Persistent pain</td>
<td>+</td>
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<tr>
<td>Hx of multiple acute on chronic episodes</td>
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<tr>
<td>Neck and shoulder symptoms and even some referred pain (non-radiating)</td>
<td>+</td>
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<tr>
<td>Loss of motion</td>
<td>+</td>
</tr>
<tr>
<td>Lower levels of pain and disability</td>
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<tr>
<td>Elevated FABQ</td>
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<tr>
<td>FABQ and/or other tools</td>
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<td>Cervical motion</td>
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<td>Palpation of cervical and scapular mm</td>
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<tr>
<td>Deep neck flexor, extensor and scapular mm assessment</td>
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Component 2 & 3:
Examination

• Standard Elements
• Differentiating Elements
  – Psychosocial and Psychological Measures
  – Flexibility Assessment
  – Neuromotor control Assessment
    • DNF activation
    • Deep Neck Flexor Endurance Test
  – Sensorimotor Testing
    • Joint Position Error Testing
  – Ergonomic Assessment

Psychosocial and Psychological Measures

• Ransford Pain Diagram
• Fear Avoidance Beliefs Questionnaire
• Tampa Scale of Kinesiophobia
• Impact of Events Scale
• Pain Catastrophising Scale
• Patient Specific Functional Scale
• Others
Deep Neck Flexor Activation Test

- **Purpose**: Assess deep cervical flexor activation
- **Patient position**: Supine with occiput on table
- **Procedure**: Ask patient to flex cervical spine by tucking chin. Avoid retraction and isolate movement to upper cervical spine. Assess the small crease just posterior to ear. **Avoid activation of SCM**
- **Common compensations**:  
  - Patient will perform retraction.
- **Normal Test**:  
  - Able to flex occiput without activation of the SCM

Neck Flexor Endurance Test

- **Purpose**: Assess time that patient is able to maintain head off the pillow while keeping upper cervical flexion
- **Patient Position**: Supine with head on table.
- **Procedure**: Time starts when PT takes support of hand away and is ended when 1 of the following criteria are met:
  - Pain experienced or pt unwilling to continue
  - Pt looses chin tuck (determined by examiner)
    - Assess skin fold behind mandible
  - Pt raises head further (flexes neck)

High intra and inter rater reliability  
(ICC: .83 and .78)

Olson LE. JMPT 2006
Norms: Neck Flexor Endurance Test
(Olson LE. J Manip Physio Ther. 2006)

<table>
<thead>
<tr>
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<td>9</td>
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</tr>
<tr>
<td>Total</td>
<td>21 sec</td>
<td>11</td>
<td>13 sec</td>
<td>55sec</td>
</tr>
</tbody>
</table>

Assessment of Scapular Musculature

- Assess patients ability to perform scapular retraction/depression in prone
  - Assessing 2 things
    - Patients ability to **ISOLATE** lower trap activity
    - Patients ability to **INHIBIT** upper trap/levator activity
  - Ideal arm position at ~ 120°
- Poor performance
  - Scapular elevation
    - Upper trap/levator activation
  - Scapular depression
    - Latissimus activation
Joint Position Error Testing

• Joint Repositioning Error
  – Controls: 2 degrees
  – Chronic WAD: 4.5 deg
    • Trelevean et al 2003 J Rehab Med
• Often accompanied by reports of dizziness, unsteadiness, or loss in balance

Component 4: Interventions

• General Interventions
  – Cervical and Thoracic Thrust and Non-Thrust Mobilizations
  – Upper Cervical Mobilizations
  – Self mobilizations/ROM exercises
• Primary Interventions
  – Education
    • Pain Sciences
    • Ergonomics
  – Soft Tissue Stretching
  – Deep neck flexion/extension activation and endurance exercises
  – Para-scapular strengthening
  – Sensorimotor Training
  – Graded Exposure
Exercises

• Deep cervical flexors
  – Activation
  – Cranial flexion at various levels
  – Sequencing options (with cervical ext)
• Cervical extensor progression
  – Retraction options (seated, prone, 4 point, tband)
  – Sequencing options (with DCF)
• Lower trap
  – Activation
  – Progression in prone, tband
• Serratus
  – Progression
• General neck strengthening
  – T-band rotation

Training the deep flexors

• Begin in supine with chin tuck
  – No raising of head
• Emphasize true upper cervical flexion
  – NO RETRACTION
• Avoid fatigue, pain and substitution of SCM
  – Palpate for activation
• Integrate into postural exercises in sitting/standing
Cranial cervical flexion exercise:

**Part 1: Activation**
- Instructions: Chin tuck, avoid retraction. Isolate motion to upper cervical spine.
- Clinician: Monitor motion and palpate for activation of SCM. Utilize NRE techniques
- VARIOUS POSITIONS (ex: sitting, reclined, supine)
  - Goal: 10 X 10 second hold, 2 x/day
  - up to 100x/day

**Part 2: Dynamic stabilization**
- Instruction: Gently nod your head as though you were saying “yes” and lift head off table approx. 1-2 inches
- Clinician: Monitor motion and crease below chin. Instruct to avoid protrusion and keep upper cervical flexion
- VARIOUS POSITIONS
- Goal: 10 sec hold, 10 x
Cervical Extensors

- Retraction options (prone, 4 point, seated with theraband)
- Sequencing options (with DCF)

Training the Lower Trapezius

- Tactile and verbal cuing during the activity
- Place scapula in desired position and have them hold
- Isometric holds in the desired position
- Eccentric loading of muscle (pressure on posterior acromion)
Training the Lower Trapezius

• Progression:
  – Lower trap activation with UE movement in various positions (prone, sitting, standing)

Training of the serratus anterior
Sensoriomotor Training

- Cervical Joint Position Sense
  - Eyes open/Closed/Mapping
- Oculomotor Reflex Training/ Cancellation
  - Simple Background/Busy background

Treleaven et al Man Ther 2008

Graded Exercise Program
(Example)
First Session

• Goal: Establish a baseline exercise quota
  – Patient performs therapeutic activities to pain tolerance
  – Record duration, frequency and/or intensity

• Example:
  – Pre exercise pain: 4/10
  – Manual therapy (if necessary)
  – Activities performed:
    • Thoracic stretching: 2x10 reps
    • Cervical upper trap stretching: 2x30”
    • Deep cervical flexor activation: 2x10 reps
    • Prone scapular activation: 2x10 reps
    • Wall push ups: 2x10 reps
    • UBE: 6-8 minutes
  – Post Exercise pain: 4/10
  – Encourage HEP to meet next goal

Second Session

• Patient performs same therapeutic exercises
• If tolerated previous session, increase frequency, duration and intensity by 10-15%

• Example:
  – Pre exercise pain: 5/10
  – Manual therapy (if necessary)
  – Activities performed:
    • Thoracic stretching: 2x12 reps
    • Cervical upper trap stretching: 2x30”
    • Deep cervical flexor activation: 2x12 reps
    • Prone scapular activation: 2x12 reps
    • Wall push ups: 2x12 reps
    • UBE: 8-10 minutes
  – Post Exercise pain: 4/10
  – Encourage HEP to meet next goal
Subsequent Sessions

• Patient performs same therapeutic exercises
• If tolerated previous session,
  – Increase frequency, duration and intensity by 10-15%
  – Positive reinforcement for meeting goals
• If does not tolerate previous session,
  – Do not increase from the previous session
  – Encourage patient to meet the goals
  – Downplay catastrophizing
  – Do not try to explain an anatomical rationale

Thank You!

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