Headaches and the Neck?

- Can the neck cause HA?
- Is this accepted across the medical community?

What is a Cervicogenic HA?

"Referred pain perceived in any region of the head caused by a primary nociceptive source in the musculoskeletal tissues innervated by cervical nerves”

North American Cervicogenic Headache Society
PREVALENCE OF HEADACHES

- 16% of general population have headaches
  - Kränzlin P, Wächli B. The concept of cervicogenic headache. Annual postgraduate course of the association of Swiss chiropractors. 1993;13
- 14% of population had HA
  - Olesen J. Cephalalgia 1990;5:159-164
- 35% of both male and female university students reported headaches

WHO
- At least 1 symptomatic HA per year: 50%
- ½ to ¾ of adults aged 18–65 years in the world have had headache in the last year
  - 30% or more have reported migraine.
- Headache on 15 or more days every month affects 1.7–4% of the world’s adult population

http://www.who.int/mediacentre/factsheets/fs277/en/

PREVALENCE OF CERVICOGENTIC HEADACHES

- Using IHA Criteria, 17.8% of headache sample had cervicogenic HA
  - 2.5% of general population
  - 2/3 were women

Headache Diagnostic Clinical Algorithm

- Exclude possible intracranial causes
  - Neuroimaging
  - Lab tests
- Exclude viral or infection
- Exclude drug-induced headache
- Consider exercise related headache
- Differentiate between
  - Vascular
  - Tension
  - Cervicogenic

Generally Accepted Cervical Causes of Headache

- Developmental abnormalities
  - Arnold-Chiari malformation
- Tumors of craniovertebral junction and upper cervical spine
  - Meningiomas
- Pagets Disease of skull with secondary basilar invagination
- Osteomyelitis of upper cervical vertebrae

Generally Accepted Cervical Causes of Headache

- Cervical disk disease
- Rheumatoid Arthritis or Ankylosing Spondylitis of the upper cervical spine
- Traumatic subluxation
- Retropharyngeal tendonitis
- Craniocervical dystonias
Trauma to the Cervical Spine and Head

“Based on the obvious anatomical association of the head and neck it is reasonable to expect that with any blunt impact and/or acceleration / deceleration of the head will also result in some degree of inertial loading to the soft tissue and joints of the cervical spine”

- Important factors from WAD studies:
  - As little as 4.5 g of neck acceleration can cause tissue damage
  - Signs and symptoms mimic those of a mild TBI


Post Traumatic Headache

- Severity of trauma does not matter
- IHS Criteria:
  - Loss of consciousness
  - Post traumatic amnesia > 10 minutes
  - At least 2 abnormalities
    - Skull X-ray
    - Neuroimaging
    - Evoked potentials
    - CSF
    - Vestibular function
    - Neuropsych testing
    - Headache onset < 14 days
    - Headache gone within 8-weeks

Cephalgia. 1997;18:S43-110

Commonly Reported Symptoms in High School and College Athletes Within 3 days of Concussion (Lovell, Neurosurgery 2007)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Symptom</th>
<th>% with symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Headaches</td>
<td>71</td>
</tr>
<tr>
<td>2</td>
<td>Feeling Slow Down</td>
<td>58</td>
</tr>
<tr>
<td>3</td>
<td>Difficulty Concentrating</td>
<td>57</td>
</tr>
<tr>
<td>4</td>
<td>Dizziness</td>
<td>55</td>
</tr>
<tr>
<td>5</td>
<td>Fogginess</td>
<td>53</td>
</tr>
<tr>
<td>6</td>
<td>Fatigue</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>Blurred or Double Vision</td>
<td>49</td>
</tr>
<tr>
<td>8</td>
<td>Light Sensitivity</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Memory Dysfunction</td>
<td>43</td>
</tr>
<tr>
<td>10</td>
<td>Balance Problems</td>
<td>43</td>
</tr>
</tbody>
</table>
CERVICOGENIC HEADACHES
MEDICAL DIAGNOSTIC CRITERIA

• Clinical examination or by imaging of a cervical source

• Complete relief of head pain following controlled, local anesthetic blocks of one or more cervical nerves, or structures innervated by cervical nerves

Bogduk (1992)

INTERNATIONAL HEADACHE SOCIETY (1990)

• Pain localized to the neck and occipital region

• Pain increased with neck movements, or sustained neck postures

• One of the following:
  • Resistance/limitation of active/passive neck movements of the upper cervical spine
  • Abnormal tenderness of neck muscles
  • Changes in muscle contour

• Radiologic exam finds either a fracture, abnormal posture, or movement abnormalities

CERVICOGENIC HEADACHES DIAGNOSTIC CRITERIA (International Headache Society)

• Clinical, laboratory and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck, known to be able to cause headache

• Evidence of causation demonstrated by at least two of the following:
  • 1. Headache has developed in temporal relation to the onset of the cervical disorder or appearance of the lesion
  • 2. Headache has significantly improved or resolved in parallel with improvement in or resolution of the cervical disorder or lesion

Cephalalgia. 2015; 33: 629–808
CERVICOGENIC HEADACHES DIAGNOSTIC CRITERIA (International Headache Society)

- 3. Cervical range of motion is reduced and headache is made significantly worse by provocative movements.
- 4. Headache is abolished following diagnostic blockade of a cervical structure or its nerve supply.
- Not better accounted for by another ICHD-3 diagnosis.

ICHD-3 Diagnostic Headache Criteria

- Doesn’t believe ICHD-3 criteria answered all the questions.
- Comments made that it falls short in distinguishing Cervicogenic Headaches from migraines and tension headache.

Frederickson TA. J Headache Pain. 2015;16:6

CERVICOGENIC HEADACHES DIAGNOSTIC CRITERIA

- HA precipitated by neck movements or by pressure against certain tender spots on the neck.
- There may be an ipsilateral shoulder, arm and hand pain, which may even be radiculopathic.
- There is stiffness and pain in the neck with crepitation on movements.
- There is reduced motility of the neck.
- Further evidence from local ipsilateral C2 and C3 anesthetic blocks - lateral approach.
- Syndrome or “reaction pattern”.

CERVICOGENIC HEADACHES DIAGNOSTIC CRITERIA

1. Unilaterality without side shift

2. a. Pain triggered by neck movement and/or sustained awkward posture
   b. Pain with external pressure over ipsilateral, upper posterior neck region or occipital region
   c. Decreased cervical spine range of motion
   d. Ipsilateral non-radicular neck, shoulder, and arm pain

3. Non-clustering pain episodes

4. Pain episodes of varying duration

5. Moderate, non-excruciating pain, non-throbbing

6. Pain starting in the neck, spreading to oculo-fronto-temporal areas where maximum pain is located

7. Anesthetic blocks of major occipital nerve, C2 root on symptomatic side abolish pain


CERVICOGENIC HEADACHES DIAGNOSTIC CRITERIA

a. Female Sex

9. Past history of head trauma

10. a. Nausea
    b. Vomiting
    c. Ipsilateral periocular swelling

11. Dizziness

12. Phono / Photophobia

13. Ipsilateral “blurred vision”

14. Difficulty on swallowing

**DIAGNOSTIC CRITERIA VALIDITY**

- Comparative study of patients with migraine, tension, and cervicogenic headaches
- Found that if 7 or more of the criteria were met for cervicogenic headaches, can:
  - Differentiate from Migraines with 100% sensitivity and specificity
  - Differentiate from Tension headaches with 100% sensitivity and 86.2% specificity

  Vincent, Luna. Cephalgia. 1999;25:S11-S16

**DIAGNOSTIC CRITERIA RESEARCH**

- Studied 2 criteria
  - Unilat HA without side-shift
  - Pain starting in neck and spreading to fronto-ocular
- Having both criteria resulted in higher frequency of cervicogenic HA
  - 74%

  Antonaci F. Cephalgia. 2001;21:573-583

**Clinical Practice Guidelines**

- Reasonable level of certainty when the following is present:
  - Unilat HA with neck/suboccipital symptoms increased by neck movements
  - HA increased with provocation of ipsilateral C spine
  - Restrict C spine ROM and segmental mobility
  - Impaired performance on cranial cervical flexion test
Bottom-line Problems in Diagnosing Cervicogenic Headache

- No specific qualities conclusively identify a headache as cervicogenic to the exclusion of other entities
- Diagnosis of exclusion
- The evidence of neck involvement may be ambiguous.
- No consensus of what is an adequate physical exam
- No trauma may be present
- Normal imaging may occur
- Little limitation of neck movements
- May have neck pain may not

Edmeads J. Headache. 2001
Edmeads J Neurology 1988;38:1874-1878

Review of The Anatomy and Physiology

Osseous Anatomy

- Consists of 7 vertebrae.
- C0-C2 (upper cervical spine, subcranial spine, suboccipital spine)
- C2-C1 – OA jt. (occipit-atlas)
- C1-C2 – AA jt. (atlanto-axial)
- C3-C7 – mid/lower cervical spine.
Occiput or C0
- Inferior portion of occipital bone.
- Occipital condyles

Atlas or C1
- C0-C1 - the ‘Yes’ joint.

Axis or C2
- Prominent spinous process
- Bifid spinous process
- Starting here, no more transverse processes
C1-C2

- Forms the 'No' joint.
- Majority of cervical rotation occurs here.
- Most active joint, 600x/hr (Bland, JH. 1990)

C3-C7

- At C2-C3, facet orientation changes.
- C4-C7 start typical cervical vertebrae characteristics.
- Area of most wear and tear
- Hypermobility
Referrals - Facet

- Referral map from symptomatic patients
- C2-3 most painful joint
- Cooper, G et al 2007 Pain Medicine

Referrals - Facet

- Healthy subjects
- Contrast medium injected into facet capsule
- Dwyer, A et al 1990 Spine

Images from Mercer, S and Bogduk, N 1999 Cervical Disc
Referral Patterns- Disc

Figure 2. Pattern of pain provoked by discography at each cervical level: C2-C3 (A), C3-C4 (B), C4-C5 (C), C5-C6 (D), and C6-C7 (E). For purposes of illustration only, pain is depicted as unilateral to the left at C4-C5 through C6-C7.

Upper Cervical Muscles

Cervical Muscles - Anterior
**Referral Patterns - Muscles**

**Upper Cervical Ligaments**

**Vascular Anatomy**

- **Vertebral Artery**
  - Off of subclavian artery
  - Enters C6 and travels cranially through transverse foramen
  - Areas of potential compromise
    - C1-C2 T.P. during Rot.
    - C4-C6 OA
Possible Referrals

Table 2. Distribution of the C1-C3 spinal nerves

<table>
<thead>
<tr>
<th>C1-C3 Dorsal root</th>
<th>C3, C4 supraspinous joints</th>
<th>Supraspinatus, pectoralis, rhomboids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanto-occipital</td>
<td>Longus colli, longus capitis</td>
<td>Multifidus</td>
</tr>
<tr>
<td>Lateral atlanto-occipital</td>
<td>Longus cervicis</td>
<td>Splenius capitis</td>
</tr>
<tr>
<td>Ligamentum nuchae</td>
<td>Occipital ligament</td>
<td>Sphenoid sinus</td>
</tr>
<tr>
<td>Rectus capitis occipital</td>
<td>Transverse ligament</td>
<td>Atlas spinous process</td>
</tr>
<tr>
<td>Trapezius</td>
<td>Santorini ligament</td>
<td>C2-3 spinous process</td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td>Dura mater of posterior fossa</td>
<td>Vertebrobasilar artery</td>
</tr>
</tbody>
</table>


*Anatomic scheme of cervicogenic headaches.

Trigeminal Nucleus

- Convergence between cervical and trigeminal nucleus
- Nociceptive afferents from the C1, C2, and C3
- Spinal nerves converge onto second-order neurons that also receive afferents from adjacent cervical nerves and from the first division of the trigeminal nerve (V), via the trigeminal nerve spinal tract.

Convergence between cervical afferents allows for upper cervical pain to be referred to regions of the head innervated by cervical nerves (occipital and auricular regions).

Convergence with trigeminal afferents allows for referral into the parietal, frontal, and orbital regions.
Evidence Informed Guide to Cervical Spine Examination

EXAMINATION

- HISTORY
- POSTURE
- ROM
- STRENGTH
- OUTCOMES
- SPECIAL TESTS
  - Neuro Screen
  - Ligament Laxity
  - VBI?
- PALPATION

PHYSICAL EXAMINATION

- Subjective History
  - Headaches origin
  - When started
  - Location of HA
    - Temporal, occipital or frontal
    - Unilat / Bilat
  - HA description
    - Throbbing, dull or pressure
  - Frequency
    - How long do they last
  - Nausea / Dizziness
  - Neck pain / Stiffness?
Medical Red Flags

- Craniovertebral junction abnormalities – Systems review and Imaging

- **Fusion of the atlas and occipital bone** - anterior-posterior diameter of the foramen magnum post to the odontoid process decreases to < 19 mm. Symptoms of cervical myelopathy

- **Platybasia** - asymptomatic flattening of the skull base.

- **Basilar invagination** - odontoid process protrudes into the foramen magnum. Short neck develops and combinations of brain stem, cerebellar, lower cranial nerve, and spinal cord signs.

Medical Red Flags

- **Klippel-Feil malformation** – a fusion of cervical vertebrae. Often asymptomatic except for neck deformity and limited range of motion.

- **Atlantoaxial subluxation or dislocation** - displacement of the atlas anteriorly in relation to the axis. Acute or chronic spinal cord compression as a result.

Use Caution

- **Red Flags** looking for the following conditions:
  - **Cervical myelopathy**
    - Babinski, clonus, sensory disturbance of hands, unsteady gait, bowel and bladder problems
  - **Upper cervical ligamentous laxity**
    - Occipital HA, severe limit of neck motion all directions, post trauma, RA, Downs
  - **Vertebral artery insufficiency**
    - Drop attack, dizziness, dysarthria, diplopia, cranial nerve signs, ataxia
EXAMINATION
Instability Tests

- **Transverse Ligament Tests**
  - **Sharp-Purser**
    - Patient: Sitting
    - PT: Hand on forehead, and other hand Thumb on SP of C2
    - Patient flexes head, while PT presses backward on forehead
    - (+) Test
    - Reduction in HA symptoms
    - Clunk
    - Sensitivity of 69%, and a specificity of 96% for laxity >3mm

- **Alar Ligament Mechanics**
  - **Lateral flexion**
    - Tightens Ipsilateral Atlantal portion, and Contra lateral Occipital portion
  - **Rotation**
    - Tightens Contra lateral Alar ligaments

- **Alar Ligament Stress Test**
  - **Lateral Flexion**
    - Patient Sitting: Neutral
      - Can do in supine
    - PT: Hold C2 over SP, and attempts to side flex head and C2. Only minimal Side flexion should occur
EXAMINATION
Instability Tests

- Alar Ligament Stress Test
  - Rotation
  - Patient sitting, neutral head
  - PT: Hold C2 SP with thumb, passively rotate head left and right.
  - Should not have > 30 degrees rotation without C 2 segment moving

\textbf{Bottom line:} Studies have much bias, and much variability

Examination

- Neurological and Orthopaedic Testing
  - Sensation testing – dermatome patterns
  - Assess Trigeminal distribution
  - Myotomal testing
  - Cranial Nerve testing ?
  - Deep tendon reflexes were symmetrical and 2+ for biceps brachii, brachioradialis, and triceps brachii muscles
  - Jaw Trigeminal Nerve: Potential Brain Stem
  - Scapulohumeral (Shimizu)
  - (C 0 to C 4) “Blind Zone”
PT EXAMINATION
Posture

- Done in both sitting and standing
- Look most specifically for:
  - Cervical spine rotation
  - Lateral head tilt
  - Thoracic / pelvic girdle rotation
  - Uneven weight-bearing
- Lateral head tilt and correction giving patient the perception of "leaning to the right" supported by concept of "Joint Position Error" (Treleaven et al 2003)

POSTURAL STRESSES

- Sitting in Class
- Surfing the Net/ Emailing Friends
- Texting / Cell
- Watching TV/Movies
- Playing Video Games
- Carrying Backpacks
- I-Pad / Kindle
- Doing Homework/Reading

Patient’s Dominant Posture

- Dominant versus Non dominant postures
- "Cross-over"

Course notes, Susan Clinton, Oct 1, 2016
EXAMINATION BREATHING

Faulty Breathing Patterns
- More associated with back pain than obesity and physical exertion (Smith et al., 2005)
- More associated with cervical pain (Herr et al., 2001)

Course notes, Susan Clinton, Oct 1, 2016

POSTURE AND CERVICAL FLEXOR MUSCLE STRENGTH

Subjects with headaches had:
- Greater amount of forward head,
- Less isometric strength, and
- Less endurance

When compared to non-headache group

Watson, Trott Cephalgia.1993

POSTURE AND CERVICAL FLEXOR MUSCLE STRENGTH

Subjects with headaches had less:
- Cervical extension ROM,
- Strength for both cervical flexors and extensors than non-headache subjects
- Forward head and shoulders was no different between groups

Placzek et al. J Man Mani Ther.1999
PT EXAMINATION
Neck Range of Motion

- Recorded on single trial, after 2 warm-up motions
  - ICC were found to be greater than 0.80 for intra- and inter-tester reliability. Youdas et al. Phys Ther. 1992;72:770-780.
  - Clinical reliability study
    - Test-retest reliability ICC .89-.98
    - Found that change in motion ≥ 5 degrees in any direction is true change
  - Standard Errors of Measurement was found to be 4° for flexion, 3° for extension, 2° for lateral flexion, 3° for right rotation, and 2° for left rotation
  - Universal Goniometer ICC was > 0.80 Youdas et al. Phys Ther. 1991;71:96-97

PHYSICAL EXAMINATION
Passive Segmental Spinal Mobility

- Inter-rater agreement of PIVM for the cervical spine has been found to be poor
- Excellent intra-examiner reliability has been found for segmental mobility assessment of the cervical spine
- Flexion Rotation Test
  - Was found to have 100% inter-tester reliability in assessing the specific mobility of the C1-2 spinal segment

UPPER CERVICAL SPINE and HEADACHES

- Flexion Rotation test showed average unilateral rotation of 27.6 degrees for headache patients, and 44.7 degrees for non-symptomatic controls
- Flexion rotation test has Sensitivity of 91%, and Specificity of 90%
- Severity of headache is not correlated to degree of ROM restriction
- Side of C1 C2 restriction correlated with side of headache
- Hall and Robinson. Man Ther. 2004 and 2010
- Asymmetry of greater than 10 degrees or 17 degree loss B/L is a positive test
- Sensitivity and specificity of the flexion–rotation test was 91% and 90%, respectively (P<.001), with an overall diagnostic accuracy of 91% (P<.001)
CERVICAL SPINE RANGE OF MOTION LIMITATION

- Subjects with cervicogenic headaches showed significantly greater ROM limitation for flexion/extension, rotation compared to migraine and tension headache groups

  Zwart JA. Headache. 1997;37:6-11

EXAMINATION
OA FLEXION

- Patient
  - Neutral head position
- Therapist
  - Knees slightly flexed
  - Fingertips between C1 TP and the tips of the mastoid process
  - By extending knees, rock patient’s head into forward flexion
    - Feel for separation between mastoid and C1 TPs
  - Axis of motion through the ears
- Can also rotate 30 degrees to R and nod, 30 degrees to left and nod

INTERVENTION
OA LATERAL GLIDE

- Patient:
  - Neutral head position
- Therapist:
  - Knees slightly flexed
  - 2nd Ray/ finger on C1 Transverse Process
  - Rock hips to left
  - Should feel Left TP move into your finger
- Axis of motion through the nose
Mobility testing

- Passive Physiologic Intervertebral Movement Testing (PPIVM) C2-7
  - **Prone**: P/A to each level assess / compare mobility
  - **Supine**: as a gentle side glide to each level, while supported the head and neck, cradle head
  - *Can also be tested in seated position*
  - *Technique does not matter as long as it ID’s deficits*

Examination

- **Muscle strength testing**
  - Mid range isometric neck
    - Flexors
    - Lateral flexors
  - Consider Cervical Rotation strength testing in 3 positions
    - Shortened
    - Mid range
    - Lengthened (Joint?)
  - Deep Neck Flexors
  - Scapular strength
  - Abdominals

PT EXAMINATION
Strength Testing

- **Cranio-cervical Flexion Test**
  - On wedge, OA nodding
  - Jull: Pressure sensor under neck. Cervical spine retraction: flattening out lordosis, increasing pressure 10 mmHg
  - **Activation Score** is that which patient can hold increase of 10 mmHg for 10 seconds, for 10 repetitions
    - *Spine 2002;27:1835-1843*
Cervical Strength Testing

- Neck Endurance Test
  - Maximal chin retraction and maintained
    - 2.5 cm (1 in) above the plinth while keeping the chin retracted to the chest
  - Verbal commands (ie, 'Tuck your chin' or 'Hold your head up') are given when either the line edges began to separate or the subject's head touched the rater's left hand
  - The test is terminated if the edges of the lines no longer approximated each other due to loss of chin tuck or the subject's head touched the rater's hand for more than 1 second

PT EXAMINATION

Strength Testing: Deep Cervical Flexors

- Neck Endurance Test
  - Excellent reliability
    - ICC= 0.93
    - Standard error: 6.4 seconds
  - Minimum change required to represent change
    - 17.8 seconds

  Harris KD. Reliability of a measurement of neck flexor muscle endurance. Phys Ther. 2005;85:1349-1355

Normative Values for Deep Neck Flexor Endurance Test

- Mean hold times
  - Men: 38.9 seconds
  - Women: 29.4 seconds
  - Correlations were not significant between age hold times or in activity levels and hold times

CERVICAL MUSCLE STRENGTH

- Deep neck flexor muscle strength significantly inferior in headache group when compared to control
  Jull (1999)

PALPATION

- Palpation of soft tissue:
  - Trigger point referrals
    - Sternocleidomastoid
    - Proximal and distal
    - Upper traps
    - Scalenes,
    - Suboccipital region
  - Jaw contributions:
    - Buccinator, temporalis, masseters, pterygoids
  - Pectoralis Minor
  - Scapulothoracic muscles

OUTCOME TOOLS

Numeric Rating Scale

- Has been shown to be a valid and reliable measurement, which can be used easily in the clinical setting (Williamson 2005)
- Has been shown that only a 2-point change in score is needed to indicate a minimum clinically important difference (MCID) in patients with low back pain (Childs et al 2005)
- MCID of the NRS was found to be 1.3 in patients with neck pain (Cleland et al 2008)
OUTCOME TOOLS

**Numeric Rating Scale**
- Asked per symptoms reported by patient
- Light headedness
- Dizziness
- Headache
- Neck pain / stiffness
- No research found using NRS for headaches

**Neck Disability Index (NDI)**
- Developed from a modification of the Oswestry Low Back Pain Index (Vernon and Mior 1991)
  - Test-retest reliability of 0.89
  - Minimal detectable change (MDC) of 4.2 percentage points
- Several studies have looked at Minimal detectable change (MDC) and MCID scores, with the best being a MDC of 10.2, and MCID of 7.0 percentage points (Westaway et al 1998, Cleland et al 2006)

**Headache Disability Inventory (HDI)**
- 25-item scale
- Determines impact of headache on daily living
- Good test-retest reliability
  - Total score
  - Functional
  - Emotional
  - MDC: 29 points

Lab: Examination Tests of The Cervical Spine

- Manual joint palpation
- Cranio-cervical flexion test
- Cervical flexion rotation test
- Cervical AROM
- Head forward posture
- Trigger point palpation
- Muscle tests of shoulder girdle
- Passive physiologic intervertebral movements (PPIVMs)
- Reproduction and resolution of HA symptoms
- Screening of thoracic spine
- Combined movement tests

Modified Sharp Purser

- Patients' head is slightly flexed and assess symptoms
- Examiner grasps the spinous process of C2 using a pincer grasp
- Gently apply a posterior translation force with the palm of your other hand through the patient's forehead, while stabilizing C2.
- Positive test is reproduction of myelopathic symptoms with forward flexion or decrease in symptoms during AP movement or excess displacement during movement. (may or may not have a clunk)

Specificity 96
+LR 17.3

Uhlrich, G & Indenbaum, S 1988
Alar Ligament Stress Test

- With the patient in sitting
- Stabilize the spinous process and gently rotate the head
- There should be minimal rotation available
- Increased rotation would indicate the Alar ligament has been compromised

No data for sensitivity/specificity

Alar Ligament Test

- The patient is in a sitting or supine position
- Using a pincer grip, place thumb and index finger on the sides of the C2 spinous process
- Place the opposite hand on vertex of hand, then impart either sidebending or rotation
- The examiner attempts to perceive movement of the C2 spinous process
- A positive finding is lack of movement palpated at C2 or a delay in movement, indicating alar ligament compromise

No data for sensitivity/specificity

C0-1

Bilateral Assessment

Possible left C0-1 restriction
C1-2 Mobility

Mid Cervical Assessment

Assess translations in flexion to assess for opening restrictions.
Assess translations in extension/neutral for closing restrictions.

Palpation

- Multifidus/deep rotatores
Treatment Interventions for the Cervical Spine and Dysfunction

Treatment of CGH
- Manual Therapy
  - For identified segmental dysfunctions
  - For trigger points
- Exercise prescription
  - Normalization of muscle length
  - Activation of deep neck flexors and extensors

Manual Therapy
- Physiotherapy and spinal manipulative therapy might be helpful for cervicogenic HA
- Systematic review of varying quality RCT’s
Manual Therapy

- Upper cervical and upper thoracic manipulation vs. mobilization or exercise
- 6-8 sessions with at least 1 session of manipulation
- Targeted C1-2 and T1-2 primarily
- Therapist discretion for other areas to be treated (other cervical levels, thoracic, ribs)

Thrust Techniques

Mobilization Techniques

- C1-2 UPA grade 4
- T1-2 CPA grade 4
Exercise

- Inflate cuff to 20 mmHg
- Instructed to raise to 22, 24, 26, 28, or 30 and hold for 10 sec x 10.

Results

- Thrust manipulation group found to have superior outcomes (NPRS, NDI) compared to nonthrust mobilization group and exercise
- Non-thrust with exercise some improvement

Trigger Points

- Soft tissue techniques to:
  - Posterior cervical musculature
  - Sternocleidomastoid
  - Upper trapezius
- Dry Needling
  - May be helpful in conjunction with other treatment modalities (Man Ther, exercise) (France, S, et al 2014)
  - Weakly supports dry needling
Exercises - Deep Neck Flexors

Exercise - DNF advanced

Exercise - Deep Neck Extensors
Exercises – Deep Neck Extensors

Cervical Extensor Endurance Test (Sebastian, D. et al 2015)

Exercises – Deep Neck Extensors

Manual Therapy Techniques for the Upper Cervical

Lab Time!
Prone C1-2 UPA

Figure 2. Posterior-anterior upper cervical spine joint mobilization. The thumb of the therapist makes contact over the C1/C2 zygapophyseal joint and a posterior-anterior glide is applied.

Nonthrust C2-3 Opening Mobilization

- Patient in supine
- Identify the segment that is to be opened, and place MCP at the segment above (eg. If opening right C2-3, right MCP is place at C2)
- Flex head until the C2-3 level
- Translate the head to the left
- Slightly sidebend the head and C1 to the right
- Then rotate C2 and head to the left until barrier
- Apply at rotary mobilization towards the patients opposite eye

Prone T1-2 CPA
LAB Specific Exercise Training

INTERVENTION Posture

- Passively elevating the scapulae by supporting the weight of the patient’s arms and asking her to adduct her scapulae allowed the patient to report a decrease in her posterior neck tension.
  - (McDonnell et al. 2005)

INTERVENTION Posture

- Sleeping
  - Pillow(s)
    - Neutral positioning
  - Side-lying / Supine
  - Not Prone
INTERVENTION
Home Exercise Program

- Sitting Scapular Setting
- Humeral External Rotation
- Adduct Scapulae
- Humeral ER
- **Don’t extend spine**

INTERVENTION
SOFT TISSUE MOBILIZATION

- Pectoralis Minor
  - Gentle Pressure downward on anterior shoulder
  - Fingers under 2nd Rib, sustaining pressure

INTERVENTION

- Cervico-thoracic Extension
  - Passive
  - Active
INTERVENTION
SELF MOBILIZATION

Seated supported cervical extension

SELF MOBILIZATION

- Cervicothoracic
  - Sitting
    - Rolled towel along thoracic spine
  - Standing against the wall
    - Towel or foam roll
  - Supine on Ball

Exercise

Diaphragmatic Breathing
- Reduce activation of accessory muscles for breathing
  - Scalenes, SCM's
- Muscles are tight due to weakness of DNF
- Educate patients how to breathe while activating the appropriate muscles
- Support patient in a posture that facilitates Breathing
INTERVENTION
Home Exercise Program

• Pectoralis Major Stretch
  • Clavicular Fibers
  • Sternal Fibers
  • “Step into Door”
    • Not leaning
  • 15 second hold time
  • 4 Reps, 2 times daily

INTERVENTION
Home Exercise Program

• Cervical spine retraction “Chin Tucks”
  • Subcranial “Elongation”
  • 5 second hold time,
  • 5-10 reps
  • 2 times daily
  • Supine and sitting
  • If supine, done in hooklying

INTERVENTION
SELF MOBILIZATION

• C Spine Retraction
  • Can do in neutral or rotation posture

• Use both hands behind on occipital region
  • Retract C-spine, and gently pull up with both hands
INTERVENTION
SELF MOBILIZATION

• Cervical retraction with OA flexion
  • May use opposite hand on top of head for over-pressure
  • Can also vary angle of pull to right or left

Passive to Active Assisted C1,2 Mobilization

• Mobilization
  • Rotational glide of C1 by contact on spinous process

• Tips
  • Pain Free
  • No oscillation
  • Horizontal plane
  • Very light pressure
  • Can vary flex/ext/rot

INTERVENTION
SELF MOBILIZATION

• OPPOSITE HAND SELF CERVICAL SPINE ROTATION STRETCH
  • Using opposite hand
  • Sustain cervical spine retraction
  • Keep Eyes Level
  • Prevent opposite shoulder from moving
    • Adduct Scapulae
  • Supine or sitting
    • Usually start in supine
INTERVENTION
SELF MOBILIZATION

- Patient places finger(s) anterior to right transverse process of C1, and then rotates head to the Right, applying gentle overpressure at end range
- NO PAIN

INTERVENTION
SELF MOBILIZATION

- ATLANTOAXIAL SELF MOBILIZATION
  - Hold towel with 2 fingers
  - Only perform 3 repetitions on first day of treatment
  - Prevent shoulder from moving

  (Mulligan 1991)

INTERVENTION
Home Exercise Program

- Patient places towel onto C2 spinous process
- Patient gently retracts head against C2 (anterior glide of C2)
- Hold towel with 2 fingers ("Gentle")
- Can use with hand as well
INTERVENTION
Home Exercise Program
• Scalenes
  • Anterior
  • Middle
  • Posterior
• Secondary breathing muscles
• Keep Chin tucked
  • Attachment to 1st and 2nd ribs
  Simons and Travell 1999

INTERVENTION
Home Exercise Program
• STRENGTHENING
  • Abdominals (Upper)
  • Abdominals (Lower)
  • Deep Cervical Spinal flexors
  • Middle / Lower Trapezius muscles

INTERVENTION
Home Exercise Program
• Cervical spine retraction “Chin Tucks”
** Not RETRACTION**
  • Subcranial “Elongation”
  • 5 second hold time
    • Progressively increase time of hold
  • 5-10 reps
  • 2 times daily
  • Supine and sitting
  • If supine, done in hooklying
INTERVENTION STRENGTHENING

- Deep Cervical Flexors
  - On wedge, OA nodding
  - Jull: Pressure sensor under neck. Cervical spine retraction: flattening out lordosis, increasing pressure 10 mmHg
  - Activation Score is that which patient can hold increase of 10 mmHg for 10 seconds, for 10 repetitions
    - Spine.2002;27:1835-1843
    - Cephalgia.1999;19:179-185

Cervical Flexion Strengthening

- Cranio cervical Flexion Test (CCFT)
  - Perform in supine, hooklying.
    1. Inflate blood pressure cuff to 20 mmHg and place between the lordotic curve and the surface of the table
    2. Perform cranial cervical flexion in 5 increments (22, 24, 26, 28, and 30 mmHg)
    3. Hold each position for 10 seconds with 10 seconds rest between (The cranial cervical flexion is performed by a head nod in the upper cervical spine)
    4. Make sure the patient’s jaw and neck are relaxed
    5. The test is ended when the pressure decreases >20% or when substitution occurs during the head nod.
  - Normal response is achieving 26-30 mmHg. > 10 second holds

STRENGTHENING

- Eye Movement
  - Effective when HA / neck tenderness acute
  - Pain free directions
  - May be done with eyes open/closed

- Self-Resistance
  - Mid range isometric
    - Flexion
    - Side Bending
    - Extension
    - Rotation
Neck Flexor Endurance
Strengthening

- Same as testing:
  - Chin retraction and maintained ~ 2.5 cm (1 in)
- Modify starting position
  - Standing, limit effect of gravity – nods, nod with weighted head strap
  - Inclined Supine
  - 60 deg ->45 deg ->30 deg
- Then supine training
- Side lying, s/l with
  - UE PRE
  - Quadruped

INTERVENTION
LOWER ABDOMINALS

- Pull lower abdominals inward, without lifting your ribs.
  - Your stomach will be flat or “hollowed”
  - You may roll your pelvis so that your back flattens slightly
  - Hold 3-5 seconds
- Keep your chin tucked

Exercise - DNF advanced

- DNF lift with rotation
- DNF with wall PU

Mc Donnell 2005
Exercises - Deep Neck Extensors

Advanced training

- Quadruped
  - Sustained neutral Spine
  - Can add neck movement
    - Arm lifts
    - Leg lifts

Advanced training

- Quadruped
  - Small weight ~ 1 Pound
  - Can add
    - Eye movements
    - Cervical rotation
Exercises – Deep Neck Extensors

INTERVENTION
UPPER ABDOMINALS

- Pull in your lower abdominals
- Tuck your chin
- Support back of lower neck with hands clasped
- Keep elbows together
- Roll head and shoulders up from bed without lifting chin away from chest

INTERVENTION
Scapulothoracic Strengthening

- Middle and Lower Trapezius Muscles
  - “Set” the Scapula
  - Externally rotate the humerus
  - Increase reps
  - C spine neutral
  - Can do over bolster/
    - Swiss Ball
  - Progress to bilat
INTERVENTION
Home Exercise Program
LOWER TRAPEZIUS

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CERVICAL KINESTHESIA

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<tr>
<th>Posture</th>
<th>Direction</th>
<th>Cm from Target</th>
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CERVICAL KINESTHESIA
Proprioception Testing

- Tested in
  - Vertical
  - Horizontal
  - Diagonal
- Patient moves to edge of board or pain free
- One repetition
- Score # cm off from center of target
  - If outside of target (10 cm)
CERVICAL KINESTHESIA
Smooth Pursuit Testing
- Tested in:
  - Vertical
  - Horizontal
  - Diagonal
- Patient is to move the laser along the line
- Record # times dot leaves the line
- Speed of movement should be 3-7 seconds per line

JPE Training

CERVICAL KINESTHESIA
Laser Rehabilitation Exercises
- Smooth Pursuit
  - Horizontal
  - Vertical
  - Diagonal
  - Right
  - Left
  - Vertical and Horizontal
- Eye / Neck separation exercise
- Fix Laser
  - Move eyes to target
- Fix eyes
  - Move laser to target
- Eyes / neck fixed
  - Body turns
- Eccentric Stabilization
CERVICAL KINESTHESIA Rehabilitation

- Exercises are designed to give visual feedback on movements of the cervical spine
- Exercises can be done within 5 to 15 minutes
  - Per patient tolerance
- Speed of movement should be "relatively slow"
  - 5-10 seconds per line
- 40-50 seconds for each exercise
  - 5-7 minutes

Questions

THANK YOU

- OPTA Conference Committee
- OPTA Staff