Manipulative Treatment of Multifaceted Headaches

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Learning Questions

1. What headaches are amenable to osteopathic manipulative treatment (OMT) and other non-interventional approaches?

2. What are manipulation indications and contraindications?

3. What OMT techniques can be used for cervical manipulation and mobilization?

4. What are relative risks?
Is Neck Manipulation Safe?

www.abcnews.go.com
Who does Cervical Manipulation?

- DC’s
- DO’s
- Some MD’s
- PT’s
- MT’s
- Patients and their family members
- ... People around the world who practice hands-on methods of relief
“Will you take your hands off me! What are you playing – Osteopath?”

*His Girl Friday*
Why Manipulate the Neck?

• Pain
• Reduced motion dynamics
• What else is involved? Might be more than neck or elsewhere reflecting to neck
Epidemiology of Neck Spinal Pain

• Acute vs. Chronic
  – Acute = Pain on most days > 2 weeks
  – Chronic = Pain on most days > 6 months

• Traumatic vs. Atraumatic

• Incidence peaks at 20-40 years old

• Females > Males cervical-upper thoracic pain

• Lifetime prevalence 71%

• Physical, occupational and psychoemotional factors
Standard Neck Dysfunction Etiologies

- Facet arthropathy
- Trigger points
- Trauma – Falls, MVA, sports, whiplash
- Stress, mood disorder
- Posture
- Overuse
  - Neurologic: Radiculopathy, brachial neuralgia, cervicobrahial syndrome, thoracic outlet syndrome, cranio cervical syndrome, spasmodic torticollis, dystonia, migraines, TBI, postconcussion, stroke, post-polio, meningitis
  - Orthopedic/Rheumatologic/Degenerative: DDD/DJD, spondylosis, osteoporosis

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Multivariate Neck Dysfunction Etiologies

- ENT: Sinus, mass, compression, deviated septum
- Sleep: Pillow, apnea (airway, mask)
- Endocrine: Thyroid (including post-TBI/whiplash), pituitary (including postpartum)
- Congenital: Perinatal, vertebral fusion, torticollis
- Breathing: Accessory muscles of respiration, fasciae, suspensory ligs of lungs, asthma, COPD, pneumonia, pertussis, croup
- Hyoid
- Cervical: Adhesions (spinal, dural)
- Craniofacial/Dental: Implant, caries, trigeminal (esp V2 to C2), TMJ
- Craniocervical: Spinal/cranial accessory, suboccipital neuralgia, vagal
- Vertigo & Dizziness: Skull base unleveling, monaural/bilateral semilunar canal XYZ-axis skewing
- Vision: Eyestrain, eyewear, Lasik
- Cranial: Dural, vascular, fascial, falx/tentorium, CSF, osseous, muscular
Whiplash 1

• Neck pain is #1 symptom in whiplash

• 66-82% whiplash neck injuries are from rear-end collision
  – Acute neck pain is more common among front seat occupants than rear

• Female ~2x > male

• Lighter > heavier people

• Taller > shorter

Whiplash 2

• Whiplash is a “total body injury” involving neck + back, head, rest of body
  – Cisler T. *J Am Osteopathic Assn* 1990

• “Crash test dummies don’t have jaws” so historical data omitted TMJ disorders from accident data
  – In: Swerdlow B. Headache

• Thyroid/hyoid region structural and functional disorders are often overlooked
Whiplash 3

• Consider “Mechanism of Injury” factors including speed, vectors, force, impact, vehicles types, activities during accident, awareness of imminent collision, belt and head restraints, air bag deployments...

• Strains can involve various tissues and systems:
  – Musculoskeletal
  – Neurological
  – Visceral
    – Mediastinum: Cardiopulmonary and Vascular
    – GI: Liver, omentum, Esophageal traction/GERD/hiatal hernia
Unwinding: 11 mo baby who has abnormal crawl & head positioning – born with tight nuchal cord x 2
“He just took us through his birth”
Cervical Manipulation > “Cracking”

- Articulatory/Osseous
  - HVLA – Mobilization *with* Thrust = controlled fast movement in short distance
  - LVMA – Mobilization *without* Thrust

- Soft Tissue Mobilization
  - Muscular
  - Myofascial
  - Neural
  - Ligamentous
  - Dural

- Fluid/Cellular/Energetic

*Diagram by AT Still, MD DO, from a workbook of his writings. AT Still Museum, Kirksville, MO*
Indications for Cervical Manipulation

- Facet pain
- Headaches
- Cervical disc (non-displaced)
- Strains and pains of neck and upper or lower back
- Restricted biomechanical dynamics – somatic dysfunctions (DO/MD/PT) vs. subluxations (DC)

- Selected patients with a wide range of conditions: cervical dystonia, whiplash, dysphonia, fibromyalgia (+/-)...
  - Pediatric
  - Pregnant
  - Geriatric
  - Acutely ill
Contraindications: HVLA

• Ligament laxity
  – From repeated manipulation/self-manipulation – DC overtreatment???
  – Pregnant
  – Down’s Syndrome

• Severe rheumatologic/orthopedic diseases
  – Osteoporosis
  – Inflamed joint or segment or acute radiculopathy/disc herniation
  – Advanced or active RA or spondyloarthropathy
  – Spondylolysis/listhesis (beyond grade 0-1)
  – Spinal stenosis
  – Unstable structures: Fracture; loose fixation or fusion

• Hemarthrosis associated conditions/risks
  – Patients on anticoagulants or with coagulopathies
  – (Uncontrolled/brittle) diabetes
  – Stroke (acute/subacute)
Contraindications: Soft Tissue/Other

• ...... few to no risks or bars if the practitioner is skilled and treatment is wanted by the recipient

• Staunch bleeding

• Don’t disseminate infection or malignancy

• Respect anatomic/physiologic barriers
Spinal and Membranous Dynamics

**Intracranial** strains can extend from neck and below
→ Headache

**Cervical** spine is tethered from below only, so can move in any direction
→ Spasmodic Torticollis has 4 patterns

**Thoracolumbar** spine is tethered between two poles, so has limited range of motion
→ Scoliosis

*5 Spinal junctions*: OA, CT, TL, LP/LS, SCx
*5 diaphragms*: Feet, Pelvic, Resp, Sh, Head

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3 Columns of Neck Nexus

1. Spine & associated elements/contents
   - Skeletal elements
   - Intervertebral discs
   - Ligaments
   - Muscles
   - Fascia
   - Vessels: Blood, Lymph
   - Membranes: Dura, meninges
   - Nervous system: central & peripheral; SNS/PNS/ANS

2. GI

3. Respiratory & Vocal
Cervical Fascia is 3 layers of “tubes within tubes”

- **Superficial**: Single sheet over subcutaneous fat, platysma, external jugular vein, and cutaneous sensory nerves
- **Intermediate**: Alar fascia – spreads behind esophagus, surrounds carotid sheath
- **Deep**:
  - **Outer**: Trapezius and SCM (spinal accessory nerve)
  - **Middle**: Strap muscles, scapula
  - **Inner**: Prevertebral fascia scalenes, longus colli m, anterior longitudinal lig
Anterior Muscles of the Neck

- Platysma (5)
- Mylohyoid (2)
- Anterior/Posterior belly of the digastric (3)
Strap Muscles

- The small, flat muscles inferior to the hyoid bone including:
  - sternohyoid
  - omohyoid
  - sternothyroid
  - thyrohyoid
Neck Muscles

- Semispinalis
- Splenius Capitus
- SCM
- Levator scap
- Trapezius
- Anterior and posterior scalenes
Neurovascular Structures

- Cervical nerve roots
- Cervical sympathetic nerves & ganglia
- Sinuvertebral nerve
- Proprioceptive reflexes
- Carotid, vertebral & subclavian arteries
- Lymphatic channels and nodal chains
Vertebral Artery in situ
Cervical Biomechanics

• **Occipito-Atlanteal (OA) joint** *Bony stability*
  – Flexion-Extension 20-25 degrees
  – Occipital condyles are pitched in a “double fall line” dual pitch of {O condyles convex + A sockets concave surfaces} at 30 degrees tilt towards midline and tilt anteriorly, creating a coupled motion of *contralateral* side bending and rotation of the occiput on the atlas

• **Atlas-Axis (AA) joint** *Ligamentous stability*
  – Rotation 45-50 degrees; 50% of cervical rotation is at AA

• **C2-C7**
  – F/E 45-50 degrees (balance of ~70 degrees), rotate 50%
  – *Ipsilateral* side bending and rotation of each vertebral segment on one below
  – C6-7 (4-7) motion starts & ends F/(E) – Bogduk & Mercer, 2000
Diagnosing the OA Joint

Figure 5.84. A. Step 5, extension.

Figure 5.84. B. Step 5, flexion.

Figure 5.85. Step 6, left side bending/rotation coupling.

Figure 5.86. Step 6, right side bending/rotation coupling.

Techniques for Treating the Cervical Spine

For Movies of Any of these techniques see
http://www.acofp.org/apps/OMT/index.html
Soft Tissue Technique
Myofascial Release

Claviculopectoral fascia

www.premieruppercervical.com

Nicholas & Nicholas

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Strain-Counterstrain
Muscle Energy Technique

MET can bridge into home exercise/stretching program

www.myosculpture.com
Techniques of Still

1. Rotate to ease
2. Compress
3. Rotate to barrier
Ligamentous Articular Strain
Articulatory Technique
Low Velocity Moderate Amplitude
High Velocity Low Amplitude (HVLA)

- High Velocity Low Amplitude/Distance
- Manipulation with thrust
Osteopathy in the Cranial Field, Craniosacral Manipulation

It’s not IN your head. It IS your head!

Nicholas and Nicholas

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Relative risks of procedures

Facet injection
Manipulation
NSAIDs
Steroids
“Don’t crack your neck!”
Sohyaelee’s weblog

NY Times 2013
Cervical Manipulation- Risky Business?

BM Wand, PJ Heine, NE O’Connell: *Should we abandon cervical spine manipulation for mechanical neck pain? Yes.* BMJ 2012 7 Jun; 344:e3679

- HVLA only maneuver singled out for concern

- “Incidence of vertebral artery dissection is low, with estimates between 1 (95% confidence interval 0.5 to 1.4) and 1.7 (1.1 to 2.3) per 100 000 person years in the United States.”

- “The estimates for stroke resulting from vertebral artery dissection are lower still, ranging from 0.75 to 1.12 per 100 000 person years...”

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Side Effects


• 55 percent of 1,058 patients (4,712 treatments, up to 6) reported unpleasant reaction(s) after spinal manipulation by 102 Norwegian chiropractors.

• Common: local discomfort (53 percent), headache (12 percent), tiredness (11 percent), and radiating discomfort (10 percent). Reactions were mild or moderate in 85 percent, and most were short-lived (74 percent resolved within 24 hours).

• Uncommon reactions, such as dizziness and nausea, accounted for less than 5 percent of the symptoms. No serious complications were reported.
Relative Risks – Review of Literature


- 177 cases in 116 articles published 1925-1997.
- Injuries: arterial dissection or spasm, and lesions of the brain stem.
- Death occurred in 32 (18%) of the cases.
- “… vertebral artery damage... can be avoided with the use of mobilization (nonthrust passive movements).”
Vertebral Artery Insufficiency

- Dizziness/Vertigo
- Dysphagia
- Drop attacks
- Malaise and nausea
- Vomiting
- Incoordination
- Difficulty walking
- Visual Disturbances

- Severe Headache
- Weakness in the extremities
- Sensory changes in face or body
- Dysarthria
- Altered mental status
- Hearing difficulties
- Facial paralysis
Reported Complications of Cervical Spine Manipulation

- Vertebrobasilar insufficiency/stroke
- Lateral medullary infarction
- Internal carotid artery dissection
- Cerebral infarct
- Cervical myelopathy
- Cervical radiculopathy
- Long thoracic nerve palsy
- Diaphragmatic palsy
- Central retinal artery occlusion
- Cervical fracture/dislocation
- Epidural hematoma
- Intervertebral disc herniation
- Tracheal rupture

Vertebrobasilar Artery


- Some researchers conclude that this complication occurs primarily in “at-risk” patients (those with anomalies of the vertebral vessels, cervical spondylosis, atherosclerosis, fibromuscular dysplasia, or hypertension) but others have found these “risk factors” to be largely absent (Frumkin LR, Baloh RW. *Neurology* 1990).

  – Gay & Nelson 2003
Word of Caution
It is generally accepted that backward bending one vertebral segment is allowed.

However, hyperextension of the cervical spine coupled with excessive and forceful rotation has been linked to vertebral artery dissection and stroke.
Screening

• **Vertebral Artery (Cervical Quadrant) Test/George’s Test:**
  - Patient is supine
  - Passively place the patient’s neck in extension/sidebending.
  - Rotate to the same side as side bending for 30 seconds
  - Repeat to the opposite side

• **DeKleyn-Nieuwenhuyse Test:**
  - Patient is supine or seated
  - Fully extend the patient’s cervical spine
  - Rotate each direction for 30 seconds

• Haldeman et al. (*Spine* 1999) reviewed the literature to identify potential risk factors and precipitating events related to vertebrobasilar artery dissection. **No one specific neck movement, position, or type of manipulation was found to be associated with vertebrobasilar dissection, and the majority of cases appear to occur spontaneously or following trivial neck movement or trauma (i.e., not in association with spinal manipulation).** A specific population at risk for dissection could not be identified. It was concluded that, although there may be some unique but as yet unidentified factor that predisposes to vertebrobasilar dissection, little evidence supports the contention that cervical manipulation, or any other neck motion, position, or injury is a significant risk for these occurrences.
Relative Risks (Gay & Nelson 2003)

- Although the risk of stroke after SMT is real, the relative risk compared to other commonly prescribed treatments must be kept in mind.

- Nonsteroidal anti-inflammatory agents (NSAIDs) are commonly prescribed for low-back pain, neck pain, and headaches. The estimated risk of being hospitalized with gastric ulcer caused by NSAID use is .4 percent per year among osteoarthritis patients and the risk of death is .04 percent per year (1:2500; 3,200 deaths) – Jagbandhansingh MP. *JMPT* 1997

- Although a disproportionate number of these deaths likely occur in elderly patients or persons with complicating comorbidities (as compared to stroke after cervical manipulation, which often occurs in young persons), the risk of treating back and neck pain with NSAIDs is probably far greater than the risk of treatment with SMT. – Gabriel SE, Jaakkimainen L, Bombardier C. *AIM* 1991
Complications of Chiropractic Manipulation (Gay & Nelson 2003)

• The frequency of stroke following cervical manipulation has not been clearly established, but is estimated to occur at a rate of 1:400,000 to 1:1- to 3 million manipulations (Dvorak J, Orelli F. Manual Med 1985; Shekelle PG, Coulter I. J Spinal Disord. 1997).

• After review of the literature, Hurwitz et al. (Spine 1996) estimated the occurrence of 5-10 serious complications and 3 deaths for every 10 million cervical spine manipulations.

• Klougart et al. (J Manipulative Physiol Ther. 1996) studied the patients of 226 Danish chiropractors and recorded symptoms after treatment thought to represent “vertebrobasilar incidents” (dizziness; loss of consciousness; nausea or vomiting; auditory, visual, sensory disturbance; paralysis; paresis; ataxia; cramps). These symptoms were present in 1 in 180,000 treatments overall, but were more common with rotary manipulation, especially rotary manipulation of the upper cervical spine (1:83,000). Five cases of completed stroke were noted (one death, four permanent sequelae). The risk of death or permanent sequelae was determined to be 1 in 1.3 million treatments.
References

Thanks to Nathan Nakken, OMS4, and Dr. Eric Gish, DO for many slides! – Rocky Vista University College of Osteopathic Medicine, Parker, CO

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Questions?

Thank You!

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Adrian Tournachon 1862
Metropolitan Museum of Art, NY