Osteopathic Manipulative Medicine: Cervical

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DISCLOSURES

There are no actual or potential personal, financial or legal conflict of interest in relation to this program or presentation.
BACKGROUND TO NECK PAIN

“Neck pain is one of the most common complaints of patients seeking a primary care physician... it is 1\textsuperscript{st} for MVA victims and only 2\textsuperscript{nd} to low back pain for patient’s seeking manual treatment”

“Accurate, gentle diagnosis & treatment of the cervical spine is an important aspect of patient care”

~ Foundations of Osteopathic Medicine – 3\textsuperscript{rd} ed. p.513
Neck pain can be due to many factors:

- Cervical Somatic Dysfunction [M99.01]
- Cervical Muscle Strain [S16.1]
- Cervical Ligament Sprain [S13.4]
- Cervical Spondylosis [M47.812]
- Cervical Spondylotic Myelopathy [47.12]
- Cervical Radiculopathy [M54.12]
BACKGROUND TO NECK PAIN

Text Neck Syndrome
Not Just a Neck Problem

Assessment of stresses in the cervical spine caused by posture and position of the head. An increase in forward head position increases the weight on the cervical spine.

<table>
<thead>
<tr>
<th>Angle (°)</th>
<th>0°</th>
<th>15°</th>
<th>30°</th>
<th>45°</th>
<th>60°</th>
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<tr>
<td>Value</td>
<td>12b</td>
<td>27b</td>
<td>40b</td>
<td>49b</td>
<td>60b</td>
</tr>
</tbody>
</table>

When the head is brought forward and the neck bends, the weight on the cervical spine increases.

Anterior Head Position can cause permanent damage and result in:
- Headaches
- Back Pain
- Muscle Damage
- Nerve Damage
- Spinal Disc Herniation
- Spinal Disc Compression
- Decrease in Spinal Curve

Prevalence of Selected Types of Pain, by Gender

- Lower back pain: Men 26.3%, Women 30.6%
- Neck pain: Men 12.8%, Women 17.7%
- Migraine: Men 10.1%, Women 6.7%
- Facial or jaw pain: Men 3.3%, Women 6.7%
Cervical Region Anatomy
Vertebral motion of the superior vertebrae on inferior vertebrae: Rotation (R)
Ex: C2 refers to C2 in relation to C3

Anatomic Position: Neutral (N)
Forward bending: Flexion (F)
Backward bending: Extension (E)
Lateral Flexion: Sidebending (S)
CERVICAL SPINE

7 Cervical Vertebrae

Atypical Cervical Spine
• C1, C2, C7

Typical Cervical Spine
• C3-C6
OCCIPITO-ATLANTO (OA) JOINT

Occiput on C1 “Atlas”
Sidebending and rotation occur to opposite sides
“Type-1-like”
ATLANTO-AXIAL (AA) JOINT

Articulation of C1 on C2
- C1 - “Atlas”
- C2 - “Axis”

Primary motion: Rotation

C1 “Atlas” articulates with Dens of C2 “Axis”
C2 - C7 CERVICAL VERTEBRAE

Articulations of C2 on C3, C3 on C4... C7 on T1

Obeys Fryette’s 2nd Law:
• Sidebending and rotation occur to same sides
POSTERIOR NECK MUSCLES

Trapezius

**Origin:** External occipital protuberance, nuchal ligament, spinous processes of C7-T12, occipital bone
**Insertion:** Lat 1/3 of clavicle, spine of scapula, acromion, nucal ligament

**Function:**
- Elevate shoulder, depress & retract scapula
- Steadies scapula on thorax
- Extend, laterally flex & contralaterally rotate head
**Levator scapulae**

**Origin:** Transverse processes of C1-C4

**Insertion:** Superior border of scapula

**Function:** Elevates scapula

![Diagram of posterior neck muscles with labels](image)
POSTERIOR NECK MUSCLES

**Spleniust Capitis**

**Origin:** Nuchal ligament and spinous processes of C7-T3

**Insertion:** Occipital and mastoid process of temporal bone

**Function:**
- Extend head
- Laterally flex and rotate head to same side
Sternocleidomastoid

**Origin:** Manubrium and medial clavicle

**Insertion:** Mastoid process of the temporal bone, superior nucial line

**Function:**
- Tilt head to ipsilateral shoulder
- Rotates head to opposite shoulder
- Cervical flexion
ANTEROLATERAL NECK MUSCLES

Scalenes

Anterior
- **Origin:** TP of C3-C6, **Insertion:** 1st rib
- **Function:** Flex and SB ipsilaterally, rotate to opposite side

Middle
- **Origin:** TP of C2-C6, **Insertion:** 1st rib
- **Function:** SB ipsilaterally, elevates 1st rib

Posterior
- **Origin:** TP of C4-C6, **Insertion:** 2nd rib
- **Function:** SB ipsilaterally, elevates 2nd rib
Thoracic Outlet Syndrome

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Evaluation of Neck Pain
EVALUATION OF NECK PAIN

• Obtain a good HPI
• Visually inspect patient from different angles
• Use passive/active range of motion and orthopedic tests to determine restricted motion
• Palpate all accessible portions of the muscles involved
• Correlate findings with knowledge of anatomy and palpatory exam
• Obtain appropriate imaging
PHYSICAL EXAM

• Visually inspect: Eyes, Ears, OA, Cervical Curves
• ROM – Active Flexion/Extension, Rotation, Sidebending
• Palpation – Assessment of OA and AA is difficult. Assess OA and AA by its segmental motions.
• Palpation of the cervical spine: Must feel through: skin, SQ (fat), muscle, articular pillars or columns: 2-3 cm from spinous processes lateral edge of semispinalis muscle.
• Segmental Motion Testing: Gliding OA on Condyles, AA Rotation, Flexion and Extension of C3-7, Translation - Sidebending and Rotation coupled.
• Upper C spine Prefers Rotation
• Lower C spine Prefers Sidebending
Cervical Compression, Jackson’s Compression, or Maximum Foraminal Compression

Indication for testing: Neck pain, pain radiating down the arms

Contraindication: acute significant trauma, severe rheumatoid disease, cervical instability, fracture

Procedure:

- The examiner stands behind, placing hands on top of the seated patient’s head.
- Gradually increasing pressure is applied axially down through the neck. If arm symptoms are not aggravated, the test may be repeated with the neck in a variety positions.
- Lateral flexion. The next option is to laterally flex the neck to the side of pain and again apply an axial load. Combined. If necessary, lateral flexion can be combined with extension (both of these variations have at times been referred to as Spurling’s test).
- Rotation to the symptomatic side can be added to the extension and lateral flexion in an attempt to further close down the intervertebral foramen (maximum foraminal compression).
- Other variations include holding the compression for 30-60 seconds, axial compression combined with rotation to the symptomatic side but without lateral flexion or extension (Jackson’s compression), or adding a quick vertical blow to the top of the head (considered part of Spurling’s test).

Interpretation: Creation or reproduction of upper extremity pain, paresthesia or numbness is suggestive of radiculopathy. Herniated cervical disc and osteophytic compression lead the list of differential diagnoses. However, stenosis, space occupying lesions, traction injuries, and other causes of radiculopathy may also test positive. Aggravation of local neck pain only suggests cervical disc derangement, facet syndrome, or intersegmental dysfunction.
Cervical Compression, Spurling’s Test, or Maximum Foraminal Compression
IMAGING

• Plain x-rays of the spine help rule out fracture or dislocation as well as diagnose osteoarthritis
• CT scan for occult fractures, some soft tissues injuries
• MRI to diagnose soft tissue injuries and herniated discs
Osteopathic Manipulative Medicine of the Cervical Spine
DIAGNOSIS OF SOMATIC DYSFUNCTION

• T.A.R.T. is used in diagnosing somatic dysfunction. The following signs are assessed during the osteopathic examination:

• T – Tenderness
• A – Asymmetry (static finding)
• R – Restricted range of motion (dynamic finding)
• T – Tissue texture changes
BARRIERS TO MOTION

Anatomic Barrier
• The limit of motion imposed by anatomic structure (limit of passive motion)

Physiologic Barrier
• The limit of active motion

Restrictive Barrier
• The functional limit within the anatomic and physiologic range of motion which abnormally diminishes the normal physiologic range of motion

Pathologic Barrier
• Permanent restriction of joint motion associated with pathologic changes of tissues (i.e. Osteophyte)
# Freyette’s Laws of Physiologic Motion

<table>
<thead>
<tr>
<th>1&lt;sup&gt;st&lt;/sup&gt; Law: Type I</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Law: Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>Hyperflexion/hyperextension</td>
</tr>
<tr>
<td>Several Segments (3 or more)</td>
<td>1-2 Segments</td>
</tr>
<tr>
<td>Sidebending/rotation opposite</td>
<td>Sidebending/rotation to the same side</td>
</tr>
<tr>
<td>Rotation into the convexity</td>
<td>Rotation into the concavity</td>
</tr>
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3rd Law

Inducing motion in one plane reduces or modifies the motion in the other two planes
<table>
<thead>
<tr>
<th>Direct</th>
<th>Indirect</th>
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<tbody>
<tr>
<td>• Myofascial Release</td>
<td>• Myofascial Release</td>
</tr>
<tr>
<td>• Cranial (children)</td>
<td>• Cranial (adult)</td>
</tr>
<tr>
<td>• Still</td>
<td>• Still</td>
</tr>
<tr>
<td>• HVLA</td>
<td>• Counterstrain</td>
</tr>
<tr>
<td>• Muscle Energy</td>
<td>• FPR</td>
</tr>
<tr>
<td>• Soft Tissue</td>
<td>• BLT</td>
</tr>
<tr>
<td>• Articulatory</td>
<td></td>
</tr>
<tr>
<td>• Springing</td>
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## OMT CONTRAINDICATIONS

<table>
<thead>
<tr>
<th>Muscle Energy</th>
<th>HVLA</th>
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<tbody>
<tr>
<td>• Muscle Tear</td>
<td>• Absolute</td>
</tr>
<tr>
<td>• Fracture</td>
<td>• Fracture</td>
</tr>
<tr>
<td>• Severely ill</td>
<td>• Metastasis</td>
</tr>
<tr>
<td>• Non compliance</td>
<td>• Rheumatoid Arthritis (AA)</td>
</tr>
<tr>
<td></td>
<td>• Down Syndrome (AA)</td>
</tr>
<tr>
<td></td>
<td>• Relative</td>
</tr>
<tr>
<td></td>
<td>• Rheumatoid Arthritis</td>
</tr>
<tr>
<td></td>
<td>• Osteoarthritis</td>
</tr>
<tr>
<td></td>
<td>• Osteoporosis</td>
</tr>
<tr>
<td></td>
<td>• Disc Herniation</td>
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OSTEOPATHIC MANIPULATIVE TREATMENT

• Myofascial Techniques
  • Longitudinal stretch
  • Perpendicular stretch
  • Mobilization (figure eight, traction)
  • Suboccipital tension release

• Soft Tissue Techniques
  • OA Suboccipital Release
  • Longitudinal Stretching
  • Perpendicular Stretching

• Counterstrain Techniques
  • Find and palpate the area of pain. Tell the patient that this is now a 10/10 pain scale.
  • Set the patient position.
  • Position patient until 3/10 pain relief or less from the patient.
  • Hold for 90 seconds
  • Reassess
OSTEOPATHIC MANIPULATIVE TREATMENT

• Muscle Energy
  • Setup the patient in all restrictive barriers
  • 3-5 seconds of isometric contraction.
  • Post isometric relaxation stretching.
  • Repeat.
  • Final stretch.

• HVLA
  • Glide head on condyles into Flexion or Extension restrictive barrier.
  • Sidebend to restrictive barrier.
  • Rotate to restrictive barrier.
  • Short rotational thrust though barrier in direction of ipsilateral eye
CERVICAL VERTEBRAL ARTERY DISSECTION
Osteopathic Manipulative Diagnosis and Techniques
ATLANTO-OCCIPITAL (OA) JOINT FLEXION/EXTENSION
Positioning: grasp the patient’s head with both hands, with the fingertips of the index and middle fingers over the occipital articulations

- The OA joint will be assessed in the neutral, flexed and extended positions
- Perform translation
  - Right translation = Left sidebending
  - Left translation = Right sidebending
- Diagnosis = position of ease (e.g., OA FRLSR)
**MUSCLE ENERGY FOR OA**

**Diagnosis:** OA XRLSR or XRRSL (where X = flexed or extended)

- Position patient against the restrictive barrier
- Support the patient’s head the same hand positioning as diagnosis
- Have the patient sidebend their head away from the direction you are sidebending them for 3-5 seconds
  - Complete relaxation
- Establish new barrier
- Repeat 3-5 times
  - Final stretch then retest
MUSCLE ENERGY FOR FLEXED OA

**Diagnosis:** OA FRLSR or FRRSL

- Position patient against the restrictive barrier
- Support the patient’s head with one hand and position the other’s fingers beneath their chin
- Have the patient nod their chin into your fingers for 3-5 seconds
  - Complete relaxation
- Establish new barrier
- Repeat 3-5 times
  - Final stretch then retest
MUSCLE ENERGY FOR EXTENDED OA

Diagnosis: OA ERLSR or ERRSL

• Position patient against the restrictive barrier
• Support the patient’s head with one hand and position the other’s fingers on the front of their chin
• Have the patient nod their chin into your fingers for 3-5 seconds
  • Complete relaxation
• Establish new barrier
• Repeat 3-5 times
  • Final stretch then retest
Positioning: markedly flex patient’s head forward to reduce rotation in lower vertebrae

- Passively rotate patient’s head to the motion barrier on each side
- Compare degree of restriction in rotation to right and left
- Diagnosis = position of ease (e.g., AA RL or RR)
MUSCLE ENERGY FOR AA

**Diagnosis:** AA RL or RR

- Position patient against the restrictive barrier
- Support the patient’s head using the same hand positioning as diagnosis
- Have the patient rotate their head away from the direction you are rotating them for 3-5 seconds
  - Complete relaxation
- Establish new barrier
- Repeat 3-5 times
  - Final stretch then retest
MUSCLE ENERGY AND THE OCULOCEPHALOLOGYRIC REFLEX

Eye movements reflexively affect the cervical musculature as the body attempts to follow the lead provided by eye motion.

Diagnosis:
OA FRLSR or FRRSL
AA RL or RR

• Position patient against the restrictive barrier
• Have the patient look to the opposite of the barrier for 3-5 secs
  • Complete relaxation
• Establish new barrier
• Repeat 3-5 times
  • Final stretch then retest
MUSCLE ENERGY FOR C2-C7

Diagnosis: C2 FRRSR

- Position patient against the restrictive barrier
- Have the patient rotate their head away from the direction you are rotating them for 3-5 seconds
  - Complete relaxation
- Establish new barrier
- Repeat 3-5 times
  - Final stretch, retest
REFERENCES

• Greenspan, Adam, Orthopedic Imaging: A Practical Approach, LWW 1st edition 2011
• Hoppenfeld, Stanley, MD; Physical Exam of the Spine and Extremities; 1976. pp105-132