

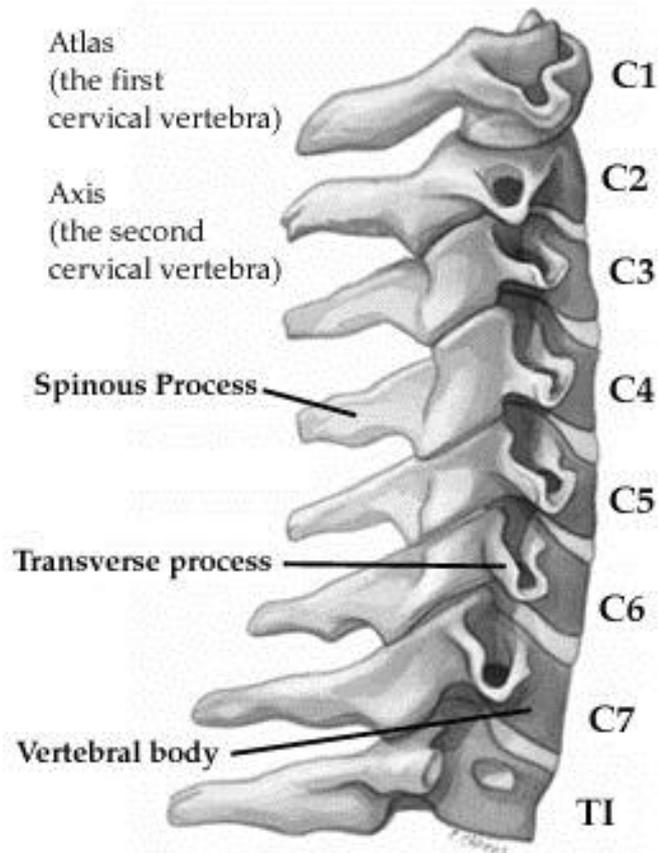
# Pediatric Cervical Spine OMT Module



AOBP with thanks to:

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# Cervical Vertebrae

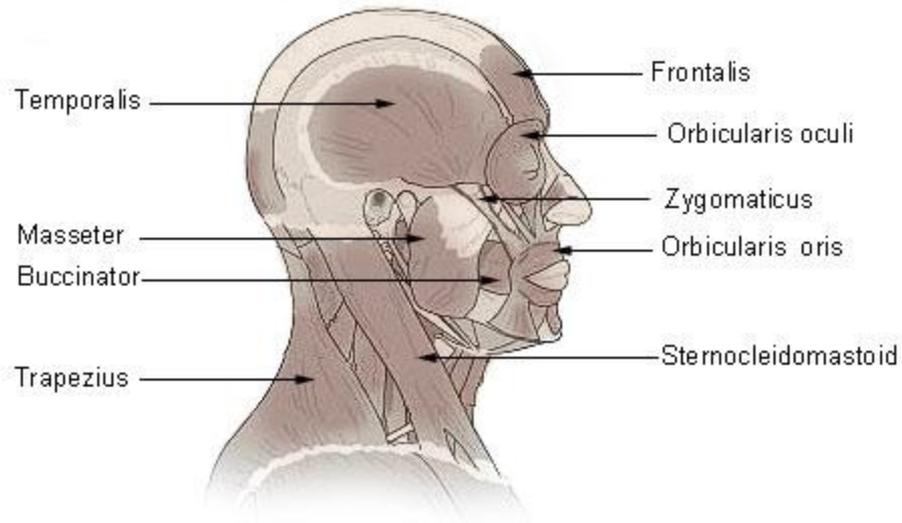


# Cervical Spine

- Provides pathway for neural, vascular and musculoskeletal communication between head and thorax
- Consists of 7 vertebrae: C1 and C2 are atypical and C3-7 are typical
- Posterior spinal muscles are continuous from the cervical spine to the sacrum

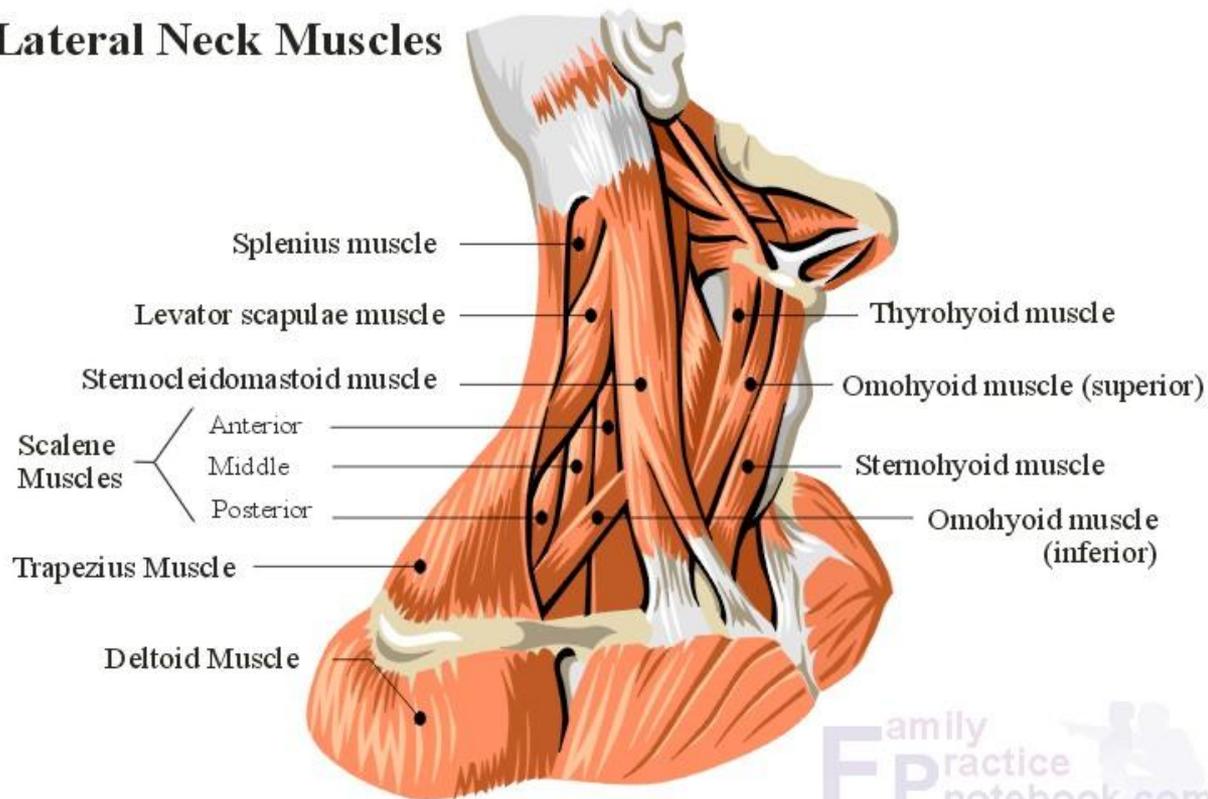
# Muscles of Neck

## Muscles of the Head and Neck



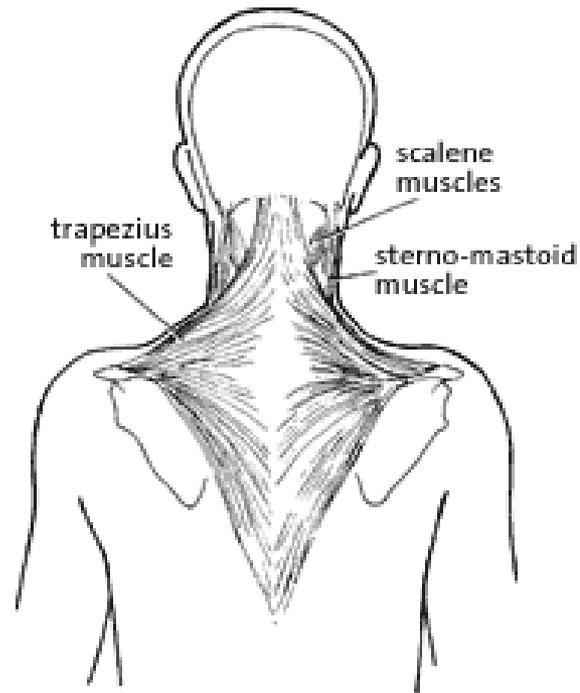
# Deeper Muscles of Neck

## Lateral Neck Muscles

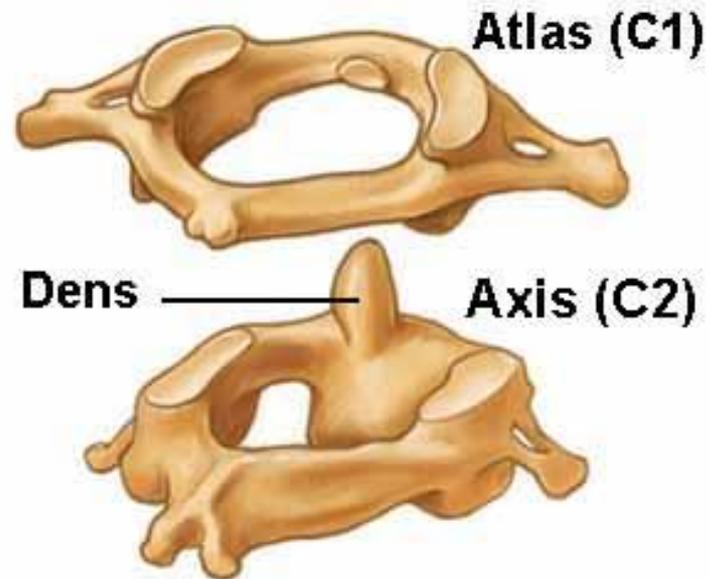


*Adapted from Corel Draw 9.0*

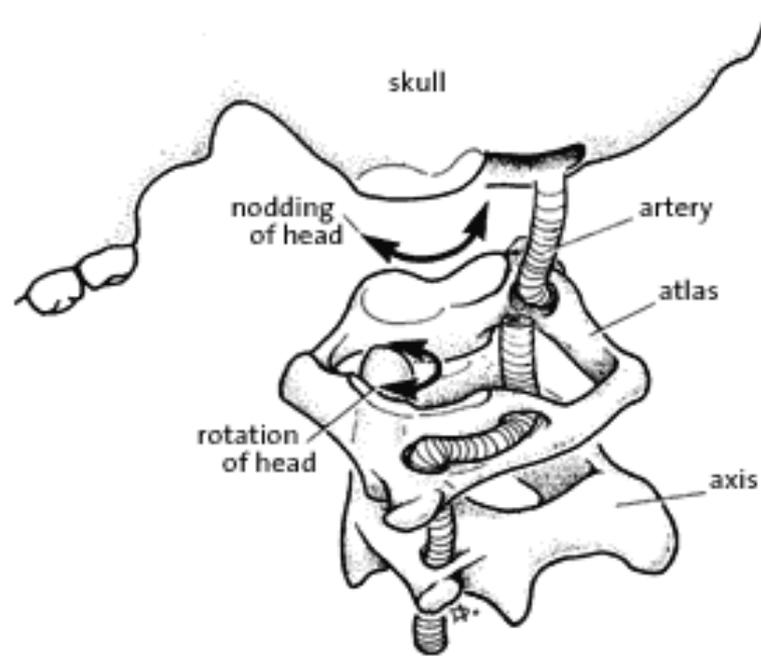
# Posterior Neck Muscles



# Atypical Cervical Vertebrae

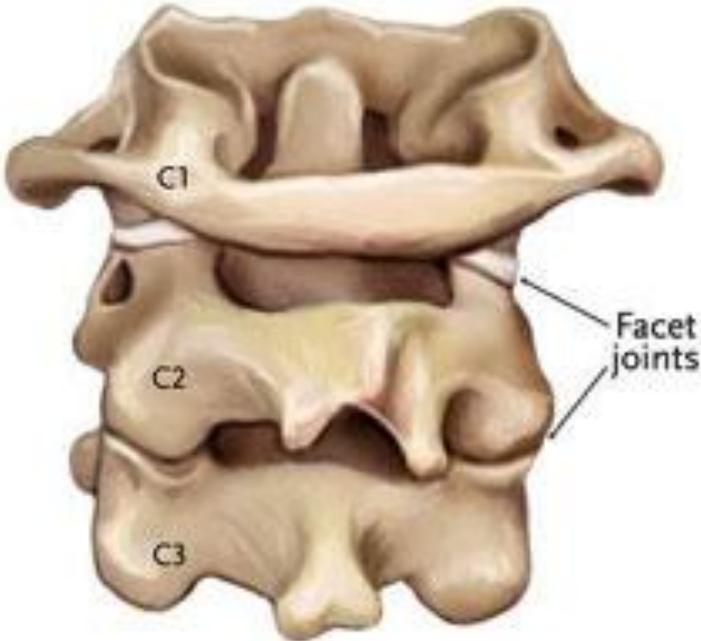


# Neural and Vascular Communications of the Neck



# Pediatric Cervical Spine Anomalies

- May be seen isolated or in association with other disorders
- Most remain asymptomatic and undiagnosed
- Patients with known associations should have an evaluation of the cervical spine
- Neck stability depends on integrity of surrounding ligaments and joint capsules



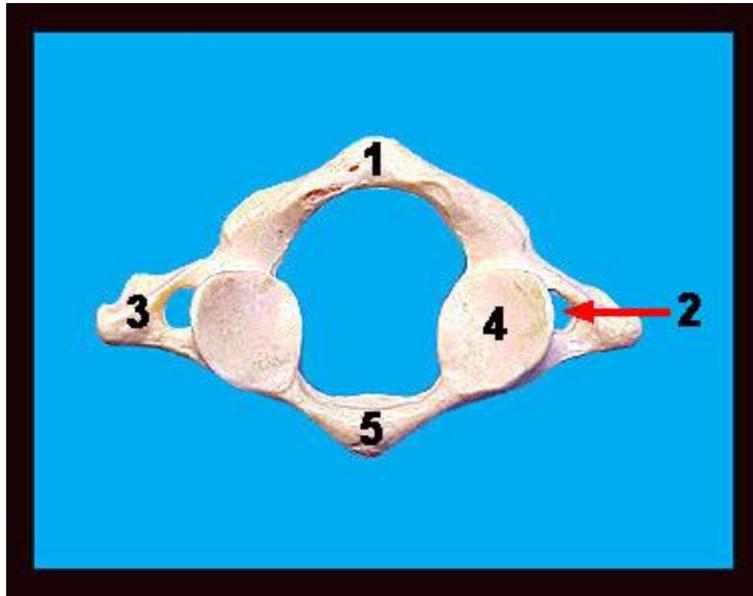
# Causes of Pediatric Cervical Instability

- Congenital
  - Vertebral or bony anomalies
  - Ligamentous or combined ligamentous and bony
  - Syndromic disorders (ex: Down Syndrome)
- Acquired
  - Trauma
  - Infection
  - Inflammatory (JRA)
  - Metabolic (Rickets)
  - Tumor (including neurofibromatosis)

# Osteopathic Exam of the Cervical Spine

- Inspection of skin and asymmetry in position of the neck
- Active motion testing by the patient through all ranges of motion
- Palpation of the cervical spine in first the seated and then supine positions
- Passive motion testing of both regional and segmental motion to determine somatic dysfunction

# C1 Structure (Atlas)



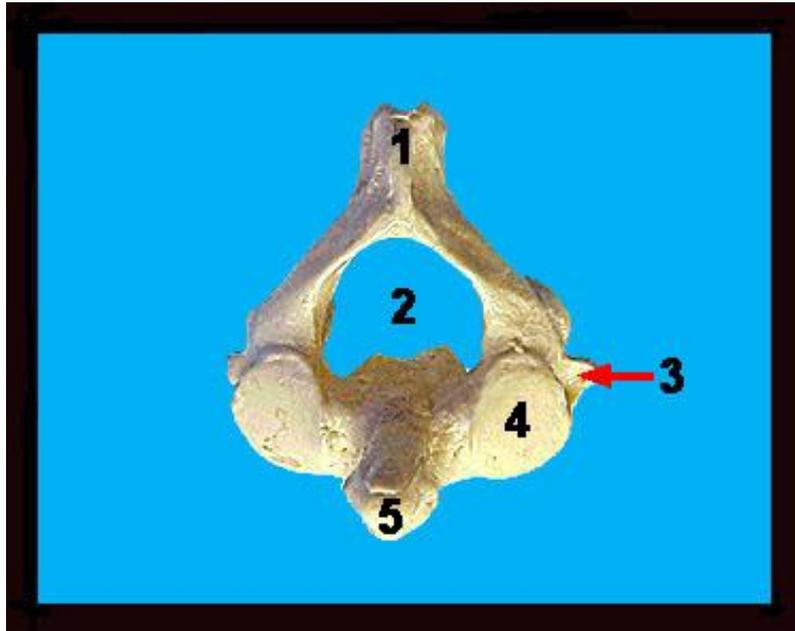
- 1. Posterior Arch
- 2. Transverse Foramin
- 3. Transverse Process
- 4. Inferior Articular Facet
- 5. Anterior Arch

The primary motions are flexion and extension

# Flexion and Extension

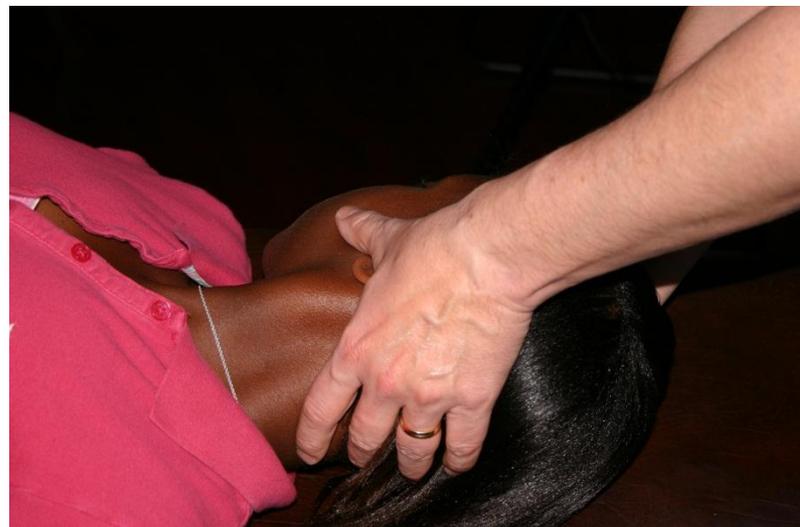
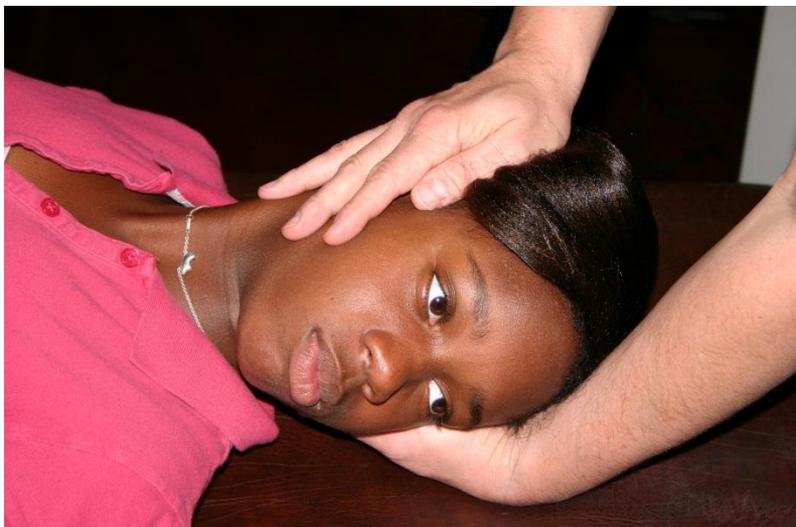


# C2 structure (Axis)

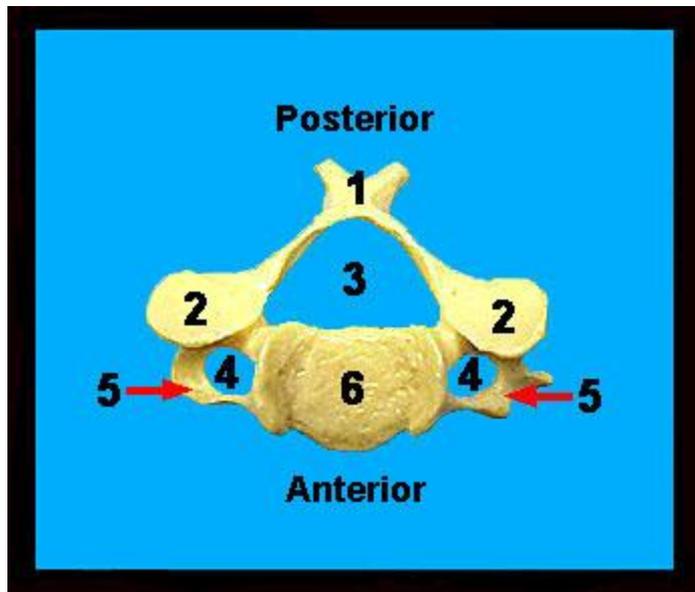


- 1. Posterior arch
  - 2. Transverse Foramen
  - 3. Transverse Process
  - 4. Inferior Articular facet
  - 5. Anterior Arch
- 
- The primary motion is rotation

# Rotation



# Cervical Spine (C3 through C7)



- 1. Spinous process
- 2. Superior articular facets
- 3. Vertebral foramen
- 4. Transverse foramina
- 5. Transverse processes
- 6. Body
  
- The primary motion of these vertebrae is sidebending

# Sidebending



# Neck Injuries

- Most common injuries to the neck in children are soft tissue
  - Contusions, muscle strains, ligament sprains
- Often overlap between all 3 types of injuries
- Cervical disk injuries in sports usually result from uncontrolled lateral bending
- Cervical injuries are less common than lumbar injuries and are uncommon in pediatrics

# Neck Injuries

- Red flags in pediatric athletes with neck pain
  - Midline cervical spine pain
  - Neck pain on range of motion
  - Focal neurologic defects
  - Loss of consciousness
- If red flag present, neck fracture needs to be ruled-out with C-spine X-rays (A/P, lateral, oblique, open-mouth)
- If unable to actively flex or extend neck: CT scan should be performed

# Neck Injuries

- Radiographic signs of instability
  - Interspinous widening
  - Vertebral subluxation
  - Vertebral compression fracture
  - Loss of cervical lordosis
- MRI sensitive in diagnosing ligamentous and spinal cord injuries

# Treatment of Neck Injuries

- If negative radiographic exam and normal neurologic exam, neck can be immobilized in a soft collar for comfort
- Rest and NSAIDS benefit minor injuries
- Range of motion exercises when collar is removed
- Cervical disk problems may also require cervical traction
- Strength training should be initiated after symptoms improve to help prevent recurrence

# OMT Treatment Guidelines

- For unstable, symptomatic cervical spine problems:
  - Avoid HVLA of cervical spine
  - Decrease muscle tension: may need to treat upper thoracic and rib dysfunction to accomplish
  - Counterstrain, cranial, and indirect techniques are thought to be least traumatic to the neck
  - Muscle energy may be appropriate if it does not cause pain
  - Traction may be appropriate with the proper direction of force

# OMT for neck pain

- Manipulation of the cervical spine for neck pain and headache is the second most common use of spinal manipulative therapy

# OMT for neck pain

- True incidence of complications from OMT is unknown since reporting has only been in form of case reports and surveys
- Attempts have been made to relate vertebral basilar accidents to chiropractic manipulation of cervical spine, but the literature does not support this relation
- Of the 1500 patients reported in clinical trials of manipulation of multiple kinds, no complications have been reported

# OMT: Cradling and Traction

- The physician will place the fingers close to the cervical spine, but lateral to the spinous processes bilaterally, then apply an anteriorly directed force bilaterally with slight traction through the arms of the physician.



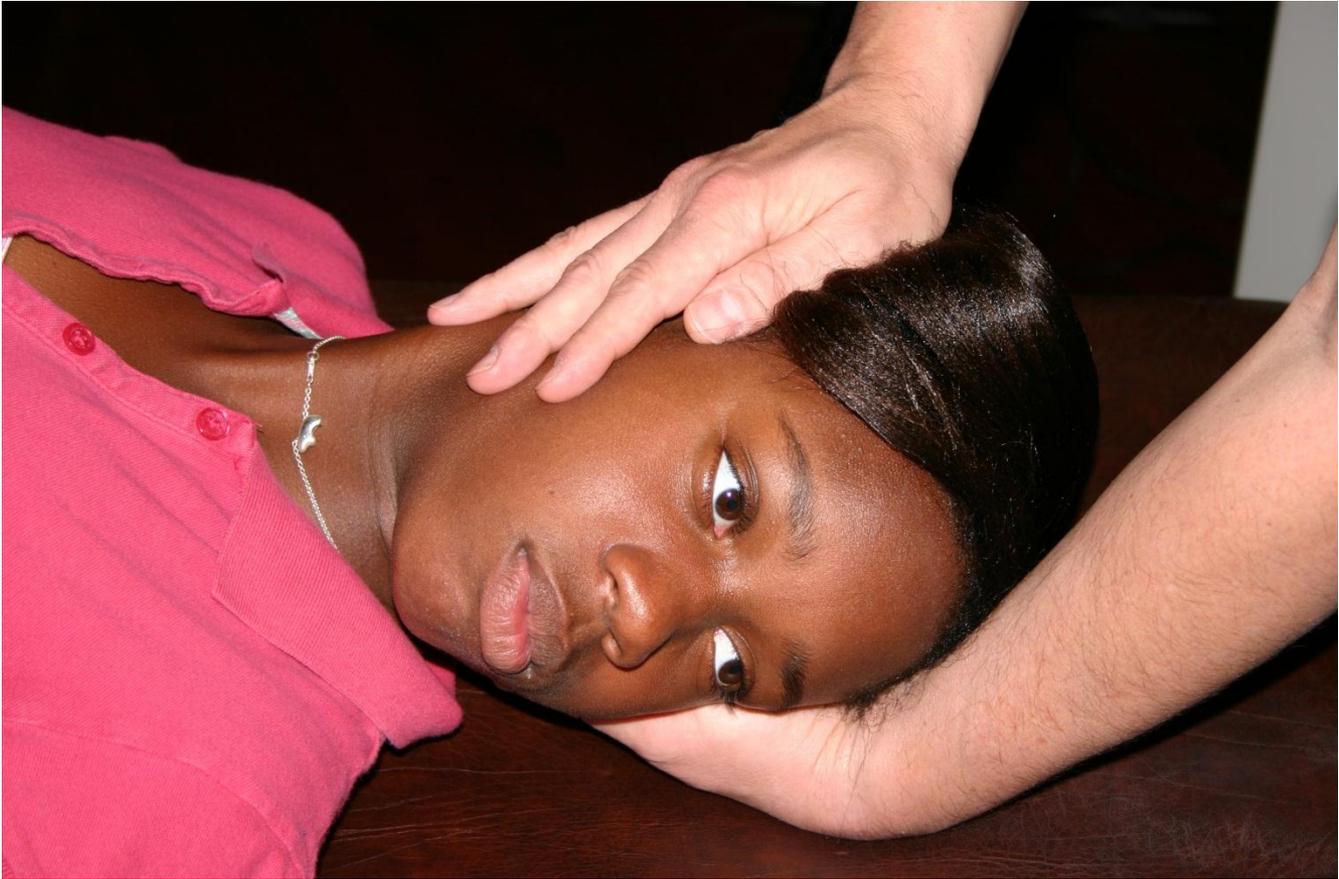
# OMT: Counter-Lateral Traction

- Place one hand on the frontal bone, the other hand on the lateral aspect of the cervical spine along the articular facets. While applying pressure on the frontal bone away from you, the other hand stretches the muscles of the neck toward you.



# Occipital-Atlantal Cervical High Velocity Low Amplitude

- The patient is supine. Place your hand on the ramus of the mandible with fingers extending downward toward the chin. Apply a sudden increase in the rotation of the neck by pressing downward toward the table on the ramus of the mandible, without extending the cervical spine



## 3rd to 7<sup>th</sup> Cervical High Velocity Low Amplitude

- The patient is supine. Rotate and sidebend the neck to point of maximum resistance at somatic dysfunction. The index finger of your hand is posterolateral to the articular process. The patient's head may be flexed or extended depending on the dysfunction and then the corrective thrust is made with the index finger in an arc conforming to the plane of the facets.

# HVLA Cervical Spine



# Evidence-based Medicine: neck pain

- JAOA study 2005 comparing efficacy of single dose ketorolac to OMT for the management of acute neck pain in the ED
- Convenience sample of 58 patients 18-50y
  - 29 patients received ketorolac
  - 29 patients received OMT
- Subjective measures of pain on an 11-point scale were gathered immediately before intervention and one hour post-intervention
- Subjects perceived pain was also recorded at one hour post-intervention on a 5 point pain relief scale

# Evidence-based Medicine: neck pain

- 3 enrolling osteopathic physicians who specialize in emergency medicine and routinely use OMT in the ED
- Patients randomly assigned to intervention group but unable to be blinded due to study design
- All patients received an initial structural exam
- OMT performed included any or a combination of HVLA thrust, muscle energy and soft tissue
- All OMT interventions lasted less than 5 minutes

# Evidence-based Medicine: neck pain

- OMT group showed a statistically significant decrease in self-reported pain INTENSITY
- No significant difference in perceived pain RELIEF at one hour between the groups
- Some patients had self treated with NSAIDS prior to ED arrival
- OMT was more effective than ketorolac for decreasing pain levels among the 40 patients who had not taken NSAIDS within 24 hours of ED arrival

## Evidence-based Medicine: neck pain

- Although a placebo arm was not used, most patients in study were unfamiliar with OMT
- 8 patients reported an adverse event with ketorolac including: arm soreness, dizziness, drowsiness, dyspepsia, nausea, vomiting
- 1 patient reported an adverse event with OMT which was transient “arm felt funny”

# Evidence-based Medicine: neck pain

- Authors conclusions:
  - OMT is significantly better than IM ketorolac at decreasing pain intensity
  - OMT is as efficacious as ketorolac in providing pain relief for acute neck pain in the ED
  - Less side effects with OMT
- Previous studies suggest patients do better with a combination of medication and manipulation

# Question 1

- The motion through the first cervical vertebrae is best described as:
  - A. Flexion
  - B. Opposition
  - C. Rotation
  - D. Sidebending
  - E. Translation

## Question 2

- According to a study of OMT utilized for neck pain in ER patients, which of the following is a possible expected outcome after OMT?
  - A. Better pain relief than the use of muscle relaxant medication
  - B. Better pain relief than the use of NSAIDS
  - C. Decreased pain intensity compared to NSAIDS
  - D. Increased neck pain
  - E. No improvement in neck pain

## Question 3

- The motion through C3-7 is best described as which of the following?
  - A. Extension
  - B. Flexion
  - C. Opposition
  - D. Rotation
  - E. Sidebending

## Question 4

- A 16 year old football player presents to the ER with neck pain after being tackled. He denies LOC, paresthesias or weakness, but on exam he is unable to actively flex or extend his neck. Which of the following is the imaging of choice?
  - A. Bone scan
  - B. CT scan
  - C. MRI
  - D. Ultrasound
  - E. X-ray

## Question 5

- According to OMT treatment guidelines, how should the athlete in question 4 be initially treated with OMT?
  - A. Counterstrain
  - B. Facilitated Positional Release
  - C. HVLA
  - D. Muscle energy
  - E. Rib raising

# References

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- Ward R. Foundations for osteopathic medicine. Philadelphia, PA: Lippincott Williams and Wilkins; 2003.
- Kliegman R, Jenson H, Behrman R, Stanton B. Nelson textbook of pediatrics, 18<sup>th</sup> ed. Philadelphia, PA: Saunders Elsevier; 2007.