Osteopathic Considerations in the Newborn

AOBP with thanks to:
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- Eric Hegybeli, DO
Osteopathic Tenets

- The body’s inherent ability for self-repair
- The interrelatedness of body systems
- The body possesses self-regulatory healing mechanisms
- The interrelatedness of structure and function
Review Bones and Sutures of the Skull
- the cranial base (a line from the eye socket to base of occiput) is about 30 degrees in a child (more horizontal) and 50 degrees in an adult.
Note differences of adult and infant skull:
Newborn Anatomy

- Newborn bone is in various forms of maturity
- Bones of the newborn skull are individual and separated by membranous fascia
- Newborn reflex arcs in the spinal cord are still immature
- Bones in newborn will form in response to pressures placed on it as child grows
- The newborn cranium will drastically change shape as the child grows
Osteopathy in the Cranial Field

**Reminder**

### Cranial Bone Movement

- **Midline:** Flexion and Extension
- **Paired:** Internal and External Rotation

### Common Patterns of Cranial Plagiocephaly

- **LATERAL SBS Strain** (Parallelogram Head)
- Flexion (Fat Head)
- Extension (Cone Head)
Cranial Somatic Dysfunction Affects Function

- Ophthalmologic
  - CN II, III, IV, VI
- Gastrointestinal
  - CN IX, X, XII
- Respiratory
  - CN X
- Musculoskeletal
  - XI
- Parasympathetics with III, VII, IX, X
Prevalent Newborn Problems

- Musculoskeletal System
  - Torticollis
  - Postitional plagiocephaly
- Respiratory System
  - Bronchopulmonary dysplasia
  - Assisted ventilation
- Gastrointestinal System
  - Constipation
  - Poor Feeding/Sucking
  - GERD
- Neuro-Psycho-Social
  - Strabismus
Torticollis

- Fibrosis of the sternocleidomastoid (SCM) muscle results in ipsilateral neck sidebending and contralateral neck rotation
- Most commonly presents from 3 weeks to 3 months of age
- Following “Back to Sleep” guidelines, infants can now present as asymmetric occipital flattening
Torticollis  Etiology

- Proposed positioning in utero
- Some association with prolonged or difficult labor but not necessary causal
- Risks
  - Primiparous mother
  - LGA
  - Male
  - Breech
  - Multiples
  - Maternal uterine abnormalities
Osteopathic Considerations in Torticollis

- SCM attachments at the mastoid process and medial clavicle
- SCM innervation is Accessory nerve
- Attention to temporal bones with expected external rotation of ipsilateral temporal
- Sphenoid torsion with contralateral side elevated
- Compensatory changes throughout the body
CN XI - Accessory Nerve

Foramen Magnum

Accessory Portion CN XI supplying: the intrinsic muscles of the larynx (via Vagus and Recurrent Laryngeal Nerves)—except the cricothyroid

Ganglion Nodosum of Vagus nerve

Spinal Portion of Cranial Nerve XI

Sternocleidomastoid Muscle

Trapezius Muscle

SCM
Osteopathic Considerations in Torticollis with Plagiocephaly

- Torticollis can present as postional plagiocephaly and facial asymmetry
- Ipsilateral ear is inferior and posterior due to temporal bone position
- Ipsilateral eye appears smaller and inferior
- Ipsilateral maxilla and cheek appear smaller and zygoma is inferior
Treatment of Torticollis and Plagiocephaly

- Home positioning to encourage rotation and sidebending to the restricted side
- Encourage awake belly time at a young age
- Home stretching with diaper changes
- Office OMT vs. Physical therapy (PT)
  - No full scale study to indicate one is more effective but PT alone has shown improvement in up to 90%
Proposed OMT for Torticollis and Plagiocephaly

- OMT focused on the SCM, cranial base, occipito-mastoid suture, temporals
- Treatment of the associated and compensatory dysfunctions of the thoracic, lumbar, cervical and sacral regions
- Diagnosis and intervention earlier is better to avoid potential surgical intervention or cranial orthotic devices
Physiological and Structural Differences: Newborn vs. Adult

- Increased cheek fat pads in newborns make the oral cavity more narrow
- Newborn tongue is larger in size relative to the mouth
- Newborn hyoid bone and larynx are more forward under the tongue
- Newborns must also learn to coordinate suck and swallow with respiration
Nipple Feeding Dysfunction

- Initial nipple feeding requires muscles innervated by CN V and VII to seal the mouth around the nipple.
- Bottle and breast feeding requires different actions by the infant tongue.
- Pharyngeal swallowing requires use of intrinsic tongue muscle, as well as mandible, hyoid and other stabilizing muscles.
- Esophageal swallowing relies on peristalsis.
CN IX - Glossopharyngeal Nerve

Jugular Foramen
CN IX - Glossopharyngeal Nerve

- Function
- Motor to muscle; Parasympathetic to glands; Sensory to palate
- Structure
- Jugular foramen
- Dysfunction
- Difficulties swallowing, excessive gag reflex
- History
- Trauma to occiput &/or temporals
- Physical examination
- Test gag reflex
- Evaluation of temporals, occiput, occipitomastoid suture
CN XII - Hypoglossal Nerve

Hypoglossal canal
CN XII - Hypoglossal Nerve

- **Function**
- **Structure**
- **Dysfunction**
- **History**
- **Physical examination**

- **Motor to Tongue**
- **Hypoglossal canal**
- **Dysphagia, tongue function (latch-suckle)**
- **Occipital condyle trauma; intraosseous strain**
- **Test tongue motions**
- **Test neonatal suck**
- **Evaluate occiput (condyles), top cervicals**
Case Report

- JAOA 2011 report of twins born at 25 weeks with poor transition from gavage feeds to nipple feeds complicated by GERD
- After receiving almost daily OMT from DOL 102-DOL 122 both twins were taking all feedings by nipple and avoided earlier plans for surgical placement of gastrostomy tube
- Specific OMT used was not based on predetermined protocol, but on independent exam
Feeding changes were independent of OMM service input and relied solely on neonatology and daily nursing notes.

Twin A improved from 7.9% total feeding volume by nipple prior to OMT to 100% after OMT.

Twin B improved from 38.7% before to 100% after OMT.

No complications were reported with OMT.
Osteopathic Considerations in Nipple Feeding Dysfunction

- Stabilization of hyoid bone position and surrounding muscles to level tongue
- Consider entrapment of the hypoglossal nerve in the hypoglossal canal
- Possible comorbid respiratory disease affecting the ability to coordinate breathing with feeds
- Somatic dysfunction of the muscles used for respiration
Occipital Release Technique for Newborns and Infants

- Support the patient’s body by cradling it with your forearm
- Support the head and palpate for motion with the ipsilateral hand
- Support the sacrum and palpate for motion with 2 or 3 fingers of the contralateral hand
- Grasp the cranium with fingers evenly splayed “as firmly as you would a ripe tomato so as not to leave impressions”
- Feel subtle release of muscles
<table>
<thead>
<tr>
<th>Organ/System</th>
<th>Parasympathetic</th>
<th>Sympathetic</th>
<th>Ant. Chapman’s</th>
<th>Post. Chapman’s</th>
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<tbody>
<tr>
<td>EENT</td>
<td>Cr Nerves (III, VII, IX, X)</td>
<td>T1-T4</td>
<td>T1-4, 2nd ICS</td>
<td>Suboccipital</td>
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<tr>
<td>Heart</td>
<td>Vagus (CN X)</td>
<td>T1-T4</td>
<td>T1-4 on L, T2-3</td>
<td>T3 sp process</td>
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<td>Respiratory</td>
<td>Vagus (CN X)</td>
<td>T2-T7</td>
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<td>Esophagus</td>
<td>Vagus (CN X)</td>
<td>T2-T8</td>
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<tr>
<td>Foregut</td>
<td>Vagus (CN X)</td>
<td>T5-T9 (Greater Splanchnic)</td>
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<tr>
<td>Stomach</td>
<td>Vagus (CN X)</td>
<td>T5-T9 (Greater Splanchnic)</td>
<td>5th-6th ICS on L</td>
<td>T6-7 on L</td>
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<td>Liver</td>
<td>Vagus (CN X)</td>
<td>T5-T9 (Greater Splanchnic)</td>
<td>Rib 5 on R</td>
<td>T5-6</td>
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<td>Rib 6 on R</td>
<td>T6</td>
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<td>T5-T9 (Greater Splanchnic)</td>
<td>Rib 7 on L</td>
<td>T7</td>
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<td>Pancreas</td>
<td>Vagus (CN X)</td>
<td>T5-T9 (Greater Splanchnic), T9-T12 (Lesser Splanchnic)</td>
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<td>Midgut</td>
<td>Vagus (CN X)</td>
<td>Thoracic Splanchnics (Lesser)</td>
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<tr>
<td>Small Intestine</td>
<td>Vagus (CN X)</td>
<td>T9-T11 (Lesser Splanchnic)</td>
<td>Ribs 9-11</td>
<td>T8-10</td>
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<td>Appendix</td>
<td>Pelvic Splanchnics (S2-4)</td>
<td>T12</td>
<td>Tip of 12th Rib</td>
<td>T11-12 on R</td>
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<td>Hindgut</td>
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<td>Lumbar (Least) Splanchnics</td>
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<tr>
<td>Ascending Colon</td>
<td>Vagus (CN X)</td>
<td>T9-T11 (Lesser Splanchnic)</td>
<td>R Femur @ hip</td>
<td>T10-11</td>
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<tr>
<td>Transverse Colon</td>
<td>Vagus (CN X)</td>
<td>T9-T11 (Lesser Splanchnic)</td>
<td>Near Knees</td>
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<tr>
<td>Descending Colon</td>
<td>Pelvic Splanchnic (S2-4)</td>
<td>Least Splanchnic</td>
<td>L Femur @ hip</td>
<td>T12-L2</td>
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<tr>
<td>Colon &amp; Rectum</td>
<td>Pelvic Splanchnics (S2-4)</td>
<td>T8-L2</td>
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Question 1

1. Dysfunction of which of the following nerves will cause difficulties in swallowing and an excessive gag reflex:

A. CN VII  
B. CN XI  
C. CN XII  
D. CN IX  
E. CN VI
2. Dysfunction of which of the following nerves will cause dysphagia, poor tongue function (latch-suckle):

A. CN XI
B. CN XII
C. CNV
D. CN VI
E. CN VII
3. A newborn has been diagnosed with torticollis affecting the right SCM. Which of the following is an expected finding on exam?

A. External rotation of left temporal
B. External rotation of the sphenoid
C. Head rotated left, sidebent right
D. Head rotated right, sidebent right
E. Smaller left palpebral width
4. A premature newborn is having difficulty transitioning to nipple feeds. OMT directed at which of the following areas would help stabilize the tongue and improve swallowing?

A. Cranial nerve XI
B. Hyoid bone
C. Temporal bones
D. T2-3
E. Sacrum
5. Which of the following is one of the anatomic differences found in a newborn as compared to an adult?

A. Hard cranial vault to protect brain during delivery  
B. Immature reflex arcs in spinal cord  
C. Large oral cavity to accommodate nipple feeds  
D. More vertical cranial base to allow bottle feeds  
E. Smaller tongue to provide better latch
References: