Treatment of Infant Tongue Tie and Lip Tie

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• This program has received NO COMMERCIAL financial support
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• Neither I nor my immediate family have any financial interests that would create a conflict of interest or restrict my independent judgment with regard to the content of this course

Overview

• Normal infant biology (breastfeeding)
• Impact of Tongue Tie and Lip Tie on breastfeeding
• Impact of Untreated Ties on the craniofacial skeleton

Overview

• This is a paradigm shift
• This is new information
• You don’t have to believe me - start your own journey in learning more about it

Teamwork Needed

• Lack of expertise by practitioners = potential misinformation to parents
• Importance of sympathy to parents - especially important if your patient population is limited to children
• Importance of trusting your IBCLC - they are the breastfeeding experts

Evolutionary Angle

• Breastfeeding is one of the most basic instincts
• Difficulty with breastfeeding is common. That does NOT mean it is normal
• Breastfeeding is an essential component of normal infant life and its absence means something is fundamentally wrong with the infant’s world
Mechanism of Breastfeeding

• Should be an active process, even in instances when mom has OALD or high flow – some babies will just drink, rather than nurse
• Contrary to popular belief, the baby does not “milk” the breast in a stripping motion
• Understanding the mechanism of breastfeeding is crucial in understanding why intervention may become necessary

Mechanism of Breastfeeding

• Geddes (2008) and Elad (2014)

Elad et al (2014)

• “Biomechanics of Milk Extraction During Breast-feeding” - PNAS 2014
• “The results demonstrated that the rigid movement of the anterior tongue was dictated by the mandible oscillations, while the posterior tongue was undulating to facilitate swallowing and coordination with breathing.”
• “The subatmospheric pressure oscillations required to extract milk from the breast are most likely generated by changes in mouth volumes due to the mandible oscillations and the posterior tongue peristalsis.”

Tongue Function in Breastfeeding
Understanding Compensations

- The ability of a baby to compensate for tethered tissue doesn’t justify inaction. These compensations cause negative downstream effects.
- Lip Tie (to some extent buccal tie) effects:
  - small mouth opening
  - inadequate flanging
  - can force a shallow latch

Understanding Compensations

- Tongue Tie
  - Impeded movement
    - up = no seal
  - No seal = no latch
  - No latch = compensation

Must treat the dyad

- In most of medicine/dentistry, treating the patient is for the sake of the patient.
- With TT/LT that affects breastfeeding, treating the patient may be for the benefit of someone other than the patient.
- Importance of sympathy/empathy towards the mother is critical.

Breastfeeding Problems

- Poor quality latch
- Falls asleep prematurely while nursing
- Slides off breast
- Colic symptoms
- Reflux symptoms
- Gumming/chewing
- Pacifier problems
- Low milk supply
- Nipple damage (creased, cracked, bleeding)
- Severe pain
- Poor/incomplete breast drainage
- Mastitis/thrush
- Vasospasm
- Infected nipples
- Poor weight gain

<table>
<thead>
<tr>
<th>Complaint</th>
<th>Prevalence</th>
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<tbody>
<tr>
<td>Poor latchting</td>
<td>81%</td>
</tr>
<tr>
<td>Falls asleep while attempting to nurse</td>
<td>73%</td>
</tr>
<tr>
<td>Creased, flattened, or blanched nipples after nursing</td>
<td>68%</td>
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<tr>
<td>Gumming or chewing of nipple when nursing</td>
<td>67%</td>
</tr>
<tr>
<td>Poor or incomplete breast drainage</td>
<td>60%</td>
</tr>
<tr>
<td>Slides off nipple when attempting to latch</td>
<td>60%</td>
</tr>
<tr>
<td>Severe pain when infant attempts to latch</td>
<td>59%</td>
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<tr>
<td>Cracked, bruised, or blistered nipples</td>
<td>49%</td>
</tr>
<tr>
<td>Reflux symptoms</td>
<td>46%</td>
</tr>
<tr>
<td>Unable to hold a pacifier in mouth</td>
<td>40%</td>
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<tr>
<td>Poor weight gain</td>
<td>32%</td>
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<tr>
<td>Colic symptoms</td>
<td>24%</td>
</tr>
<tr>
<td>Bleeding nipples</td>
<td>24%</td>
</tr>
<tr>
<td>Plugged ducts</td>
<td>21%</td>
</tr>
<tr>
<td>Mastitis or nipple thrush</td>
<td>14%</td>
</tr>
<tr>
<td>Infected nipples or breasts</td>
<td>6%</td>
</tr>
</tbody>
</table>
Approach to These Symptoms

- What explains these symptoms?
- We must look for an anatomic reason for this difficulty if conventional interventions are unsuccessful
- Waiting is not an option
  - Weaning
  - Baby’s health can be jeopardized
  - Mom’s health can be jeopardized

Significance

- Ahluwalia et al (2005)
  - 32% of moms don’t initiate breastfeeding
  - 4% stopped BFing in 1st week, 13% more stopped by 4th week
  - Only 51% breastfed beyond 4 weeks

<table>
<thead>
<tr>
<th>Reason</th>
<th>&lt;1 wk (n = 1105), % (95% CI)</th>
<th>1-4 wk (n = 4697), % (95% CI)</th>
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<tbody>
<tr>
<td>Sore/cracked/bleeding nipples</td>
<td>34.9 (30.5-39.8)</td>
<td>30.2 (27.8-32.6)</td>
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<tr>
<td>Not producing enough milk</td>
<td>28.1 (23.7-32.6)</td>
<td>38.1 (33.3-43.3)</td>
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<tr>
<td>Sick/couldn’t breastfeed</td>
<td>7.0 (4.4-9.5)</td>
<td>7.9 (5.9-9.9)</td>
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<td>Baby had difficulty</td>
<td>46.4 (43.5-49.3)</td>
<td>36.0 (32.5-39.4)</td>
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<tr>
<td>Baby not satisfied with breast milk</td>
<td>22.2 (18.1-26.3)</td>
<td>38.6 (36.1-41.1)</td>
</tr>
</tbody>
</table>

Breastfeeding Rates and PPD

New Evidence on Breastfeeding and Postpartum Depression: The Importance of Understanding Women’s Intentions
Cristina Borre - Maria Jacovs - Almudena Sevilla

- Maternal Child Health Journal, Aug 2014
- Lowest risk of PPD - moms who wanted to breastfeed who were able to breastfeed
- Highest risk of PPD - moms who wanted to breastfeed but couldn’t (2x the risk)


- Prevalence and Risk Factors for Early, Undesired Weaning Attributed to Lactation Dysfunction (J Women’s Health, 23:5. 2014)
  - 2335 moms in study
  - 12% experience disrupted lactation
  - In women who experience disrupted lactation, median weaning age 1.2 months.
  - In women who don’t experience disrupted lactation, median weaning age 7.0 months
  - Presence of PPD nearly doubles the risk of disrupted lactation

Financial Burden

Policy Statement
Breastfeeding and the Use of Human Milk

- March, 2012
- If 90% of infants breastfed exclusively for the first 6 months, the US would save $13 billion annually

Examination Technique

- This is absolutely key to diagnosing a potential anatomical problem that affects BFing
- It’s ok to make a baby cry during examination
- Use a headlamp
- Proper positioning is the most important part of the examination
Examination Technique

Normal Labial Frenulum

• The location of attachment of the frenulum does not mean it’s a tie
• Many people will see a labial frenulum that comes down low on the gumline and assume it’s pathologic
• The examination is key to determining tension
• Evaluation by IBCLC is key to determining abnormal function

Normal Lingual Frenulum

Frenulum vs Tie
Anterior TT vs Posterior TT

- Anterior TT is the classic webbing that is at or near the tip of the tongue
  - heart shaped tongue
  - speech implications
  - relatively obvious
- Revising these alone (no bleeding, minimal crying) rarely leads to improvement

Anterior TT vs Posterior TT

- Posterior TT is a bad name
  - submucosal
  - hidden
  - invisible
- Tend to be thicker - significant restriction
- Must use your fingers to feel this type of restriction
- Think of a sailboat
Flinck et al (1994)

- “Oral Findings in a Group of Newborn Swedish Children” - Int’l J. of Paediatric Dentistry
- Examinations on 1021 newborns
- Ankyloglossia in 2.5% (4:1 M:F)
- 6.7% had class 1 or 2 lips
- 76.7% had class 3 lips
- 16.7% had class 4 lips

Incidence

- Research - 1-12% of babies with tongue tie (only anterior TT)
  - Incidence is increasing (genetic, epigenetic)
  - Approximately 4 million born in 2014 (if you assume 4% incidence, that’s 160,000 babies)
  - Emergence of posterior tongue tie as a diagnosis explains the increased incidence clinically
- “The presence of tongue tie triples the risk of weaning in the first week of life” (Ricke et al., 2005)

Midline defect constellation - May occur with other midline defects

<table>
<thead>
<tr>
<th>Defect</th>
<th>Other Defect</th>
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<tbody>
<tr>
<td>Lip tie</td>
<td>Umbilical hernia</td>
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<tr>
<td>Cleft lip/palate</td>
<td>Hypospadius</td>
</tr>
<tr>
<td>Sacral dimple</td>
<td>Tight frenulums on penis</td>
</tr>
<tr>
<td>Cleft lip/palate</td>
<td>Labial adhesions</td>
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<tr>
<td>Spina bifida</td>
<td>Gastrochisis</td>
</tr>
<tr>
<td>Heart defects</td>
<td>Abdominal hernia</td>
</tr>
</tbody>
</table>

Genetic Predisposition

- Genetic (Han, et al 2012)
  - 149 babies with TT revision
  - Used pedigree analysis
  - Results:
    - 67% boys, 33% girls
    - Seems to follow an X-linked pattern
- Klockars 2009 - Autosomal Dominant with Variable Penetrance

Take home message
- If your dyad has a family history of TT or ULT, that should be a strong consideration if problems arise

Moms are often told...

- “It’s normal to have pain/bleeding/cracking.”
- “You need time for your nipples to toughen up”
- “Baby is just getting tired/baby is a lazy eater”
- “You’re not making enough milk”
- “She just has a small tongue”
- “Tongue tie doesn’t cause problems with breastfeeding”
- “Your nipples are too big” or “baby’s mouth is too small”
- “Your baby can’t be tongue tied b/c they can stick out their tongue”
- “Your baby is gaining weight, so there’s nothing more to worry about”
- “Enough with the breastfeeding!”
- “The frenulum will stretch over time”
- “One day, your child will fall and rip the upper lip tie and it’ll take care of itself”

“Here’s a nipple shield”

- Decreased stimulation = decreased supply
- Inconvenient
- Risk of latch refusal once mom tries to get off the shield
- If a patient needed oxygen, but we never found out why, would it be ok to just say “keep using oxygen”??
“Just Pump - Your Milk Still Gets In”

- Rarely sustainable
  - Remember, the goal is to nurse as long as possible
- Decreased milk supply
- Horribly inconvenient
  - can add hours to each day for just pumping
- Loss of emotional experience
- Facial developmental changes

Is There Evidence?

- The desire to practice EBM vs the desire (and need) to treat a dyad where time is of the essence
- Safety
- Avoidance of panacea
- Every study published shows an improvement in breastfeeding following frenotomy

Efficacy

- What are the outcomes we’re most interested in?
  - maternal pain
  - weight gain
  - breastfeeding quality
  - speech (older children)
  - dental development/health

Available Studies

- Dollberg 2006
- Berry 2012
- Buryk 2011
- Hogan 2005
- Ochi 2014
- Steehler 2012
- Ricke 2005
- Edmunds 2011
- Ito 2014
- Geddes 2008
- O’Callahan 2013
- Pranksy 2015


- 24 mother-baby dyads
- Milk transfer, pain, and LATCH scores pre- and post-procedure
- Ultrasound pre- and post-procedure
- All but 1 improved in all arenas
- Ultrasound shows nipple compression before and improvement after

A: Pre-frenotomy, showing nipple compression
B: Post-frenotomy, showing less nipple compression

O’Callahan et al (2013)

• 311 babies - 299 underwent lingual frenotomy
• Only 16% had a classic anterior TT
• 37% had a labial tie
• 92% of dyads ultimately breastfed
  – mean duration 14 months
• Improvement in latch quality and nipple pain
  – limitation is subjective grading by moms - bias

Ito (2014)

• “Does Frenotomy Improve Breastfeeding Difficulties in Infants with Ankyloglossia?”
• Pediatrics International: 2014 June 30
• Meta-analysis looking at available literature
• “The literature review supported an overall moderate quality of evidence for the effectiveness of a frenotomy for the treatment of breastfeeding difficulties in infants with ankyloglossia. No major complications from a frenotomy were reported.”

Pransky (2015)

  
  These improvements were measured immediately after the procedure

Treatment

• Finding a knowledgeable provider
  – Will fully release LT/TT/PTT
  – Decreases chance of revision later
  – Supportive/knowledgeable of breastfeeding – receptive to IBCLCs
  • Some prefer eval with IBCLC before referring to them
  – No general anesthesia on babies
Treatment

- **Procedure risks**
  - May require further revision
  - Reattachment
  - Damage to salivary gland ducts or tongue muscles
  - Bleeding
  - Infection (very, very rare)
  - Painful

Treatment

- Can breastfeed immediately after – may or may not notice improvement
  - Provides compression to help stop bleeding
  - Breastmilk is antibacterial

- 3-5 hours after – very sore
  - Tylenol (for >6 months can use Motrin)
  - Arnica – inflammation (has been shown to help edema)
  - Hyland’s Teething Gel or Orajel Naturals – Soothing lubricant for stretches

- 24-48 hours – latch may worsen, baby may refuse
  - Keep feedings the same as before – avoid too many changes
  - Skin to skin
  - Moving while feeding
  - Feeding in a bath

Treatment Goals - Tongue

- Full release of central tissue - this includes the submucosal fibers
- Appropriate lateral incisions to allow the tongue to release
- Avoid cutting into muscle **at all costs** - it’s preferable to leave the fascia over the genioglossus muscle intact
- Palpate afterwards to determine if any residual tension exists
Treatment Goals - Upper lip

- Try to stay as close to periosteum as possible to minimize swelling and bleeding
- Release up to the mucogingival junction for best result
- Avoid cutting into the orbicularis muscle at all costs
- The result should be effortless flanging of the upper lip

Personal Experience

- Between April 2012 and April 2013, 203 babies underwent TT and ULT revision using scissors
- 203 babies experienced bleeding
- Directly to breast afterwards - all bleeding stopped. None needed cautery
- No general anesthesia - just local (ULT) or topical EMLA (TT)

Scissor Revision

- What do you need?
  - Swaddle
  - Assistant
  - Grooved Director
  - Tenotomy Scissors
  - Topical numbing agent (EMLA or TAC)
    - Benzocaine contraindicated under age 2
  - Lidocaine with Epinephrine
  - Gauze
Scissor Revision

- Technique
  - Baby swaddled
  - Swab topical numbing on upper lip tie
    - Can inject the lip tie with a small amount of 1% lido with 1:100000 epi. Try to inject supraperiosteal
    - Same numbing technique for tongue if desired
  - Some fear using gel in the mouth because of inadvertent swallowing - use thick paste and paint directly on desired areas
How to Manage Bleeding

- Once procedure is complete, immediately to the breast (or bottle if not breastfeeding). The compression helps with hemostasis
- Have a glass of ice cold water (with salt) with gauze soaking - use if necessary
- Afrin-soaked gauze can help
- I have never needed to use cautery or stitches

Scissor Revision

- Disadvantages
  - Bleeding can limit your visualization and force you to undercorrect
  - “More frenulum can come forward”
  - Because scissors have an inherent thickness to them, some tissue is always left down on the gums when revising an ULT

Laser Revision

- These lasers are typically dental lasers
  - Diode
  - Erbium (Er,Cr:YSGG or Er:YAG)
  - CO2
- More than just a tool
  - Must prepare for laser safety with training and specific precautions
Laser Revision

- Differences from scissor revision
  - No parents in the room (laser safety, liability)
  - Little to no bleeding (erbium may be an exception)
    - No need to inject epi-containing local anesthetic
  - Much more precise - lack of blood allows for gradual division of fibers with tissue preservation
  - Complete removal of desired tissue

Histopathological Differences

  - 8 dogs - surgical excision + diathermy for hemostasis on one side
  - 2 CO2 wounds on the other side
  - Laser wound healed better - denatured collagen served as a biological dressing, smaller zone of adjacent tissue damage with laser

Histopathological Differences

  - 22 guinea pigs, buccal mucosal histology
  - looked at TNF-alpha and TGF-beta1 expression
  - Scalpel and Er,Cr:YSGG laser wounds were similar - CO2 had more wound inflammation

Surgical Outcome Differences

  - 16 patients divided
  - 6/8 in the Er:YAG group could have frenotomy without local anesthesia. All of the diode patients needed local
  - The Er:YAG patients bled more and were more uncomfortable at 3h after
  - Chewing/eating/speaking/pain equal at 1 day and 7 days

Laser Revision

- What do you need?
  - Swaddle
  - Assistant
  - Grooved Director
  - Topical numbing agent (I use 2% lido/prilo/tetra)
    - Benzocaine contraindicated under age 2
  - Gauze
  - Laser goggles
Other Techniques

• Electrocautery
  • Higher temperature, larger zone of thermal necrosis
  • Possibility of inadvertent cauterizing
• Scalpel
  • Difficult to control in a moving target
Aftercare Principles

Aftercare Principles

Improper Stretching
Appropriate Wound Healing

The wounds always look infected
Mirrors a tonsillectomy wound
Our Experience


Prospective, cohort study
237 dyads followed (sufficiently powered)
0-12 weeks, no previous procedure. Strict exclusion criteria
ATLFF correlation
Demographics
IRB approved

4 primary outcomes
GERD (i-GERQ-r questionnaire)
Breastfeeding self-efficacy/self-confidence (BSES-SF questionnaire)
VAS (pain)
Efficiency of milk rate transfer

Results
56:44 M:F
78% posterior tongue tie
75% had lip tie with tongue tie. Only 1 baby with isolated lip tie
1 week/1 month responses, followed for 6 months

Future Paper

Previous study excluded previously treated babies
New study will only include babies who have previously had a tongue tie release
Same outcomes (BSES, GERD, VAS)
### I-GERQ-R

<table>
<thead>
<tr>
<th>Subgroups</th>
<th>Preoperative Mean [SD]</th>
<th>1-week postoperative Mean [SD]</th>
<th>1-month postoperative Mean [SD]</th>
<th>F-test statistic (p-value)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male infants (n=29)</td>
<td>2.2 [±2.4]</td>
<td>0.6 [±1.1]</td>
<td>0.7 [±1.2]</td>
<td>11.3 (p=0.001)</td>
<td>27%</td>
</tr>
<tr>
<td>Female infants (n=26)</td>
<td>2.2 [±1.8]</td>
<td>0.8 [±1.1]</td>
<td>0.5 [±1.2]</td>
<td>11.3 (p=0.001)</td>
<td>35%</td>
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<td>Kotlow Lip Classification Type:</td>
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<td></td>
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<tr>
<td>Class III (n=25)</td>
<td>5.9 [±2.7]</td>
<td>5.0 [±1.8]</td>
<td>5.1 [±1.7]</td>
<td>1.6 [±1.3]</td>
<td>17%</td>
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<tr>
<td>Class IV (n=31)</td>
<td>6.0 [±2.2]</td>
<td>5.7 [±1.5]</td>
<td>5.3 [±1.4]</td>
<td>1.6 [±1.5]</td>
<td>32%</td>
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<tr>
<td>Coryllos Tongue Classification Type:</td>
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<tr>
<td>Type I (n=24)</td>
<td>6.5 [±1.8]</td>
<td>6.0 [±1.9]</td>
<td>5.5 [±1.8]</td>
<td>1.5 [±1.6]</td>
<td>29%</td>
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<td>Procedure Type:</td>
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<tr>
<td>Tongue (n=20)</td>
<td>6.5 [±1.8]</td>
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### VAS

<table>
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<tr>
<th>Subgroups</th>
<th>Preoperative Mean [SD]</th>
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<tbody>
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<td>Male infants (n=29)</td>
<td>4.3 [±1.8]</td>
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<td>41%</td>
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<td>4.2 [±1.9]</td>
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<td>4.2 [±1.6]</td>
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<tr>
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<td>5.0 [±2.3]</td>
<td>5.0 [±2.2]</td>
<td>5.0 [±2.1]</td>
<td>1.0 [±1.2]</td>
<td>33%</td>
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<tr>
<td>Class IV (n=31)</td>
<td>6.0 [±2.2]</td>
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### Future Paper

<table>
<thead>
<tr>
<th>Breasftfeeding Outcome Measures</th>
<th>Preoperative Mean [±SD]</th>
<th>1-week postoperative Mean [±SD]</th>
<th>1-month postoperative Mean [±SD]</th>
<th>F-test statistic (p-value)</th>
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</thead>
<tbody>
<tr>
<td>I-GERQ-R Total Score</td>
<td>45.0 [±10.9]</td>
<td>51.8 [±12.0]</td>
<td>56.7 [±12.2]</td>
<td>41.7 [±0.001]</td>
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<tr>
<td>Kotlow Lip Classification Type:</td>
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<tr>
<td>Class III (n=25)</td>
<td>50.9 [±10.1]</td>
<td>55.0 [±10.2]</td>
<td>56.0 [±10.3]</td>
<td>23.4 (p=0.001)</td>
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<td>Procedure Type:</td>
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<tr>
<td>Type IV (n=22)</td>
<td>41.3 [±10.6]</td>
<td>45.0 [±10.9]</td>
<td>48.0 [±11.2]</td>
<td>14.0 (p=0.001)</td>
</tr>
</tbody>
</table>

### BSES

<table>
<thead>
<tr>
<th>Subgroups</th>
<th>Preoperative Mean [±SD]</th>
<th>1-week postoperative Mean [±SD]</th>
<th>1-month postoperative Mean [±SD]</th>
<th>F-test statistic (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male infants (n=29)</td>
<td>45.5 [±10.4]</td>
<td>51.6 [±11.4]</td>
<td>55.7 [±12.3]</td>
<td>17.2 (p=0.001)</td>
</tr>
<tr>
<td>Female infants (n=26)</td>
<td>44.5 [±11.7]</td>
<td>52.2 [±12.9]</td>
<td>57.8 [±11.7]</td>
<td>24.3 (p=0.001)</td>
</tr>
<tr>
<td>Coryllos Tongue Classification Type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class III (n=23)</td>
<td>41.6 [±10.5]</td>
<td>45.1 [±11.2]</td>
<td>50.6 [±10.5]</td>
<td>27.8 (p=0.001)</td>
</tr>
<tr>
<td>Procedure Type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type IV (n=22)</td>
<td>46.1 [±11.0]</td>
<td>53.0 [±10.9]</td>
<td>58.3 [±9.7]</td>
<td>23.4 (p=0.001)</td>
</tr>
</tbody>
</table>

### My Next Project

- Building a curriculum
- Anatomy/Physiology
- Ultrasound Correlation
- Surgical videos
- Free to everyone
Conclusions

• TT and ULT are real phenomena. This is not a fad. Posterior tongue tie is not “controversial”
• If all other interventions fail to improve breastfeeding quality, TT/ULT is a potential cause
• TT and ULT revision is safe and extremely effective