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Frenulotomy: Back to the Future?

A Review of Current Literature and Academy Statements

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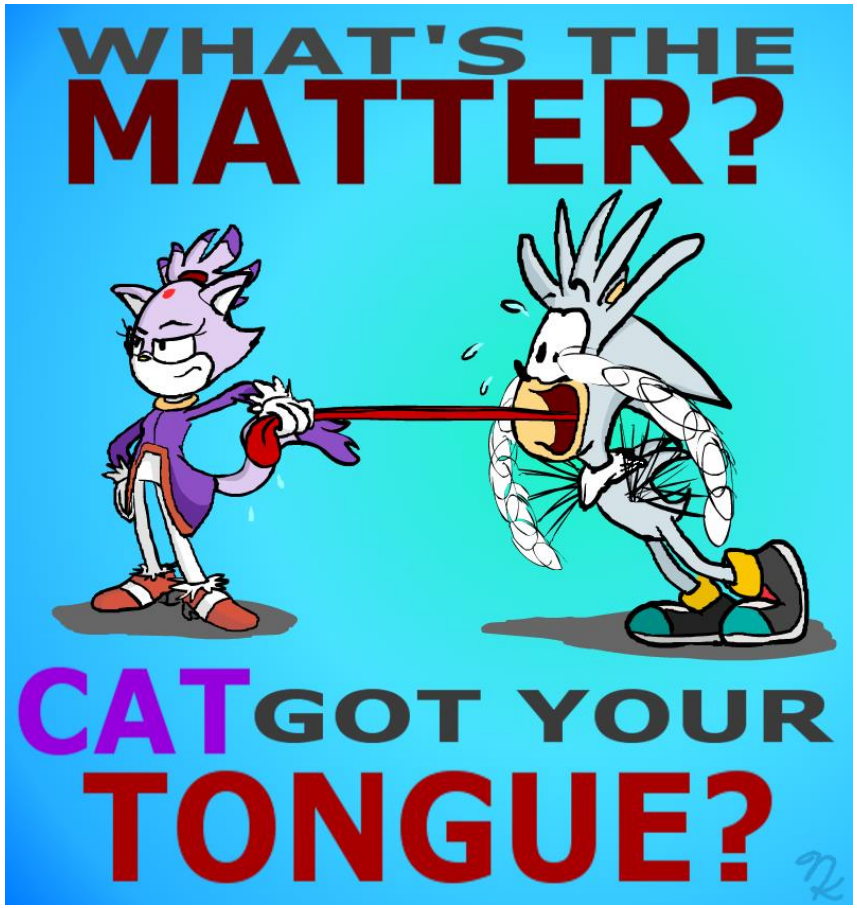
Conflicts of interest

- Planning Committee & Faculty Disclosure: The Planning Committee and Faculty have no relevant financial relationships with commercial interests to disclose.

Tongue Tied?

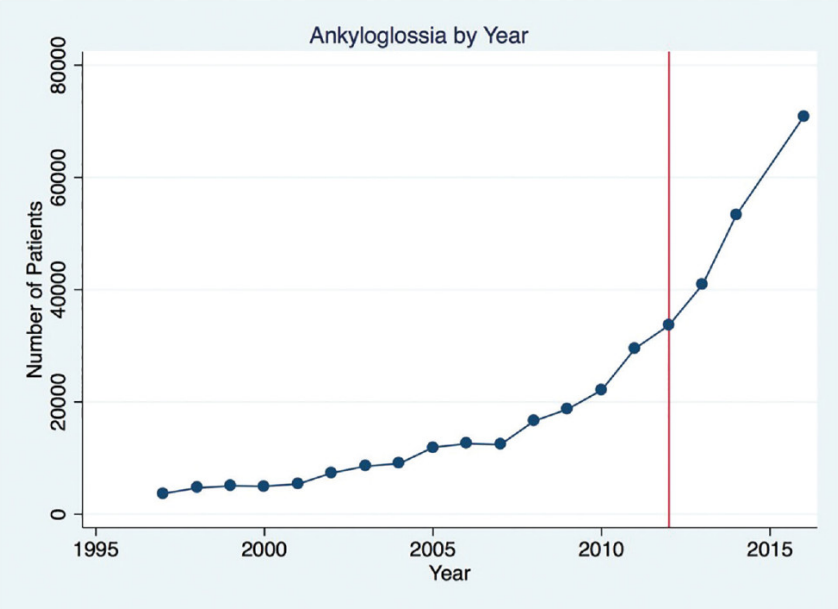
- Figure of speech?
- Cause of speech delay?
- Cause of breast-feeding trouble?
- Cause of increased dental cavities?
- Cause of difficulty being on the debate team, triple tonguing trumpets.
- Ice cream cones going up your nose?



Why Does it Matter?

- Significant increase in number of babies diagnosed as tongue-tied in the US and internationally in just the last 10 years.
- Significant increase in number of frenotomies being done.
- Concern that ankyloglossia may be being overdiagnosed.
  - Overdiagnosed meaning that the patient may have no benefit from the diagnosis and may even be harmed because of the treatment of the diagnosis.

Ankyloglossia: Update on Trends in Diagnosis and Management in the United States, 2012-2016



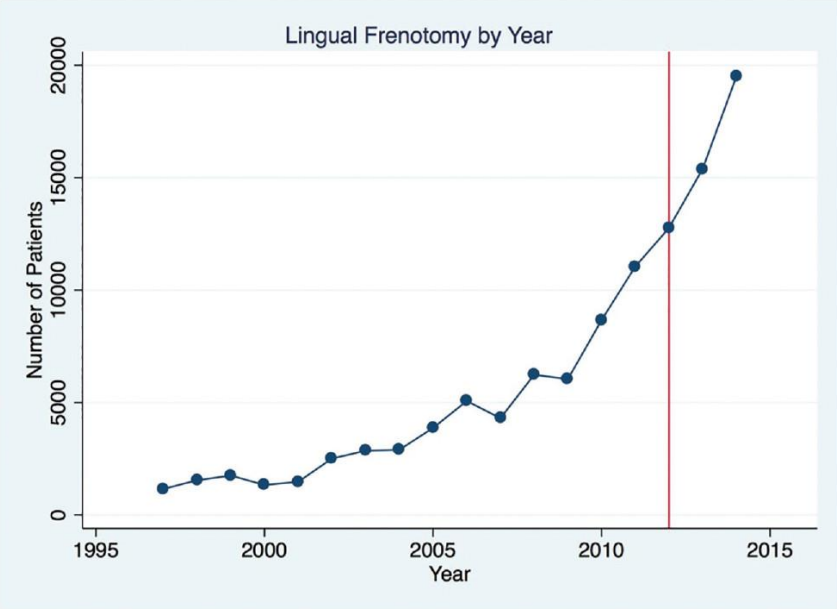


Figure 2. Lingual frenotomy by year, 1997 to 2014. Trends up to 2012 (marked by the red line) were previously reported in Walsh et al.2

Why does it matter?

- Breastfeeding is important and recommended by the AAP to be minimum of 6 months with a goal of up to 2 years.
- Want to be sure that the assessment of a mother/baby dyad with breastfeeding issues has their best chance at meeting those recommendations.

Timeline of breastfeeding

- Breastfeeding was primary until 1890's….
  - Long fingernail on midwife
- Specialization of medical providers at the same time as the development of "better", "more hygienic" formula
  - Perky not pendulous
- Determination that breast milk was better in the 70's – return to natural, woman's rights
- Now if a mother cannot directly breastfeed, she is considered deficient.

- Is breast feeding possible for everyone?

Definitions

- Frenula:
  - a membranous fold that attaches one anatomic structure to another.
- Mouth Frenula:
  - Lingual frenulum, maxillary labial frenulum, mandibular labial frenulum, buccal frenula
- Tight frenulum: restricts movement/function
- Constricted lingual frenulum affects the ability of the tongue to move as intended which is a tight-tongue or ankyloglossia aka tongue-tie.

Definitions continued

- Frenotomy or frenulotomy
  - Division of the frenulum
- Frenulectomy
  - Excision of frenulum
- Frenuloplasty
  - Change the shape of the frenulum
  - Usually involves stitches with or without flaps

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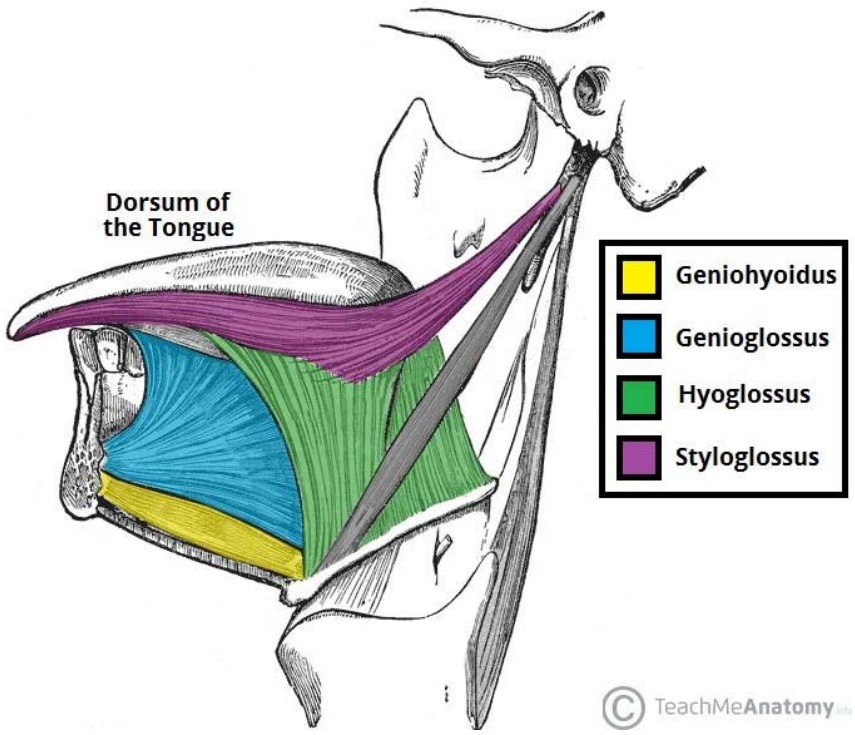
Tongue-Tie: Ankyloglossia

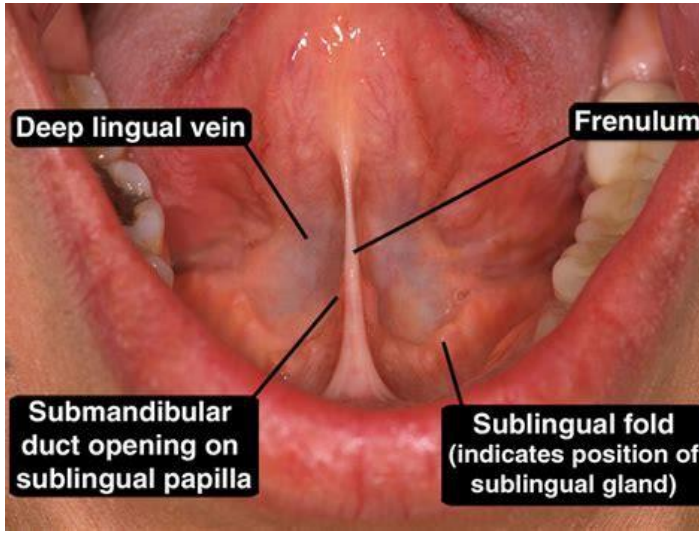
Tongue and Mouth Anatomy



- A few more definitions:
- **Dorsal tongue**: top of the tongue
- **Ventral tongue**: under surface of the tongue
- **Floor of mouth**: the space between the inside of the mandible the ventral tongue attachment
- **Posterior tongue**: behind foramen cecum
- **Tongue base**: where the posterior tongue meets the epiglottis

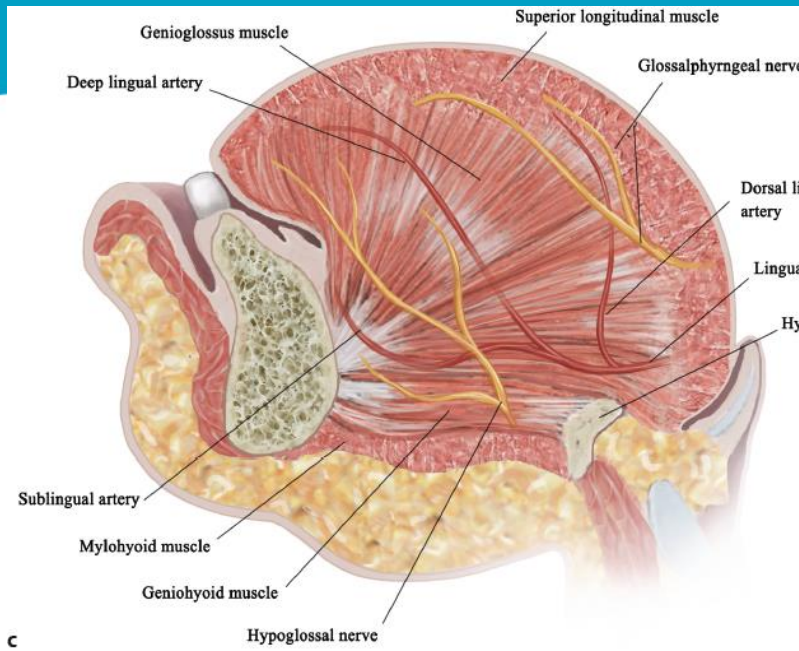
Lingual Frenulum Anatomy
Mills et al. Clinical Anatomy 2019

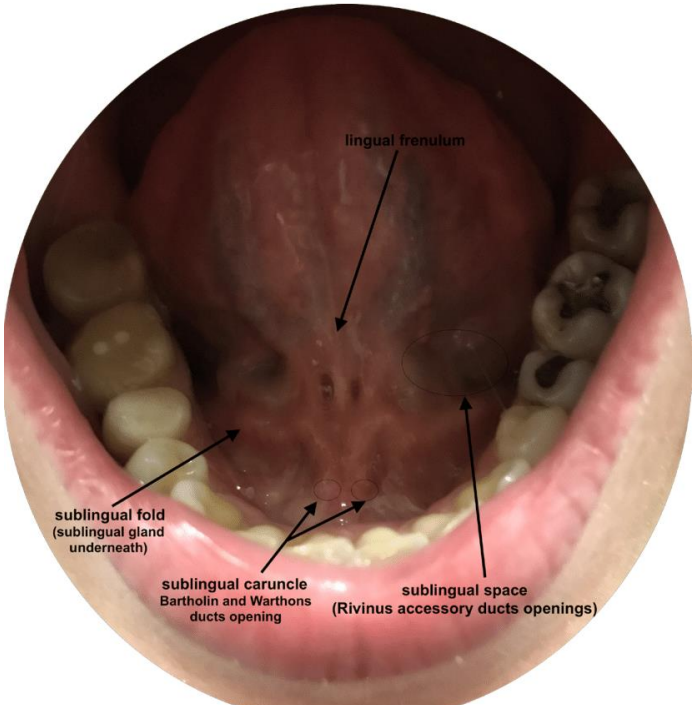
- Not a discrete midline connective tissue structure or band.
- Fascia sling under the mucosa of the floor of mouth attached to the ventral tongue that is forms with elevation.
  - the fascial fibers that form the frenulum have a basket-weave orientation as they cross the midline.
  - Consistent with 1966 histology of diagonal fibers.
- Varies in origin and insertion as well as thickness
  - Mucosa, fascia, genioglossus muscle



Lingual frenulum anatomy

- Does NOT insert into the tongue base but just inside the jaw.
- Posterior tongue-tie is an unfortunate term as it is not anatomically correct.
- Need a term for “When there is poor function of the tongue and no visible band to release”





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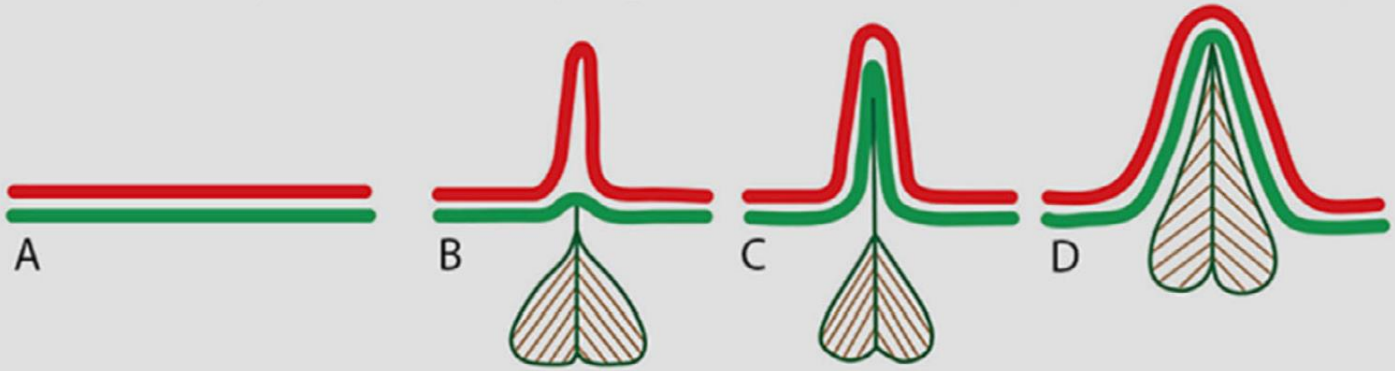
1. Presumed popular model of lingual frenulum stucture: a submucosal band

2. New evidence based understanding of lingual frenulum structure:
   A fascial layer with overlying mucosa - with explanation for morphological variablity



Mills observations

- Deeper dissection did not find any persistent band going between the genioglossus muscle bellies.
  - Calls into question the deeper frenotomy
- Dissection did find nerve fibers for sensation and motor movement near the surface of the ventral tongue.
  - Calls into question the broad diamond that particularly with thermal energy could cause damage.
- The lingual fascia has two balancing roles: providing tongue stability vs. facilitating tongue mobility
  - It keeps the tongue suspended and manages to allow movement without a skeleton

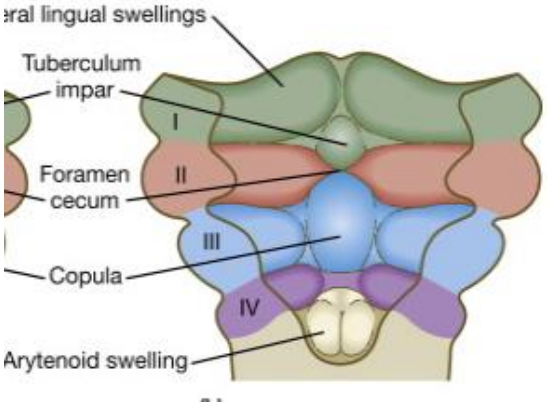
Mills observations

- Ankyloglossia: an imbalance of the 2 roles where stability interferes with mobility
- Where as a frenulotomy may improve mobility, it can undermine the stability.
- It should be noted that releasing the lingual frenulum in children with micrognathia or cleft palate may alter tongue position at rest, with potential to worsen any pre-existing airway compromise
  - Worsens OSA,
  - Tongue lip adhesion was an old treatment for Pierre Robin airway obstruction – the opposite of a tongue release.

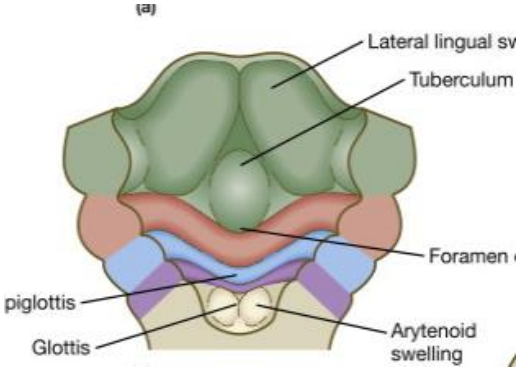
Questions on anatomic study

- None of the anatomic dissections had feeding difficulty known. Study of the **normal**.
- The fact that <50% of patients with ankyloglossia by appearance have breast feeding issues means that at least half the time there is **no feeding issue** with a short frenulum.
- The fact that Dr. Ghaheri's recent posterior tongue tie randomized paper shows a difference and the feel of a band or pop under the mucosa and **improved breast feeding** after release in many babies means that something else may be going on.
- Is there a difference in the anatomy? Is it a neurologic issue?
- Abnormal development during embryology is not addressed.
- Possibly the persistence of the **tuberculum impar** is to blame.

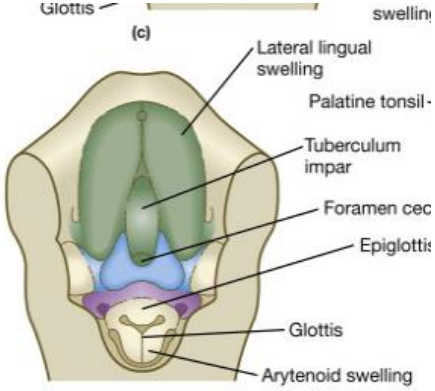
Tongue Embryology: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/tuberculum-impar



Four weeks



early 6th week



middle 7th week

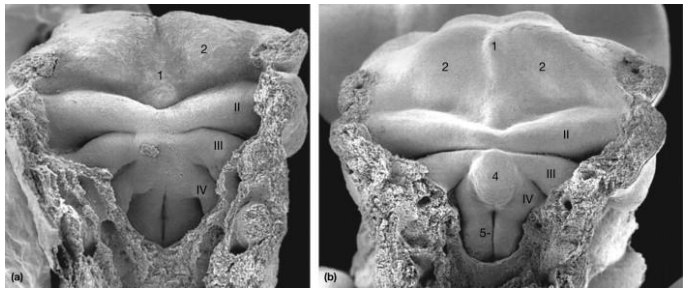


Figure 8. Scanning electron micrographs looking down at the tongue-forming region of 5-week (a) and 6-week and (b) human embryos. 1, Tuberculum impar; 2, lateral lingual swellings (in arch

Things tongues do.

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- Breastfeeding: draw milk out of breast or pinch it out of nipple.
- Swallowing – move bolus posteriorly
- Speech
  - Rolling R's for Spanish and other languages
- Ability to lick your lips
- Dental health

Physiology of Feeding

- Ultrasound studies have shown milk extraction from a bottle occurs by a combination of **positive pressure and peristaltic motion** of the anterior tongue.
- Breastfeeding, however, has been shown to rely primarily on **creation of intraoral negative pressure** and sucking motion associated with en block movement of the anterior and **mid-tongue with tongue elevation** appearing to be important in creating the intraoral vacuum.
- An ultrasound study has shown that patterns of tongue motions differed both in infants with ankyloglossia (with breastfeeding problems) and those without ankyloglossia, but as no anatomical variables of the lingual frenulum were included in this study

Tongue tie and Breastfeeding

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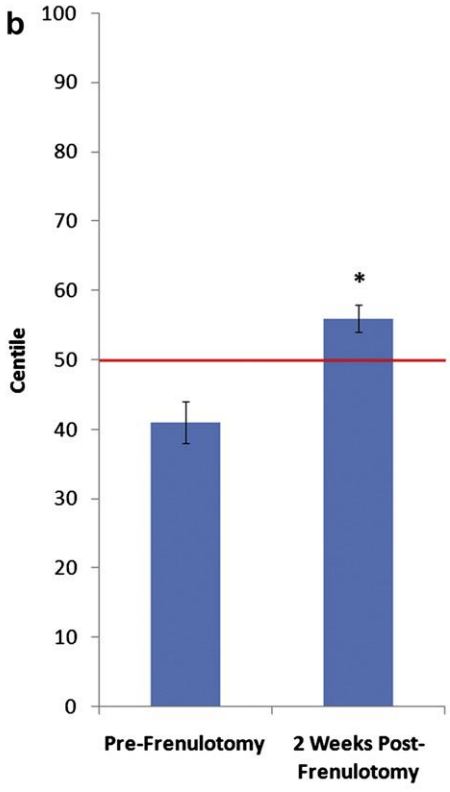
- The tongue needs to be over the edge of lower gum to effectively draw milk out.
- Symptoms of tongue tie impacting breast feeding:
  - Difficulty latching or maintaining latch
  - Continuous snacking
  - Frustrated baby try to feed
  - Gumming or chewing on nipple
  - Nipple pain, poor let down, mastitis
  - Poor weight gain.
- Signs of tongue tie
  - Frequent hiccups
  - Loss of milk from corners of mouth
  - GERD/spit up/gas/limiting feeing

Multidisciplinary evaluation

- Pediatrician:
  - Infection/congenital heart disease (CHF)/inborn error of metabolism/intestinal obstruction/craniofacial abnormalities
- Lactation specialist/Speech therapist:
  - Positioning/latch/milk supply and flow/massage/exercises to open mouth
- Proceduralist:
  - Retrognathia/cleft/reflux/ incoordination/airway obstruction/

Figure 1 (a) Tongue-tie/ankyloglossia, with the fibrous lingual frenulum clearly visible upon opening the mouth and lifting the tongue. The frenulum is seen extending to the tip of the underside of the tongue. (b) At 2 weeks post-frenulotomy, neonates gained significant weight by centile (15 1.2) ($p < 0.0001$), moving up from the 41st 2.5 to 56th 2.4 centile.



Journal of Plastic, Reconstructive & Aesthetic Surgery (2010) 63, e683ee685

Table 1 Table illustrating markers of breastfeeding improvement at 2 weeks post-frenulotomy in 62 infants.

Clinical Feature	**Pre-frenulotomy**	**2 weeks post-frenulotomy**
Growth percentile	41 ± 3	56 ± 2 (p<0.0001)
Breastfeeding sessions/24 h	10 ± 0.7	7 ± 0.5 (p<0.0001)
Bottle feeding supplementary sessions/ 24 h	9 ± 0.6	2 ± 0.7 (p<0.0001)
Clinical Feature	**%pt pre-frenulotomy**	**% pts reporting improvement post-frenulotomy**
Poor latch	55 (28/51)	89 (28/51)
Nipple pain	53 (27/51)	100 (27/51) improvement+83%
Nipple cracking	37 (19/51)	100 (10/51)
Nipple bleeding	22(11/51)	100 (11/51)

In office frenulotomy

- Gently restrain
  - Swaddle vs. elbows at ears
- Isolate the frenulum
  - Finger vs. instrument
- Clip the thin band with short bladed sharp scissor.
- Sweep the floor to check for further release
- Hold pressure with gauze
- Feed baby for pain relief.
  - sugar in breast milk/formula/Sweeties

Is it always the baby's fault?

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- When difficulty breastfeeding arises, the baby is evaluated for ankyloglossia but also ties of the lip and the cheeks.
- https://medlineplus.gov/ency/article/002452.htm
- https://www.facebook.com/groups/tonguetiebabies

A different paradigm

- Universal breasts: perfect for breast-feeding
  - Any baby with any type tongue tie feeds well.
    - Many older children with significant tongue tie have breastfed without difficulty.
- Universal mouths: perfect for breast-feeding
  - Baby can effectively suckle off any type of breast/nipple.
- No guaranteed match:
  - My baby may/may not be able to breast feed from me – the MOTHER!

What is important

- Identify if there is a restriction (tie) that can be released without harm to the baby or to the mother/baby dyad.
  - Avoid oral aversion from tongue stretches required after laser
  - Avoid pain from multiple raw areas in the mouth
  - avoid exposure to anesthesia

AAOHNS Clinical Consensus Statement on Ankyloglossia 2020

- Not enough high-quality evidence to generate a Clinical Practice Guideline.
- Purpose of a CCS is to identify areas of consensus and identify those areas of no consensus.
  - Used a modified Delphi Survey Method
- Panel attained clear consensus validating anterior ankyloglossia and its importance in breastfeeding.

https://journals.sagepub.com/doi/10.1177/0194599820937298?icid=int.sj-full-text.similar-articles.1

CCS: Ankyloglossia 2020

Table 1. Statements That Reached Consensus: Ankyloglossia (General).

No.	Statement	Mean	Outliers
4c	Ankyloglossia is a condition of limited tongue mobility caused by a restrictive lingual frenulum.	8.00	0
6b	In recent years, some practitioners have described ankyloglossia as being anterior or posterior.	8.18	1
6c	Those practitioners who describe ankyloglossia as being anterior or posterior typically use the term anterior ankyloglossia to refer to a lingual frenulum that extends to the tip of the tongue or near the tip of the tongue that restricts tongue mobility.	7.45	1
2b	In some communities, infants and children are being over-diagnosed with ankyloglossia.	8.09	0
3b	In some communities, a significant number of children are having unnecessary surgery on the lingual frenulum.	7.82	0

Table 2. Statements That Reached Consensus: Buccal Tie/Ankyloglossia and Sleep Apnea.

No.	Statement	Mean	Outliers
36	Surgery to release a "buccal tie" should not be performed.	8.64	1
54	Ankyloglossia does not cause sleep apnea.	8.36	0

CCS: Ankyloglossia 2020

Table 3. Statements That Reached Consensus: Ankyloglossia and Breastfeeding.

No.	Statement	Mean	Outliers
10	Breastfeeding difficulties are common in the newborn period and evidence shows that anterior ankyloglossia is a potential contributor to infant feeding problems	7.82	1
12	Maternal pain and poor infant latch can be caused by ankyloglossia but these symptoms can also be present with other etiologies of breastfeeding difficulties	8.73	0
8	Ankyloglossia in an infant should be evaluated by a careful history (including lactation history) and physical examination, including inspection and palpation	8.85	0
19	The maternal and infant breastfeeding dyad should be recognized as a vulnerable patient population and care should be taken to ensure adequate support services, education and counselling, and shared decision making.	8.82	0
20	Infants should ideally be evaluated by a lactation consultant prior to lingual frenotomy	7.27	1

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Table 5. Statements That Reached Consensus: Frenotomy Procedure.

No.	Statement	Mean	Outliers
24	Lingual frenotomy is generally a safe and well-tolerated procedure	8.00	0
30b	Topical anesthetic agents are not recommended prior to infant frenotomy.	7.82	1
30c	Injected anesthetic agents are not recommended prior to infant frenotomy.	7.82	1
30d	Oral sucrose has been shown to decrease pain response in infants undergoing procedures and can be given to an infant prior to undergoing frenotomy.	7.73	1
39	There is insufficient evidence to support claims that one technique of frenotomy, such as laser, is superior to other techniques.	8.09	1
42b	After frenotomy is performed for ankyloglossia there is no evidence to support a standard post-procedure care regimen (eg stretching, massaging, manual elevation of the tongue by the parents).	7.36	1

When should frenulotomy NOT be done?

- When the risk of reattachment is high.
  - Post weaning and pre-understanding delayed gratification. (not yet consistently bribable)
    - Between 9-12 months and age 3.5-4 years
- When risk of procedure is high for baby.
  - Family history of bleeding problem.
  - Baby/child with bleeding diagnosis.

Relative contraindications for frenulotomy secondary to airway concerns

- Pierre Robin sequence, cleft palate
- Retrognathia, micrognathia
- Hypotonia
- Neuromuscular disorder

Complications:

- Hemorrhage, scarring, injury to salivary ducts/glands, airway obstruction
- Oral aversion
- Revision procedure may be needed if reattaches

Conclusion

- Ankyloglossia can be quite symptomatic but is not the cause for every mother's difficulty with breast feeding.
- Anterior ankyloglossia can be released easily and in the newborn or baby who nurses at least every 3 hours requires little parental follow up.
  - Is almost always successful in decreasing painful latching, improving feeding efficiency.
- "Posterior Tongue Tie" is currently a topic that has not been universally defined or accepted and treatment for posterior tongue tie needs further study.
- Propose investigation to see if release of the tuberculum impar (TI) is what the current treatment of posterior tongue tie is accomplishing.
- Refine the diagnosis and define the risks, benefits and alternatives to TI release really are.

Post procedure video

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How to Refer

- ENT fax: 971-282-0142
- Internal Epic Referrals
  - Peds ENT: REF72H
- Epic E-Consult
- Clinic phone: 503-216-6050

What about speech?

- Webb et al: Review article 2013
  - 378 abstracts/20 studies met inclusion criteria/15 observation and 5 randomized controlled trials
  - Tongue division improved LATCH scores and other feeding benefits such as milk production, maternal pain but no definite speech function differences were reported.
- Messner: 2000 studies 21 children and all but two were rated better articulation after frenulotomy but did not have a control group.