

Tethered Oral tissues and Nursing: A review of literature.

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Abstract

The role of tethered oral tissues such as an infant's tongue and upper lip attachment are often overlooked/ dismissed as a cause of infant distress or maternal discomfort during breastfeeding. Tethered oral tissues can include ties of the lip, tongue and buccal tissues. This is when the frenulums are short and/ or thick and restrict the movement of tongue, lips, cheeks. The exact incidence of ankyloglossia is unknown. Prevalence of symptomatic ankyloglossia of up to 46.3% have been reported. Babies who have one/ more of those oral anomalies show symptoms of poor, difficult latch/ popping off frequently when breastfeeding; gumming/ chewing while nursing; or gasping for air, clicking/ wheezy sounds while nursing; or excessive drooling. This ends up in excessive air swallowing during

feedings, causing hiccups and gassiness, which may successively cause colic and reflux issues. This review of literature analyses the tethered oral tissues and difficulties related to that in infants and their mothers. This literature analysis has shown that the tethered oral tissues are crucial problems. If not well treated, in fact, they can create problems not only related to feeding and speech difficulties, but also involving growth and posture. Since they are present in a relevant number of newborns, they should be diagnosed earlier to be cured on time.

Keywords: Ankyloglossia, Tethered oral tissues, Lip ties, Nursing, Breastfeeding, Infants.

Introduction

Breast milk supplies the absolute nutrition for infants, and the profits of breastfeeding expand well beyond basic nutrition. The American Academy of Pediatrics (AAP) and the World Health Organization suggest exclusively breastfeeding for the first six months of age.[1,2] Breastfeeding is promoted as the ideal nursing practice for a newborn, because of the protective, immune-modulatory and nutritional advantages that maternal milk confers plus the positive influence of breastfeeding on maternal attachment and mother-neonate bonding.[3,4]

Some studies have proposed that breastfeeding difficulties in infants may stop mothers from meeting their desired aims for breastfeeding.[5,6] The causes behind breastfeeding termination are miscellaneous which includes incomplete latch, maternal nipple pain, and poor weight gain requiring augmentation with formula. In one study of mothers who could not reach their expected period of nursing, more than 62% quoted causes associated with difficulty in latching, sore nipples, or painful breastfeeding.[6]

Pain during breastfeeding has been attributed to oral soft-tissue abnormalities in the infant, such as tongue-tie and lip-tie.[7] These abnormalities can alter the normal movement of the tongue and upper lip during breastfeeding, arising in difficulties with milk transfer and the potential for nipple trauma. If breastfeeding becomes painful and difficult, a switch to bottle feeding may occur, which can have considerable effects on the mother and infant.

Mills et. al. reported that the lingual frenulum is a dynamic structure formed by a central fold of fascia that spans the floor of mouth and together with the overlying oral mucosa it forms the “roof” of the sublingual space. From its broad connection around the inner arc of the mandible, the fascia connects around the anterior and

lateral ventral surfaces of the tongue, to stabilize tongue position while allowing freedom of movement. Mills et. al. stated that “The Lingual Frenulum Is a Fold of Fascia, Not a Band”; the lingual frenulum is not composed of just connective tissue fibers with an anteroposterior orientation nor is it a discrete cord or band as often described. The use of the terms such as cord, string, mast or band to describe the lingual frenulum is misleading and should be discontinued and she suggests the structure of the lingual frenulum should be described as a “midline fold” with a basket weave pattern. [Fig 1][8]

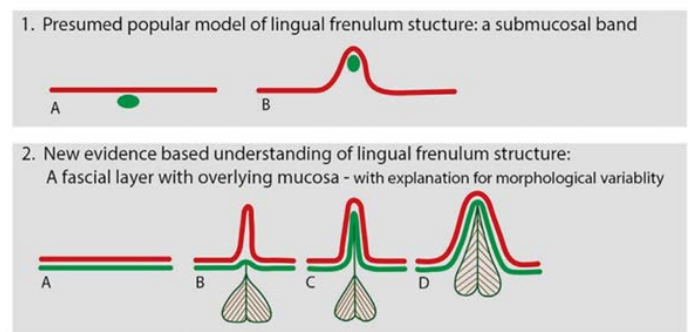


Figure 1

Model of the lingual frenum as suggested by Mills et. al. 2019.[8] Anatomically based understanding of lingual frenulum structure. Diagram illustrating coronal section of floor of mouth: (1) Current “presumed” understanding of lingual frenulum structure: a submucosal band: (a): tongue relaxed, (b): tongue elevated, raising lingual frenulum. Red line: oral mucosa green oval: coronal section of connective tissue “band.” (2) Their newly proposed anatomically based understanding of lingual frenulum structure: red line: oral mucosa green line: floor of mouth fascia, with genioglossus suspended from fascia. (a): Tongue relaxed, floor of mouth fascia immediately beneath mucosa. (b–d) Variations in frenulum morphology with tongue elevated to raise frenulum. (b) “Transparent” frenulum—mucosal fold elevates above fascia to form fold, with fascia remaining low/at base of fold. (c) “Opaque” frenulum—mucosal and fascia elevate

together to form fold. (d) “Thick” frenulum”—mucosa and fascia elevate together, with genioglossus also drawn into fold. [Image courtesy: Nikki mills, Seth m. Pransky, Donna t. Geddes, Seyed ali mirjalili. What Is a Tongue Tie? Defining the Anatomy of the In-Situ Lingual Frenulum. Clinical Anatomy 2019.]

This review article discusses the importance and effect of tongue-tie and lip-tie on breastfeeding and nursing based on the existing recommendations and scientific literature. This information will assist the primary care clinician in making informed decisions when evaluating an infant with breastfeeding difficulties.

Ankyloglossia (Tongue-Tie)

Ankyloglossia (tongue-tie) is a common congenital condition characterized by an abnormally short, tight, or thickened lingual frenulum, which may restrict tongue mobility. This condition is not considered problematic in the newborn unless it causes difficulties with breastfeeding. Tongue-tie in infants is associated with a 25% to 70% incidence of breastfeeding difficulties. This tethering restricts the tongue from elevating and extending past the lower gum, both of which are necessary to remove milk from the breast. Pain during breastfeeding can be caused when the hard gum pad (mandible) hits the underside of the breast when it is not separated or cushioned by the thickness of the tongue. Although many infants with these abnormalities breastfeed without difficulty. Studies have shown that infants with tongue-tie have a shorter breastfeeding duration than infants without a thick or shortened lingual frenulum.[9, 10]

Posterior ankyloglossia

In the last decade, there has been more discussion about “posterior” or “submucosal tongue-tie.” Currently, there is limited literature on this condition and its management. Posterior tongue tie (PTT) is defined as “symptomatic ankyloglossia with frenulum attachments at the middle to

posterior aspect of the undersurface of the tongue.”[11] This condition is not easily identified and is believed to be “hidden” at the base of the tongue in the tissue layer beneath the oral mucosa. PTT is a controversial and debated phenomenon because infants are usually diagnosed with this condition on the basis of impaired tongue function on oral assessment.[12] The published literature concerning PTT does not provide strong evidence that the phenomenon exists. Breastfeeding experts argue that this idea of PTT may be confused with impaired tongue function attributable to other factors and that we may be risking unintended outcomes.[13] Posterior ankyloglossia and its association with the efficacy of breastfeeding has only been described by a few case reports.[14,15,16] Hong et al. described posterior ankyloglossia as a condition where the lingual frenulum is not very prominent on inspection but thought to be tight on manual palpation or found to be abnormally prominent, short, thick or fibrous cord-like with the use of a grooved director.[14] Posterior ankyloglossia remains a poorly defined condition and this is reflected by the significantly higher rate of revision frenotomies reported in these cases.[17]

Upper Lip-Tie

Upper lip-tie is characterized by a thickened labial or maxillary frenulum resulting in tethering of the upper lip that prevents flanging of the upper lip. Inadequate latch is commonly attributed to the lingual frenulum (tongue-tie), but the labial frenulum (upper lip-tie) can also be problematic and needs to be considered. This area, which is the attachment of the upper lip to the maxillary arch, is often overlooked when feeding problems are evaluated. These soft-tissue abnormalities are more recently being attributed to difficulties with breastfeeding.[18]

The labial frenulum is referred to as a lip-tie when it is thought to be contributing to breastfeeding difficulties.

Expert's report concerns that a tight labial frenulum may hinder a proper latch because the upper lip is unable to flange out, resulting in improper attachment to the breast.[18,19] With a proper latch, the infant is able to suckle both the areola and the nipple. With a tethered upper lip, an infant is unable to flange his or her lip upwards to create a seal around the areola and the nipple. If an infant is only able to grasp the nipple, the mother may experience pain, nipple irritation, and the infant may fail to transfer milk.[18]

Buccal tie

The least well-known and most uncommon condition among the tethered oral tissues that can affect infant breastfeeding are perhaps buccal ties. Tongue ties and upper lip ties are being the other more common types. Buccal ties are atypical mucosal ties extending from the cheeks to the gingiva. This condition is in divergence to the upper lip ties which are mucosal ties extending from the midline upper lip to the gingiva and tongue ties which extend from the midline tongue to the gingiva and floor of the mouth. In some cases, buccal ties can also restrict a baby's ability to perceive an appropriate latch for breastfeeding. Like upper lip ties, buccal ties may harbour bacteria resulting in risk of gingivitis and cavities. These ties may eventually contribute to gum recession. Fortunately, buccal ties are easily released the identical way as congenital abnormality and lip ties. Even as with upper lip ties, stretching exercises are recommended to intercept reattachment.[20]

Diagnosis

One of the primary problems involving a tethered or restrictive tongue attachment usually goes undetected, misdiagnosed or dismissed by many healthcare professionals. It is seen in mothers seeking professional help trying to diagnose problems associated with breastfeeding. Due to the poor or incomplete latch the

subsequent are the symptoms and or the difficulties which occurs in infants and their mothers during breastfeeding are breathing (apnea), nasal congestion (silent reflux), colic, reflux (aerophagia), nipple damage, bleeding and pain.[21] Additionally, babies are often fail to achieve weight at the expected rate.[22] Postpartum depression is usually seen in these mothers. In spite of correcting these ties, mothers are just told to use formula and a bottle or are told the attachments will stretch or tear without treatment and be fine.[23]

Ankyloglossia can be diagnosed from a simple scale of 1,2,3,4 supported insertion location of the tie restrictions for both the upper lip and tongue, to more complex movement evaluation. The primary evaluation should happen at the time of infant delivery. Properly trained delivery room personal, accountable for examining the infant, have to remember the results of ankyloglossia on reducing an infant's ability to appreciate a correct latch. Immediately after birth, a finger sweep, under the infant's tongue, on the bottom of the mouth within the domain where the second primary molars will eventually erupt, can alert the mother of potential latch difficulties. During this primary examination, if a minor interference is found, the mothers are usually advised to hold up in mind of potential latch difficulties and also the symptoms associated with an incomplete latch. If a substantial obstruction or interference is found the infant is referred for an immediate revision to the health professional.[21,24]

After the evaluation of tongue for any form of hindrance, the infant's suck should be evaluated by placing an examiner's finger gently into the infant's mouth and allowing the infant to try sucking. A shallow latch may end up in gum pad pressure or discomfort on the examiner's fingernail and will cause the infant to gag. The gagging results due to the tongue's inability to increase

forward and pass under the fingertip. This can be caused when a restrictive tongue-tie reduces the power of the tongue to protrude forward and not block the infant's airway.[23]

Revisions should be evaluated with three diagnostic criteria. the foremost important diagnostic criteria to contemplate are the symptoms exhibited by the infant and/or the mother that may be traced to a incomplete latch of the infant onto a mother's breast. Some or all of the subsequent may indicate a shallow or incomplete latch. The second group of criteria to be evaluated relies upon the appearance and skill of the tongue and maxillary lip to attain efficient mobility and performance. The tongue attachment is classed by the situation of the lingual frenum insertion to the underside of the tongue.[23]

One classification employed in identifying the attachment of the tongue, is recognizing the attachment of the tongue as an anterior tongue-tie or a posterior tongue-tie. The position of the tie is expressed as located either anterior or posterior to submandibular salivary duct, which is found within the floor of the mouth. Any attachment forward of the salivary duct is considered an anterior tie and attachment behind the salivary duct is identified as a posterior tie.[23] A more clearly defined tongue classification divides the region in front of the salivary duct as a Class IV tongue-tie, when found closest to the tip or a Class III tongue-tie if nearer to the anterior part of the salivary duct. When the attachment is found distal or behind the duct, the area just behind the duct would be a Class II tie and the area closest to the bottom of the tongue is a Class I tie. Class I ties can also be identified as submucosal ties if they are buried deep within the base of the tongue.[23]

Kotlow classification of the tongue-tie in infants:[23]



Figure 2: Class I tongue-tie is located from the base of the tongue, halfway to the salivary duct.



Figure 3: Class II tongue-tie located between the back of the salivary duc halfway to the base of the tongue



Figure 4 : Class III tongue-tie located from the salivary duct half way to the tip of the tongue.



Figure 5: Class IV tongue-tie located at the tip of the tongue and extending half way between the salivary duct and tip of the tongue.

The other classifications which are available in the literature for the assessment of ankyloglossia are as follows: Coryllos classification based on the site of

insertion of lingual frenulum of the tongue [24], Hazelbaker Assessment Tool for Lingual Frenulum Function (HATLFF) based on appearance of tongue when lifted, elasticity of frenulum, length of lingual frenulum when tongue lifted, attachment of lingual frenulum to tongue, attachment of lingual frenulum to inferior alveolar ridge [25], Bristol Tongue Assessment Tool (BTAT) based on tongue appearance and its function and frenulum attachment [26], Tongue-tie and Breastfed Babies (TABBY) assessment tool based on tongue structure, attachment of lingual frenulum and functional mobility of the tongue [27], Martinelli had proposed Lingual Frenulum Protocol for Infants (LFPI) in 2015 which consists of a clinical medical history, anatomical-functional evaluation, nutritive and non-nutritive evaluations [28], Recently, Richard Baxter developed the Tongue Restriction Questionnaire (TRQ), which included typical infant-through-adult issues that often accompany a tongue restriction and improve after treatment. [29]

Treatment aspects

A frenotomy (also termed frenulotomy), is a minor surgical procedure involving separation or cutting of the frenulum, typically undertaken with sterile scissors, often without anaesthetic.[30] A more invasive frenectomy or frenuloplasty procedure may also be used, which combines excision and repair of tongue-tie, usually requiring the infant to undergo a general anaesthetic.[21] Frenectomy is reported to be a more predictable procedure resulting in a lower recurrence rate when compared to a frenotomy procedure.[30,31]

Although most practicing lactation consultants recommend neonatal frenotomy to overcome the subsequent breastfeeding difficulties,[32] to date, there is no consensus on the indications and treatment options or techniques for management of ankyloglossia.

Frenotomy is a well-tolerated procedure and provides both objective and subjective benefits to the breastfeeding dyad.[33] Despite the poor quality of the current studies it appears that frenotomy/ frenectomy procedures facilitates breastfeeding, enhances milk transfer to the infant and contributes to protection of the maternal nipple and overall breast health.[33]

A systematic review is done in 2015 [34] and reported an improvement in breastfeeding effectiveness following a frenotomy procedure when compared with a sham procedure or no intervention. However, the included studies in this review reported varying outcomes for frenotomy and decreasing maternal nipple pain.[17]

There are no studies that have evaluated non-surgical interventions, and their long-term outcomes on breastfeeding and ankyloglossia. Frenotomy, frenuloplasty and frenectomy are techniques that have been advocated in infants with a maxillary lip-tie encountering difficulties in breastfeeding.[17] Case reports also suggest that surgical release of the lip-tie improves the infant's ability to flange and latch. However, without appropriate controls, adequate samples and long-term follow-up, the results of these reports remain debatable.[18]

Treatment considerations for frenotomy procedure by Canadian Paediatric Society

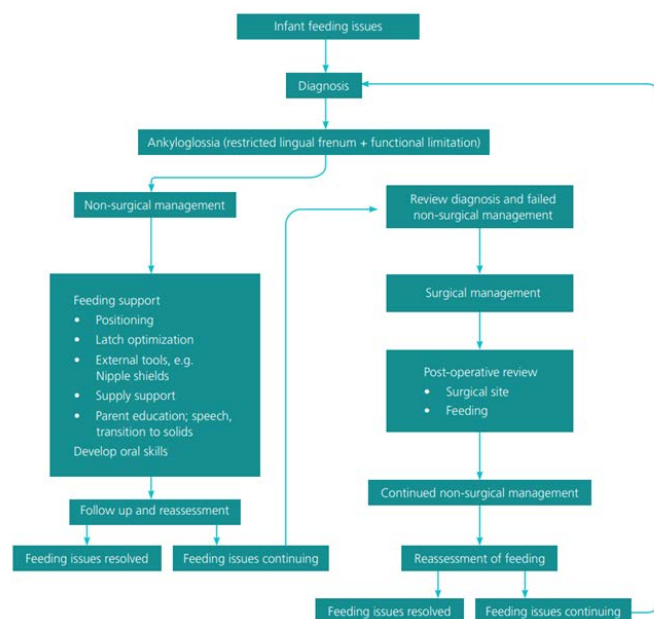
If a tongue-tie release is deemed necessary, a referral to an otolaryngologist or a physician with experience performing this procedure should be made. Appropriate analgesia should be provided for the procedure.[35]

Treatment considerations for ankyloglossia by American Academy of Pediatric Dentistry

When indicated, frenuloplasty, frenectomy, and frenotomy may be a successful approach in alleviating the problem. Each of these procedures involves surgical incision or excision, establishing hemostasis, and wound management. Dressing placement or the use of antibiotics

is not necessary. Post-operative recommendations include maintaining a soft diet, regular oral hygiene, and analgesics as needed. Postoperative exercises are necessary to prevent reattachment of the wound and relapse of the previous symptoms associated with the tongue or lip-tie.[36]

Suggested management pathway for infants diagnosed with ankyloglossia by Australian Dental Association:[37]



Discussion

In the literature the prevalence of tongue-tie varies from 1.7% to 46.3% also the highest prevalence reported is 60%.[38,39,40] This is due to the lack of a standard diagnostic criteria.[41] Most studies appraise both appearance and function of the tongue. Such as, the lowest prevalence of 1.7% includes only cases in which the lingual frenulum extends to the papillated surface of the tongue and arrest tongue from protrusion or causes a sulcus in the tip of the tongue during normal movements.[42] These neonates probably have the most severe tongue-tie from both an anatomical and a functional point of view. On the other hand, Hogan et al. enlisted infants with a frenulum extending along 25–100%

of the tongue's total length and reported a higher prevalence of 10.7% based on appearance only.[43]

In the study conducted by Lori A. Ricke [44] one of the aim was to determine the prevalence of tongue-tie in infants born in an inner-city hospital. Their finding of a prevalence of 4.24% is consistent with recent reports of the prevalence of tongue-tie in newborns of 4.4% [45] and 4.8%.[38] Tongue-tie was found in 4.4% of five hundred neonates from well-baby nurseries in Memphis, TN, that were examined for oral anomalies by 2 investigators. In this study the tongue-tied infants were 3 times more likely to be exclusively bottle-fed at 1 week than matched control subjects with normal tongues. Although, 80% of the tongue-tied infants did successfully breast-feed at 1 week. Furthermore, at 1 month of age, breast-feeding rates for tongue-tie and control infants were similar, if disappointingly low. Other factors not addressed in this study are likely to have more influence on the continuation of breast-feeding at 1 month of age. Therefore, tongue-tie appears to affect the breast-feeding ability of a minority of the affected infants. It is the function, not the appearance, of the tongue that is crucial for successful breastfeeding.[44] A similar conclusion was reached by Messner et al., in their case control study of 41 infants, 1 of 2 investigators subjectively graded tongue-tie of newborns.[32] Eighty-three percent of tongue-tied infants and 92% of control infants successfully breast-fed for 2 months. ($p < 0.01$).[44]

The presence of tongue-tie can influence the diagnosis of breastfeeding difficulty. Effective breastfeeding depends on mother–infant interaction. Proper positioning and good latching-on at the breast are rudimentary to effective suckling. The human nipple is exceedingly elastic and elongates during active breastfeeding to nearly twice its resting length. Whatever is the nipple's anatomy, it is important that the infant's tongue needs to reach the areola

and stretch the breast tissue under the areola to form a teat in his mouth, thus achieving good latch-on. During nursing, few infants with tongue-tie are not able to stretch their tongue beyond their lower gum, that it why it is difficult to accomplish good latching on to the breast. The mothers of these infants feel the infant's tongue at her nipple (instead of areola) or feel the infant's gingiva causing a biting sensation on her nipple, connected with severe nipple pain and which can give rise to cracked nipples. In the study conducted by Sopapan Ngercham et.al., approximately 98% of the mothers who reported the infant's tongue at the areola did not have breastfeeding problems. While in some of the cases when the mother found it difficult to rule out the position of the infant's tongue, these infants were sooner or later found to have poor latching-on. Although tied tongue was the most considerable risk factor for nursing difficulty, short nipple and inefficacy to feel the infant's tongue on the areola were also important risk factors. A dose-response effect was exhibited between severity of tongue-tie and nursing problems. Corresponding to other studies nearly one third of the infants having tongue-tie had problems with nursing. Mother-infant dyad were assessed after the initial 24 hours of life when the effect of maternal analgesics and sedation, which would influence nursing success in infants and their mothers, would have worn off. Although, post-partum nurses initiated nursing support as soon as possible. Breastfeeding difficulty is an important issue, for individual patients and from a public health perspective. The potential for missed opportunities for breastfeeding is enormous. Ricke et al. reported that infants with tied tongues were three times more likely to be solely bottle-fed at 1 week than infants with normal tongues.[44] The problem needs to be identified early so that breastfeeding coaching and emotional support can be commenced as early as possible.[46]

In the 2017 Cochrane Review, they have done randomized, quasi-RCTs, and cluster-randomized trials by doing comparison in the procedures like frenotomy vs no frenotomy or frenotomy vs sham procedure in newborn infants. Frenotomy did reduce the mother's nipple pain but did not show a consistent positive effect on infant breastfeeding. No studies were available that reported whether frenotomy led to long-term successful breastfeeding. More recent studies have shown an association between tongue-tie and upper lip-ties and breastfeeding difficulties. A group of researchers monitored a cohort of 237 mother/ infant who underwent surgical release of tongue-tie and lip-tie. This resulted in significant improvement in maternal pain and breastfeeding quality scores in early outcomes (1 week postoperatively) and continued through 1 month postoperatively.[47]

Tongue-tie and lip-tie are significant problems and are associated with breastfeeding problems in newborn infants. Breastfeeding evaluation is must in every mother and her infant before sending them home, which includes examination of the infant's lingual and labial frenulum and the maternal breast. The first few weeks of the infant's life are very critical so all the mothers of an infant having severe tongue-tie should be closely and individually trained and followed up for the same.[46]

Conclusion

Clinicians must be informed about the diagnosis and management of tongue-tie and lip-tie and the role of frenotomy to appropriately advise mothers who are breastfeeding when issues arise in the first few days after birth. Breast pain could be modified by frenotomy, which is positively associated with the success of exclusive breastfeeding. Frenotomy is a low-risk procedure that can be performed in the outpatient setting with an apparent immediate benefit. Timely diagnosis and treatment can

positively affect the success of exclusive breastfeeding. High-quality studies are needed to further evaluate the effect of tongue-tie and lip-tie on breastfeeding.

Current body of literature, albeit of limited quality and external validity, tends to suggest that in cases where breastfeeding difficulties are identified, the surgical management of ankyloglossia or maxillary lip-tie may provide only subjective improvements in breastfeeding outcomes. Nevertheless, this requires cautious interpretation, as most studies lack a comparison or control group and are limited by factors such as selection and observer bias, subjective measures of assessment and limited follow-up times. Therefore, future research endeavours would benefit from standardized methods of diagnosing and classifying ankyloglossia and maxillary lip-ties with the collection of additional longitudinal data allowing for both comparative and temporal analysis.

References

1. Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics*. 2012 Mar;129(3):e827-41.
2. World Health Organization. Exclusive breastfeeding for six months best for babies everywhere. January 15, 2011.
3. Akre J, World Health Organization. Infant feeding: the physiological basis/edited by James Akre. In *Infant feeding: the physiological basis*/edited by James Akre 1990.
4. NHMRC. Infant feeding guidelines. Dietary guidelines for children. Canberra: NHMRC. 2012.
5. Fein SB, Labiner-Wolfe J, Shealy KR, Li R, Chen J, Grummer-Strawn LM. Infant feeding practices study II: study methods. *Pediatrics*. 2008 Oct 1;122(Supplement 2):S28-35.
6. Odom EC, Li R, Scanlon KS, Perrine CG, Grummer-Strawn L. Reasons for earlier than desired cessation

- of breastfeeding. *Pediatrics*. 2013 Mar 1;131(3):e726-32.
7. Muldoon K, Gallagher L, McGuinness D, Smith V. Effect of frenotomy on breastfeeding variables in infants with ankyloglossia (tongue-tie): a prospective before and after cohort study. *BMC pregnancy and childbirth*. 2017 Dec;17(1):1-9.
 8. Mills N, Pransky SM, Geddes DT, Mirjalili SA. What is a tongue tie? Defining the anatomy of the in-situ lingual frenulum. *Clinical Anatomy*. 2019 Sep;32(6):749-61.
 9. Marmet C, Shell E, Marmet R. Neonatal frenotomy may be necessary to correct breastfeeding problems. *Journal of Human Lactation*. 1990 Sep;6(3):117-21.
 10. Notestine GE. The importance of the identification of ankyloglossia (short lingual frenulum) as a cause of breastfeeding problems. *Journal of Human Lactation*. 1990 Sep;6(3):113-5.
 11. Walsh J, Tunkel D. Diagnosis and treatment of ankyloglossia in newborns and infants: a review. *JAMA Otolaryngology–Head & Neck Surgery*. 2017 Oct 1;143(10):1032-9.
 12. Corryllos E, Genna C, LeVan F. Minimally invasive treatment for posterior tongue-tie (the hidden tongue-tie). In: Watson Genna C, ed. *Supporting Suckling Skills*. 2nd ed. Burlington MA: Jones and Bartlett Learning; 2013: 243-251.
 13. Douglas PS. Rethinking “posterior” tongue-tie. *Breastfeeding Medicine*. 2013 Dec 1;8(6):503-6.
 14. Hong P, Lago D, Seargeant J, Pellman L, Magit AE, Pransky SM. Defining ankyloglossia: a case series of anterior and posterior tongue ties. *International journal of pediatric otorhinolaryngology*. 2010 Sep 1;74(9):1003-6.
 15. O’Callahan C, Macary S, Clemente S. The effects of office-based frenotomy for anterior and posterior ankyloglossia on breastfeeding. *International journal of pediatric otorhinolaryngology*. 2013 May 1;77(5):827-32.
 16. Pransky SM, Lago D, Hong P. Breastfeeding difficulties and oral cavity anomalies: the influence of posterior ankyloglossia and upper-lip ties. *International journal of pediatric Otorhinolaryngology*. 2015 Oct 1;79(10):1714-7.
 17. Patel J, Anthonappa RP, King NM. All tied up! Influences of oral frenulae on breastfeeding and their recommended management strategies. *Journal of Clinical Pediatric Dentistry*. 2018;42(6):407-13.
 18. Kotlow LA. Diagnosing and understanding the maxillary lip-tie (superior labial, the maxillary labial frenum) as it relates to breastfeeding. *Journal of Human Lactation*. 2013 Nov;29(4):458-64.
 19. Genna CW. *Supporting sucking skills in breastfeeding infants*. Jones & Bartlett Learning; 2016 Jun 21.
 20. <http://www.firstfoodforbaby.com/tongue-lip--buccal-ties.html>, Rene Moore, *Lactation and breastfeeding help, support and information*.
 21. Kotlow LA. Oral diagnosis of abnormal frenum attachments in neonates and infants: evaluation and treatment of the maxillary and lingual frenum using the Erbium: YAG laser. *J Pediatr Dent Care*. 2004;10(3):11-4.
 22. Forlenza GP, Black NM, McNamara EG, Sullivan SE. Ankyloglossia, exclusive breastfeeding, and failure to thrive. *Pediatrics*. 2010 Jun 1;125(6):e1500-4.
 23. Kotlow L. TOTS-tethered oral tissues the assessment and diagnosis of the tongue and upper lip ties in breastfeeding. *Journal of Oral Health*. 2015.
 24. Coryllos E, Genna CW, Salloum AC. Congenital tongue-tie and its impact on breastfeeding.

- Breastfeeding: Best for mother and baby Newsletter. 2004;1-6.
25. Amir LH, James JP, Donath SM. Reliability of the hazelbaker assessment tool for lingual frenulum function. *International breastfeeding journal*. 2006 Dec;1(1):1-6.
26. Ingram J, Johnson D, Copeland M, Churchill C, Taylor H, Emond A. The development of a tongue assessment tool to assist with tongue-tie identification. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 2015 Jul 1;100(4):F344-9.
27. Ingram J, Johnson D, Copeland M, Churchill C, Taylor H, Emond A. The development of a tongue assessment tool to assist with tongue-tie identification. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 2015 Jul 1;100(4):F344-9.
28. Martinelli RL, Marchesan IQ, Berretin-Felix G. Poster 2: Posterior lingual frenulum and breastfeeding. *International Journal of Orofacial Myology and Myofunctional Therapy*. 2016;42(1):49-54.
29. Richard Baxter, Ashley Lashley, and Nicholas R. Rendell. Tongue Restriction Questionnaire: A New Screening Tool to Identify Tongue-Tied Patients. *COMPENDIUM March 2021 – ARTICLE REPRINT*. Volume 42, Number 3.
30. Lalakea ML, Messner AH. Ankyloglossia: does it matter?. *Pediatric Clinics*. 2003 Apr 1;50(2):381-97.
31. Kupietzky A, Botzer E. Ankyloglossia in the infant and young child: clinical suggestions for diagnosis and management. *Pediatric dentistry*. 2005 Jan 1;27(1):40-6.
32. Messner AH, Lalakea ML. Ankyloglossia: controversies in management. *International journal of pediatric otorhinolaryngology*. 2000 Aug 31;54(2-3):123-31.
33. Webb AN, Hao W, Hong P. The effect of tongue-tie division on breastfeeding and speech articulation: a systematic review. *International journal of pediatric otorhinolaryngology*. 2013 May 1;77(5):635-46.
34. Francis DO, Krishnaswami S, McPheeters M. Treatment of ankyloglossia and breastfeeding outcomes: a systematic review. *Pediatrics*. 2015 Jun 1;135(6):e1458-66.
35. Rowan-Legg A. Ankyloglossia and breastfeeding. *Paediatrics & child health*. 2015 May 1;20(4):209-13.
36. American Academy of Pediatric Dentistry. Policy on management of the frenulum in pediatric dental patients. *The Reference Manual of Pediatric Dentistry*. Chicago, Ill.: American Academy of Pediatric Dentistry; 2020:74-8.
37. Ankyloglossia and Oral Frena Consensus Statement First Edition 2020 Published by the Australian Dental Association, PO Box 520, St Leonards, NSW 1590, Australia © Australian Dental Association 2020.
38. Messner AH, Lalakea ML, Aby J, Macmahon J, Bair E. Ankyloglossia: incidence and associated feeding difficulties. *Archives of Otolaryngology-Head & Neck Surgery*. 2000 Jan 1;126(1):36-9.
39. Bhattad MS, Baliga MS, Kriplani R. Clinical guidelines and management of ankyloglossia with 1-year followup: report of 3 cases. *Case reports in dentistry*. 2013 Jan 29;2013.
40. Silvia Maya-Enero, Maria Pérez-Pérez, Luis Ruiz-Guzmán, Xavier Duran-Jordà & María Ángeles López-Vílchez. Prevalence of neonatal ankyloglossia in a tertiary care hospital in Spain: a transversal cross-sectional study. *European Journal of Pediatrics* 2020.

41. Segal LM, Stephenson R, Dawes M, Feldman P. Prevalence, diagnosis, and treatment of ankyloglossia: methodologic review. *Canadian Family Physician*. 2007 Jun 1;53(6):1027-33.
42. Jorgenson RJ, Shapiro SD, Salinas CF, Levin LS. Intraoral findings and anomalies in neonates. *Pediatrics*. 1982 May 1;69(5):577-82.
43. Hogan M, Westcott C, Griffiths M. Randomized, controlled trial of division of tongue-tie in infants with feeding problems. *Journal of paediatrics and child health*. 2005 May;41(5-6):246-50.
44. Ricke LA, Baker NJ, Madlon-Kay DJ, DeFor TA. Newborn tongue-tie: prevalence and effect on breast-feeding. *The Journal of the American Board of Family Practice*. 2005 Jan 1;18(1):1-7.
45. Friend GW, Harris EF, Mincer HH, Fong TL, Carruth KR. Oral anomalies in the neonate, by race and gender, in an urban setting. *Pediatr Dent*. 1990 May 1;12(3):157-61.
46. Ngercham S, Laohapensang M, Wongvisutdhi T, Ritjaroen Y, Painpichan N, Hakularb P, Gunnaleka P, Chaturapitphothong P. Lingual frenulum and effect on breastfeeding in Thai newborn infants. *Paediatrics and international child health*. 2013 May 1;33(2):86-90.
47. Merritt LS. The effect of tongue-tie and lip-tie on breastfeeding. *The Journal for Nurse Practitioners*. 2019 May 1;15(5):356-60.