

Ankyloglossia: misinformation vs. evidence regarding its effects on feeding, speech, and other functions

Abstract

Ankyloglossia, commonly, known as “tongue-tie,” is a congenital condition where a short, and often thickened lingual frenulum attaches the anterior tongue tip to the floor of the mouth. As a result of this “tie,” there is a restriction of tongue-tip movement. While ankyloglossia is sometimes associated with difficulties in breastfeeding newborns, the impact on speech production remains a topic of serious debate among professionals. The purpose of this article is to examine the current evidence regarding the effect of ankyloglossia on structure and function, particularly the effect on neonatal feeding and speech. Hopefully, this evidence will inform the practice of otolaryngologists, speech-language pathologists, and other relevant professionals for the benefit of affected children.

Keywords: ankyloglossia, tongue-tie, lingual frenulum, frenotomy, speech, breastfeeding.

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Ann W Kummer

Professor Emeritus, University of Cincinnati College of Medicine, USA

Correspondence: Ann W Kummer, PhD, CCC-SLP (ret), FASHA, Professor Emeritus, University of Cincinnati College of Medicine, USA, Tel 859-512-8207, Email Annkummer33@gmail.com

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Oral frenula: description, purpose, and types

In general, a frenulum (which is a small frenal) is a narrow band of mucosa and elastic fibers that connects a movable body part to a fixed structure. The purpose of a frenulum is to stabilize the structure and prevent excessive or unplanned movement.

In the oral cavity, there are two types of frenula: the labial frenula (plural) and the lingual frenulum. The maxillary labial frenulum connects the middle of the upper lip to the mucosa of the anterior maxilla. The mandibular labial frenulum connects the middle of the lower lip to the mucosa of the mandible. Although uncommon, extra lateral labial frenula can occur, particularly in certain syndromes (Of note is that short or tight labial frenula do not affect bilabial closure, which occurs with jaw movement, and therefore, do not affect speech.) Finally, the lingual frenulum runs vertically from the floor of the mouth to the undersurface of the tongue, connecting the mid-part of the tongue to the mandible.¹

Diagnosis of ankyloglossia

There have been efforts to develop a standardized clinical measurement for the evaluation of ankyloglossia, but this has proven to be a daunting task due to normal variation.^{2,3,4} Just as there are significant differences in normal facial traits among humans, there are also variations in intraoral structures. These differences include variations in the length and thickness of the frenulum, as well as the points of attachment on the ventral surface of the tongue and floor of the mouth. In addition, ankyloglossia is a continuous variation trait. Unlike threshold traits where a trait is either present or absent (e.g. blue eyes, cleft palate, etc.), continuous variation traits exist on a continuum (e.g., height, weight, intelligence, and blood pressure). Therefore, distinguishing abnormality from normal variation can be challenging because the boundary between the two is arbitrary.

Because of variations in the structure, ankyloglossia must be diagnosed by observation of both structure and the functional limitations of lingual movement.^{1,2,5-9} The following are indicators of ankyloglossia:

Structural findings:

An anterior attachment of the lingual frenulum on or very near the tongue tip.

A notch in the midline of the tongue during protrusion (due to restriction of the midline frenulum), resulting in the appearance of a heart-shaped edge.

See Figures 1-4 for examples of ankyloglossia.



Figure 1 Notch in the midline of the tongue.



Figure 2 Notch in the midline of the tongue with mouth slight open.



Figure 3 An anterior attachment of the lingual frenulum.



Figure 4 Notch in the midline of the tongue during protrusion.

Functional findings:

The inability to touch the alveolar ridge or lick the upper lip with the tongue tip when the mouth is slightly open.

The inability to protrude the tongue past the edge of the mandibular incisors (or past lower gingiva in edentulous children).

Otolaryngologists are experts in identifying abnormalities of oral structure. However, speech-language pathologists are uniquely qualified to diagnose the functional restrictions that may or may not be caused by ankyloglossia.

Posterior tongue-tie?

In recent years, lactation specialists have described posterior tongue-tie as a new diagnosis. They suggest that a short frenulum, even when it's in a normal posterior position, can affect breastfeeding.¹⁰⁻¹² Diagnosing posterior tongue-tie is inherently challenging due to the normal position of the frenulum and the tongue's natural adhesion to the mandible.¹³ In addition, there are no definitive studies proving that a shortened posterior frenulum attachment causes impaired lingual movement that negatively affects feeding. Consequently, many professionals, including otolaryngologists and speech-language pathologists, believe that posterior tongue-tie is not an anatomical anomaly and advocate abandoning the term and diagnosis.^{9,14}

Prevalence of ankyloglossia

The actual prevalence of ankyloglossia is unknown because the diagnosis is subjective and made by professionals who use different diagnostic criteria. In the literature, estimates of its prevalence vary greatly and range from as low as .2% to well over 10% of newborns.^{3,5,16-19}

Although the exact prevalence is unknown, the number of newborns diagnosed with ankyloglossia in developed countries has increased significantly in recent years. For example, Walsh and colleagues reported a fourfold increase in the diagnosis of ankyloglossia in newborns and a fivefold increase in frenotomies performed in the United States between 2003 and 2012.²⁰ Similar trends have been reported in other developed countries.^{17,21,22}

Natural history ankyloglossia

There are virtually no studies to determine what happens over time if ankyloglossia is not treated during infancy or early childhood. It's possible that its severity and functional effects decrease as the child grows.²³ This is because during the first 3 years of life, the oral cavity changes in size, structure, and function, while the face reaches almost 65% of its adult size.²⁴ The alveolar ridges grow in height as the primary teeth begin to erupt, and the tongue grows and narrows at the tip. At the same time, the lingual frenulum recedes, stretches, and may even rupture. Therefore, the initial restrictions on lingual movement during infancy may be diminished or even eliminated. Research is needed to confirm this.

Ankyloglossia and neonatal feeding

The effect of ankyloglossia on breastfeeding has been debated among medical professionals for decades.^{9,25-27} A survey of relevant practitioners published in 2000 showed that most lactation consultants (69%) felt that ankyloglossia frequently causes breastfeeding problems.²⁷ They report that infants with restrictive ankyloglossia have difficulty with breastfeeding because they can't fully extend their tongues over the lower gum line to form a proper seal against the nipple. Consequently, they are unable to sufficiently latch onto the breast and keep it within their mouth.^{28,29} In contrast, a minority of physicians (10% of pediatricians and 30% of otolaryngologists) agreed that ankyloglossia commonly affects neonatal feeding.²⁷

The debate surrounding ankyloglossia's effect on infant feeding most likely arises because not all affected infants experience breastfeeding challenges. One study estimated that only 25% of infants with ankyloglossia have difficulty latching on to the nipple during breastfeeding.^{18,30} This means that most infants with ankyloglossia are able to breastfeed without surgical intervention.³¹⁻³³ Another study showed that affected infants can be bottle-fed without difficulty.¹⁹ Finally, one study found that that frenotomy may result in an improvement in breastfeeding.³⁴

In addition to problems with latching on to the nipple, some breastfeeding mothers of infants with ankyloglossia have reported nipple pain during feeding. A few studies have shown that mothers reported less pain with breastfeeding after their infants underwent a frenotomy.^{16, 34-36} Geddes and colleagues used ultrasound to evaluate post-frenotomy feeding.³⁸ They observed less nipple compression during breastfeeding after frenotomy, which could explain why mothers reported a lessening of nipple pain during feeding.³⁷

There are many individual studies regarding the effect of ankyloglossia on breastfeeding. However, most notable are review articles and position statements:

- In 2015, a systematic review sponsored by the Agency for Healthcare Research and Quality (AHRQ) concluded that a “small body of evidence suggests that frenotomy may be associated with mother-reported improvements in breastfeeding, and potentially in nipple pain, but with small, short-term studies with inconsistent methodology, the strength of the evidence is low to insufficient.”²⁹
- In 2015, a systematic review concluded that “data are currently insufficient for assessing the effects of frenotomy on non-breastfeeding outcomes that may be associated with ankyloglossia.”³⁹
- In 2017, a Cochrane review of the effects of frenotomy on newborns with ankyloglossia found that breastfeeding mothers reported less nipple pain following frenotomy. However, they did not find a consistent positive effect on infants’ breastfeeding abilities.⁴⁰
- In 2019, a systematic review concluded that infants with ankyloglossia showed varying degrees of difficulty breastfeeding.⁴¹
- In 2020, the American Academy of Otolaryngology—Head and Neck Surgery (AAO-HNS) published clinical consensus statement (CCS). They stated that anterior ankyloglossia is a potential contributor to infant feeding difficulties and maternal pain, although other causes of feeding difficulties should be considered.⁹
- In 2021, a meta-analysis of the effect of frenotomy on reducing nipple pain during breastfeeding found evidence of some improvements following frenotomy, although individual results varied.³⁴
- In 2021, the Academy of Breastfeeding Medicine published a position statement which concluded that tongue-tie can affect infant feeding in some cases. Therefore, if more conservative measures have been unsuccessful, frenotomy can be an effective way to increase breast milk transfer by the infant, decrease maternal discomfort, and prevent the premature cessation of breastfeeding.⁴²

Ankyloglossia and speech

A common conception among the public is that tongue-ties are a cause of speech disorders. However, relevant professionals have differing opinions regarding this assumption. This was clearly illustrated in another survey that found that 60% of ENTs, 50% of SLPs, and 23% of pediatricians believed that ankyloglossia is likely to cause speech problems. Although it has been more than 20 years since this survey was published, there is still a lack of consensus on this issue within each profession or between the professions.

In the last few decades, there have been a few studies that have reported improvement in speech after frenotomy.^{16,39} However, various reviewers have judged these studies to be of poor quality and, therefore, not conclusive.^{9,45}

In contrast, the following are notable review articles and position statements that do not find an association between ankyloglossia and speech disorders:

- In 2013, a systematic review of studies published between 1966 and 2012 found “no significant data to suggest a causative

association between ankyloglossia and speech articulation problems.”⁴⁶

- In 2015, the Agency for Healthcare Research and Quality (AHRQ) published another systematic review in which they concluded that there is “insufficient evidence that surgical intervention for ankyloglossia improves speech.”⁴⁵
- In 2020, the AAO-HNS consensus group concluded that “ankyloglossia does not typically affect speech.”³⁸
- In 2021, a systematic review reported “no strong evidence to support that ankyloglossia caused speech problems.”⁴⁴
- In 2021, a prospective study on the effect of tongue-tie release on speech concluded that most of the children referred for treatment due to the presence of ankyloglossia had only age-appropriate speech errors.⁴⁷ The authors also reported that ankyloglossia was not associated with speech errors related to insufficient tongue mobility, and therefore, there was no benefit of tongue-tie release to improve speech or intelligibility.

Why ankyloglossia is unlikely to affect speech

To understand why tongue-tip restriction is unlikely to affect speech, it may be helpful to review how tongue-tip phonemes (e.g., lingual-alveolar and interdental sounds) are produced.

The speech sound that requires the greatest amount of lingual elevation is the lingual-alveolar phoneme /l/. This phoneme is produced with the mandible elevated so that the tongue tip is just under the alveolar ridge. During production, the tongue tip is slightly retroflexed as it articulates against the alveolar ridge. However, if this retroflexion is not possible because of tongue tip restriction, this phoneme can be produced with the tongue tip down, which causes the dorsum of the tongue to articulate against the alveolar ridge. The acoustic product is the same for both placements. In fact, some typical speakers naturally produce /l/ in this manner.^{1,8,47,48}

The other lingual-alveolar phonemes (/t, d, n, s, z/) are easier to produce than /l/ because they do not require retroflexion of the tongue tip. During rest with the lips closed, the tongue tip rests against the alveolar ridge. During production of these lingual-alveolar sounds, the mandible drops slightly, and the tongue elevates to articulate against the alveolar ridge for /t/, /d/, and /n/ or under the alveolar ridge for /s/ and /z/. However, if this slight elevation is not possible due to ankyloglossia, these sounds can also be produced with the tongue tip down and the dorsum of the tongue against or just under the alveolar ridge.^{1,8,47,48}

Interdental sounds (/θ, ð/) (voiceless “th” and voiced “th”) require maximum protrusion of the tongue. These sounds are typically produced with the tip of the tongue behind the maxillary incisors, not in between or in front of the maxillary incisors. However, as with lingual-alveolar sounds, interdental sounds can be produced with the tongue tip down.^{1,8,47,48}

It should be concluded that ankyloglossia is unlikely to affect speech because all lingual speech sounds in English can be produced with minimal tongue tip movement. Even when there is a severe limitation in tongue tip movement, the individual can easily compensate to achieve normal speech. However, there is one caveat to this statement. Ankyloglossia may affect the production of the lingual trill (rolled /r/) used in Spanish and other languages worldwide.^{1,47} This is because this sound requires vibration of the tip of the tongue. Research is needed to support this hypothesis.

Other potential concerns with ankyloglossia

Because the lingual frenulum is attached to the gingival ridge behind and between the central incisors of the lower mandible, some dentists feel that it can pull the gingiva away from the teeth, causing gingival recession and a mandibular diastema.^{49,50,51} However, a review of the MEDLINE and Cochrane Library databases in 2009 revealed no clear evidence of gingival recession due to ankyloglossia.⁵⁰

Older children and adults with lingual restrictions may have difficulty clearing food from their oral sulci and molars when eating. Over time, rotting food in the mouth can lead to periodontal disease, tooth decay, and halitosis if oral hygiene is not adequately maintained.

There is some evidence that ankyloglossia affects the ability to French kiss.⁵² A French kiss is performed with the lips apart and the tongues of both individuals touching. However, with both mouths combined, the tongue does not need to be extended very far.

Finally, young children may be concerned about the aesthetics of their tongue during protrusion. This could potentially lead to the child being teased or bullied. The possible effect of this abnormal appearance on the psychosocial health of affected children has not been studied, however.

Surgical procedures for ankyloglossia

The most common procedure done to release the frenulum is a frenotomy, which involves a simple cut to release the frenulum. This procedure is primarily performed on infants with breastfeeding difficulties. There is little pain and minimal bleeding with this procedure because there are few nerve endings and few blood vessels in this tissue.

There are other surgical procedures for ankyloglossia with minor variations. A frenectomy (also called frenulectomy) involves complete removal of the frenulum between the tongue tip and attachment to the mandible. This procedure is most likely performed on older children whose frenulum is pulling on the mandibular gingiva. Finally, frenuloplasty is performed by incising the frenulum and then surgically repositioning it to a more favorable location on the ventral surface of the tongue. The surgeon may opt to do a “Z-plasty” procedure, which is designed to lengthen the frenulum and minimize the risk of scar formation (which can further restrict movement of the tongue over time). The type of surgical procedure chosen depends on the patient’s age, the severity of the condition, and the provider’s preference.

Risks and potential complications of frenulotomy

Frenulotomy is generally a safe procedure. Minimal complications include temporary pain, minor bleeding, or infection. Rare, but more serious complications include hemorrhage, injury to salivary structures, oral aversion, and scarring. When scarring occurs, adhesions can form between the tongue and floor of the mouth, which can result in further lingual restriction.

Although most infants can undergo frenotomy without any long-term consequences, frenotomy is contraindicated for infants with upper airway obstruction, retrognathia, micrognathia, hypotonia, or neuromuscular disorders. This is because release of the frenulum may result in the tongue falling backward into the pharynx, causing the development or exacerbation of glossoptosis. Glossoptosis is a potentially serious complication because it can lead to significant upper airway obstruction and swallowing difficulties.^{53,54}

Finally, there is the danger of disappointment that can result when parents believe that the surgery will correct a feeding or speech problem, which is due to another cause.

Important points to remember

- Ankyloglossia is a congenital condition characterized by attachment of the lingual frenulum to the tongue tip, thus restricting lingual movement.
- The diagnosis of posterior tongue-tie is controversial. If it exists as an anomaly (which is highly debated), there is no current evidence that it affects infant feeding or any other function.
- A small percentage of infants with ankyloglossia have difficulty latching on to the nipple during feeding. If conservative methods have been tried but were unsuccessful, frenotomy may be considered to improve feeding efficiency, relieve maternal nipple pain, and prevent premature cessation of breastfeeding.
- There is no evidence that ankyloglossia causes speech disorders. In fact, simple compensations in placement result in normal acoustics of the sounds. Ankyloglossia could potentially affect the lingual trill used in some languages, but research is needed to confirm this.
- Ankyloglossia can potentially cause issues with mandibular dentition, bolus manipulation during eating, French kissing, and aesthetics.
- Frenotomy is a generally a safe procedure, but is contraindicated for infants with upper airway obstruction, retrognathia, micrognathia, hypotonia, or neuromuscular disorders. This is because release of the tongue may cause glossoptosis, resulting in upper airway obstruction and swallowing difficulties.

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Conflicts of interest

The author declares that there is no conflict of interest to disclose.

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