# Policy on Management of the Frenulum in Pediatric Patients

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## Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes that a restrictive oral frenulum may affect a child's health by hindering the ability to breastfeed or speak. The frequency of surgical intervention has increased exponentially over the last 2 decades.[1-4] The AAPD recognizes an evidence-based policy on frenula would make information more accessible to dentists, physicians, other allied health professionals, and parents and help reduce the number of unnecessary or incorrectly-timed procedures.

## Methods

This policy, developed by the Council of Clinical Affairs in 2019[5], is based on a review of current dental and medical literature and sources of recognized professional expertise and stature, including both the academic and practicing health communities, related to frenula/frenotomies. In addition, literature searches of PubMed/MEDLINE, Web of Science, and Google Scholar databases were conducted using the terms: *ankyloglossia*, *ankyloglossia* AND *breastfeeding outcomes*, *breastfeeding with ankyloglossia and/or upper lip tie*, *gastroesophageal reflux*, *frenotomy*, *frenulotomy*, *frenectomy*, *frenulectomy*, *systematic reviews of ankyloglossia other than breastfeeding*, *lip-tie*, *superior labial frenulum*, *maxillary lip-tie*, *breastfeeding cessation*, *frenum*, *frenulum*, *tongue-tie*, *speech articulation with lingual frenulum*, *frenuoplasty*, *midline diastema*, *lactation difficulties*, *nipple pain with breastfeeding*, *Hazelbaker Assessment Tool for Lingual Frenulum Function (ATLFF)*, *Infant Breast-feeding Assessment Tool (IBFAT)*, *LATCH grading scales*, *mandibular labial frenulum*, *periodontal indications for frenectomy*, *gingival recession associated with midline diastema*; fields: all; limits: within the last 10 years, English. One thousand six hundred twenty-two articles matched these criteria. Papers for review were chosen from this list and from references within selected articles. Expert and/or consensus opinion by experienced researchers and clinicians also was considered.

## Definitions

***Ankyloglossia:*** a congenital developmental anomaly of the tongue characterized by a short, thick lingual frenulum resulting in limitation of tongue movement (partial ankyloglossia) or by the tongue appearing to be fused to the floor of the mouth (total ankyloglossia).[6,7]

***Frenectomy/frenulectomy:*** the complete removal of the frenum/frenulum including its attachment to underlying bone.

***Frenotomy/frenulotomy:*** simple cutting or incision of the frenum/frenulum.

***Frenuloplasty:*** an extensive frenulum excision that usually involves repositioning of aberrant muscle and is closed by Z-plasty or a local flap with placement of sutures.[8]

***Frenulum:*** a mucosal attachment containing muscle and connective tissue fibers which connect intraoral structures such as the lip and cheek to the alveolar mucosa, gingiva, or periosteum.[9]

## Background

Typically, 7 frenula are present in the oral cavity, most notable the maxillary labial frenulum, the mandibular labial frenulum, the lingual frenulum, and 4 buccal (cheek) frenula.[10] Their primary function is to provide stability of the upper lip, lower lip, and tongue.[11] Frenulum attachments and their impact on oral motor function and development are topics of interest within the dental community as well as various health care specialties. Studies have shown differences in treatment recommendations among pediatricians, otolaryngologists, lactation consultants, speech pathologists, surgeons, and dental specialists.[6,12-19] Regardless of the etiology, a 834% increase in diagnosed cases of ankyloglossia and an 866% increase in frenulum procedures have been reported from 1997 to 2012.[2] When the data over this time span is examined more closely, the average percentage of patients diagnosed with ankyloglossia undergoing surgical procedures is 33%.[2] Most recently, 35% of patients in 2009 received surgery as did 38% in 2012.[2] In 2020, a panel of pediatric otolaryngologists released a consensus statement on the diagnosis, management, and treatment of ankyloglossia in children less than 18 years old.[3]

### Maxillary frenulum

A prominent maxillary frenulum in infants, children, and adolescents, although a common finding, can be a concern to parents. The maxillary labial frenulum attachment can be classified with respect to its anatomical insertion level.[10]

**ABBREVIATION**
**AAPD:** American Academy of Pediatric Dentistry.

1. Mucosal (frenal fibers are attached up to the mucogingival junction)
2. Gingival (frenal fibers are inserted within the attached gingiva)
3. Papillary (frenal fibers are extending into the interdental papilla)
4. Papilla penetrating (frenal fibers cross the alveolar process and extend up to the palatine papilla)

The most commonly observed types are mucosal and gingival.[18,19] However, a maxillary frenulum is a dynamic structure that presents changes in position of insertion, architecture, and shape during growth and development.[18] Evidence suggests apical migration of the insertion as the alveolar process grows and descends and the frenulum remains in place.[19,20] Infants have the highest prevalence of papillary penetrating phenotype.[18] In severe instances, a restrictive maxillary frenulum attachment has been associated with breastfeeding and bottle-feeding difficulties among newborns.[21-24] However, in a prospective study, anatomical classification of the maxillary frenulum alone was not correlated with breastfeeding success or difficulty, pain, or maternally-reported poor latch.[25] Studies suggest a restrictive maxillary frenulum may inhibit an airtight seal on the maternal breast through flanging of both lips.[22-24,26] For this reason, future studies focusing on assessment of upper lip flexibility and the ability to flange rather than just anatomical point of insertion may provide more information.[25] The maxillary frenulum can contribute to reflux in babies due to the intake of air from a poor seal at the breast or bottle leading to colic or irritability.[24,27] With the lack of understanding of the function of the labial frenulum, the universality of the labial frenulum, and level of attachment in most infants, the release of the maxillary frenulum based on appearance alone cannot be endorsed.[28] Although a causal relationship between a hyperplastic maxillary frenum and facial caries has not been substantiated, anticipatory guidance for patients with restrictive tissues may include additional oral hygiene measures (eg, swabbing the vestibule after feeding).[29]

Surgical removal of the maxillary midline frenulum may be related to presence or prevention of midline diastema formation, prevention of post orthodontic relapse, esthetics, and psychological considerations.[16-18,30] Treatment options for midline diastema and sequence of care vary with patient age and can include orthodontics, restorative dentistry, frenectomy, or a combination of these.[30] Treatment is suggested (1) when the attachment exerts a traumatic force on the gingiva causing the papilla to blanch when the upper lip is pulled, or (2) if the attachment causes a diastema wider than 2 mm, which is known to rarely close spontaneously during further development.[18,30,31] When a diastema persists into the permanent dentition, the objectives for treatment involve managing both the diastema and its etiology.[30] Pediatric dentists and orthodontists generally agree that most diastemas in the primary and mixed dentitions are normal, are multifactorial, and tend to close with maturity; therefore, any surgical manipulation of the frenulum is not recommended before the permanent canines erupt and only following orthodontic closure of the space[30,32] or in conjunction with orthodontic treatment[33]. This was recently affirmed in a systematic review.[4] Certain surgical interventions, when performed too early, may result in orthodontic relapse due to scarring.[9] A recent retrospective cohort study saw a decrease in maxillary midline diastema width when laser labial frenectomy was performed in both the primary and mixed dentitions.[34] Whether or not this early treatment can prevent the need for orthodontic closure of a persistent diastema in adolescence would best be demonstrated by a prospective investigation utilizing controls with long-term follow up, which was not present in this study.[34]

**Mandibular labial frenulum**

A high frenulum sometimes can present on the labial aspect of the mandibular ridge. This most often is seen in the permanent central incisor area but also can be found by the canine.[15] The mandibular labial frenulum occasionally inserts into the free or marginal gingival tissue.[15] Movements of the lower lip can cause the frenulum to pull on the fibers inserted into the free marginal tissue, which creates pocket formation that, in turn, can lead to food and plaque accumulation.[15] Surgical intervention can be considered to prevent subsequent inflammation, recession, pocket formation, and possible loss of alveolar bone and/or teeth.[15] However, if factors causing gingival/periodontal inflammation are controlled, the degree of recession and the need for treatment decreases.[13,15]

**Lingual frenulum**

The World Health Organization has recommended mothers worldwide exclusively breastfeed infants for the child's first 6 months to achieve optimum growth, development, and health.[35] Thereafter, they may be given complementary foods and continue breastfeeding up to the age of 2 years or beyond.[35] The American Academy of Pediatrics in 2018 reaffirmed its recommendation of exclusive breastfeeding for about 6 months, followed by continued breastfeeding as complementary foods are introduced, with continuation of breastfeeding for 1 year or longer as mutually desired by mother and child.[36] Lingual frenula, in addition to the maxillary labial frenula, have been associated by some practitioners with impedance to successful breastfeeding, thereby leading to recommendations for frenulotomy. The most common symptoms that babies experience from tongue-and lip-tie are poor or shallow latch on the breast or bottle, slow or poor weight gain, reflux and irritability from swallowing excessive air, prolonged feeding time, milk leaking from the mouth due to a poor seal, and clicking or smacking noises when nursing/feeding; maternal symptoms include painful nursing.[24,37]

An anatomical dissection study determined the lingual frenulum in neonates is not formed by a discrete submucosal midline string or band as previously thought; rather, it is a dynamically formed midline fold created in a layer of fascia spanning the floor of the mouth and characterized by

morphology that varies with tongue movement similar to that in adults.[38] This fascia runs from the inner surface of the mandible to join with the connective tissue on the ventral surface of the tongue. It is the height of the fascial attachment on the ventral surface of the tongue that alters the visual prominence of the frenulum when placed under tension as seen when elevated.[38] The lingual frenulum does not have direct connection to the posterior tongue (also known as the tongue base). Therefore, the term "posterior tongue-tie" is misleading and anatomically incorrect. Ankyloglossia can perhaps be considered an imbalance of the fascial roles, where its provision of tongue stability impacts tongue movement.[38]

A methodological review of the term ankyloglossia shows the use of multiple diagnostic criteria, leading the reported prevalence of ankyloglossia to vary between 4.2% and 10.7% of the population.[13,19] Several diagnostic classifications have been proposed based on anatomical and functional criteria, but none has been universally accepted.[13,39] No single anatomical variable of the frenulum has been shown in isolation to correlate directly with impaired tongue function. As such, the use of grading systems simply describes appearance rather than serving as an objective tool to diagnose or categorize the frenulum as ankyloglossia.[38] The tongue's ability to elevate rather than protrude is the most important quality for nursing, feeding, speech, and development of the dental arches.[40,41]

Ankyloglossia has been associated with breastfeeding and bottle-feeding difficulties among neonates, limited tongue mobility and speech difficulties, malocclusion, and gingival recession.[6,12,13,15-19,31] An ultrasound study has shown that patterns of tongue motions differed both in infants with ankyloglossia (with breastfeeding problems) and those without ankyloglossia,[42] but because no anatomical variables of the lingual frenulum were included in that study, it is not possible to correlate frenum morphology to changes demonstrated on the ultrasound[38]. A short frenulum can inhibit tongue movement and create deglutition problems.[13,42,43] Systematic literature review articles acknowledge the role of frenotomy/frenectomy for demonstrable frenal constriction in order to reduce maternal nipple pain[44] and improve successful breastfeeding when the procedure is provided in conjunction with support of other allied health care professionals.[6,13,15,16,19] A Cochrane review[44] noted the included randomized control trials were small and had multiple limitations. Due to those limitations, the review was unable to determine whether frenotomy in infants younger than 30 days who had ankyloglossia and feeding difficulties correlated with longer-term breastfeeding success. Similarly, the Canadian Agency for Drugs and Technologies in Health (CADTH) questioned whether frenectomy provides a meaningful incremental benefit over other treatments or procedures to improve breastfeeding, particularly in the longterm due to studies' designs.[1] Because breastfeeding is a complex relationship dyad, ankyloglossia may be only one of multiple possible deficiencies contributing to difficulty breastfeeding.[2,45] Therefore, predicting which infants will have improved breastfeeding following frenectomy may be difficult.[44,46] Some studies show a decrease in surgical intervention in infants with feeding difficulties when a team of allied health care professionals is involved using consistent multidisciplinary assessment and incorporating alternative intervention strategies.[47-49]

Limitations in tongue mobility and pathologies of speech have been associated with ankyloglossia.[13,50,51] However, opinions vary among health care professionals regarding the correlation between ankyloglossia and speech disorders. Speech articulation is largely perceptual in nature; variation in speech assessment outcomes is very high among individuals and specialists from different medical backgrounds.[6] The difficulties in articulation for individuals with ankyloglossia are evident for consonants and sounds like */ s /*, */ z /*, */ t /*, */ d /*, */ l /*, */ sh /*, */ ch /*, */ th /*, and */ dg /*, and rolling an R is especially challenging.[6,50] Because parents often do not report speech issues accurately, an evaluation by a speech-language pathologist skilled in assessing tongue-ties (although consensus on assessment techniques has not been established) is suggested prior to recommending a tongue-tie release.[52] Speech therapy in conjunction with frenuloplasty, frenulotomy, or frenulectomy can be a treatment option to improve tongue mobility and speech.[50,51] One pilot study reported children with moderate and moderate-to-severe speech and language impairment attained better speech and language outcomes after frenulectomy when compared with children with mild and mild-to-moderate impairments.[53] However, other studies hint at the subjective improvement when parents were surveyed.[50,54] Nevertheless, further evidence is needed to determine the benefit of surgical correction of ankyloglossia and its relation to speech pathology as many children and individuals with ankyloglossia may be able to compensate and do not appear to suffer from speech difficulty.[13,16,39,55-57]

A high-arched palate, reduced palate width, and elongated soft palate have been associated with tongue-tie.[40,41] Evidence relating ankyloglossia and abnormal tongue position to skeletal development of Class III malocclusion is limited.[58,59] A complete orthodontic evaluation, diagnosis, and treatment plan are necessary prior to any surgical intervention.[58]

Localized gingival recession on the lingual aspect of the mandibular incisors has been associated with ankyloglossia in some cases where frenal attachment causes gingival retraction.[13] As with most periodontal conditions, elimination of plaque-induced gingival inflammation can minimize gingival recession without any surgical intervention.[13] When recession continues even after oral hygiene management, surgical intervention may be indicated.[13,15]

**Treatment considerations**

Although evidence in the literature to promote the timing, indication, and type of surgical intervention is limited, frenulotomy/frenulectomy for functional limitations and symptomatic relief may be considered on an individual basis.[6,13,42,51,60,61] Evaluation for other potential head and neck sources (eg, nasal obstruction, airway obstructions, reflux, craniofacial anomalies) for breastfeeding problems before performing a frenulotomy on a patient who has feeding difficulties[3] may prevent unnecessary surgeries especially in very young neonates less than 2 weeks of age. When indicated, frenuloplasty, frenulectomy, and frenulotomy may be a successful approaches in alleviating the problem.[6,9,13,18] Each of these procedures involves surgical incision or excision, establishing hemostasis, and wound management.[62] With regards to anatomy, the lingual nerve has been shown to pass immediately beneath the fascia on the ventral surface of the tongue with smaller branches

continuing into the lingual frenum.[38] As such, sensory input necessary for tongue shape may be compromised if the lingual nerve is damaged.[63] Additional complications may occur during or following frenulum surgical procedures and include excessive bleeding, formation of a mucus retention cyst, reattachment, hematoma formation, numbness or paresthesia, infection, scar tissue formation, and restriction in tongue movement.[64] Dressing placement or the use of antibiotics is not necessary.[62] In older patients, postoperative care may include maintaining a soft diet, regular oral hygiene, and analgesics as needed. Postoperative pain has been reported in some studies and found to persist as a moderate level (6.5 on a scale of 10) for 3 days.[65] Although otolaryngologists' expert opinion[3] and the CADTH[66] do not support a standard postprocedure regimen including stretching, massaging, or other exercises to prevent reattachment of the frenulum, others have concluded that exercises after tongue-tie release have elicited functional improvements in speech, feeding, and sleep.[54,65] These studies have been limited by patient numbers and lack of control groups. Postoperative pain, especially in the neonate, may further inhibit postsurgical stretching and exercises and can lead to oral aversion.[67] Oral exercises have been advocated as a safe and potentially effective adjunct to improve tongue movements with or without surgical intervention in school-aged patients.[65]

The use of electrosurgery or laser technology for frenulotomies/frenulectomies has demonstrated a shorter operative working time, improved hemostasis, reduced intra- and postoperative pain and discomfort, fewer postoperative complications (eg, swelling, infection), no need for suture placement, and increased patient acceptance.[68,69] These procedures require extensive training as well as skillful technique and patient management, especially in the neonate.[6,9,13,18,20,51,71-72] As with all surgical procedures, an informed consent is essential. Informed consent includes relevant information regarding assessment, diagnosis, nature and purpose of proposed treatment, and potential benefits and risks of the proposed treatment, along with professionally-recognized or evidence-based alternative treatment options – including no treatment – and their risks.[73]

## Policy statement

The AAPD supports additional research on the causative association between ankyloglossia and difficulties in breastfeeding or speech articulation, between a hyperplastic labial frenulum and increased risk of caries or periodontal disease, and upper lip restriction and difficulties with breastfeeding/latch. The AAPD recognizes that causes other than ankyloglossia are more common for breastfeeding difficulties and that, while frenulotomy for an infant with ankyloglossia can lead to an improvement in breastfeeding, not all infants with ankyloglossia require surgical intervention.[3] Due to the broad differential diagnosis, a team-based approach including consultation with other specialists can aid in treatment planning. Further randomized controlled trials and other prospective studies of high methodological quality are necessary to determine the indications and long-term effects of frenulotomy/frenulectomy.

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