Ankyloglossia in the Infant and Young Child: Clinical Suggestions for Diagnosis and Management

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Abstract

Since the recommended time for a child's first dental visit is early, it is essential that pediatric dentists be familiar with all possible pathologies occurring during this early period of life. The parents of infants and toddlers who notice in their child a "tongue-tie" (ankyloglossia) are likely to turn first to their pediatric dentist for advice and help. Treatment options such as observation, speech therapy, frenotomy without anesthesia, and frenectomy under general anesthesia have all been suggested in the literature. The purposes of this report are to describe ankyloglossia, its clinical significance, and the timing of treatment. The frenotomy procedure is presented for the pediatric dentist with clinical suggestions for the diagnosis and management of ankyloglossia.(*Pediatr Dent.* 2005;27:40-46)

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Since the recommended time for a child's first dental visit is early, it is essential that the dentist be familiar with all possible pathologies occurring during this early period of life. Pediatric dentists are well acquainted with and capable of diagnosing and treating children over 2 years of age presenting with oral problems relating to the teeth and their supporting structures.

The problems of infants 1 year of age or younger, however, may be less familiar to the dentist. The parents of infants and toddlers who notice in their child a "tongue-tie" are likely to turn first to their dentist for advice and help. Lactation specialists in certain communities may refer infants with breast-feeding problems to the dentist for correction of ankyloglossia (AG) that they identified as being the cause of the child's feeding difficulties. The American Academy of Pediatric Dentistry guidelines[1] call for a complete and thorough oral exam and evaluation of the infant at the first infant dental visit. Dentists who perform such services for infants should be prepared to provide therapy when indicated or be capable of identifying the need to refer the patient to an appropriately trained individual for necessary treatment.

The purposes of this report are to describe AG, its clinical significance, and timing of treatment. The frenotomy procedure is presented with clinical suggestions for the diagnosis and management of AG.

Definition, incidence, and clinical sequalae of ankyloglossia

AG (more commonly called "tongue-tie") is a congenital anomaly characterized by an abnormally short lingual frenum, which may restrict tongue tip mobility.[2] There is much controversy regarding this condition. Differences of opinion regarding its definition, clinical significance, need for surgical intervention, and timing of treatment may all be found in the scientific literature. Otolaryngologists, oral surgeons, pediatricians, speech therapists, and lactation consultants may all voice different opinions regarding the various aspects of AG.[2-4]

AG definitions range from vague descriptions of a tongue that functions with a less-than-normal range of activity to a specific description of the frenum being short, thick, muscular, or fibrotic.[5-7] Others only designate AG as an extreme fixation of the tongue to the floor of the mouth; or as a minor limitation of movement not defined as AG. The plethora and variety of AG definitions in the literature suggests the lingering controversy regarding this condition and its clinical significance.

Table 1. Hazelbaker [19] The Assessment Tool for Lingual Frenulum Function

Function items	Appearance items
Lateralization	Appearance of tongue when lifted
2=complete	2=round or square
1=body of tongue, but not tongue tip	1=slight cleft in tip apparent
0=none	0=heart-shaped
Lift of tongue	Elasticity of frenulum
2=tip to mid-mouth	2=very elastic
1=only edges to mid-mouth	1=moderately elastic
0=tip stays at alveolar ridge or tip rises only to mid-mouth with jaw closure	0=little or no elasticity
Extension of tongue	Length of lingual frenulum when tongue lifted
2=tip over lower lip	2=>1cm or embedded in tongue
1=tip over lower gum only	1=1 cm
0=neither of the above or anterior or mid-tongue humps	0=<1 cm
Spread of anterior tongue	Attachment of lingual frenulum to tongue
2=complete	2=posterior to tip
1=moderate or partial	1=at tip
0=little or none	0=notched
Cupping of tongue	Attachment of lingual frenulum to inferior alveolar ridge
2=entire edge, firm cup	2=attached to floor of mouth or well below ridge
1=side edges only, moderate cup	1=attached just below ridge
0=poor or no cup	0=attached at ridge
Peristalis	
2=complete anterior to posterior (originates at tip)	
1=partial: originating posterior to tip	
0=none or reverse peristalsis	
Snap-back	
2=none	
1=periodic	
0=frequent or with each suck	
Scoring	
14=perfect score (regardless of appearance item score)	
11=acceptable if appearance item score is 10	
<11=function impaired; frenotomy should be considered if management fails	
Frenotomy is necessary if function score is <11 and appearance score is <8	

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Table 2. Classification of Ankyloglossia Based on "Free Tongue" Length*

Clinically acceptable, normal range of free tongue=>16 mm
Class I: mild ankyloglossia=12-16 mm
Class II: moderate ankyloglossia=8-11 mm
Class III: severe ankyloglossia=3-7 mm
Class IV: complete ankyloglossia=<3 mm

*As per Kotlow.[5]

AG incidence varies from 0.02% to 5%, depending on the study, its definition of AG, and population examined.[3,4,7-13] The incidence among outpatients of a children's hospital with breast-feeding problems was almost 3 times higher (13%).[4] Two independent studies of oral anomalies in neonates found a significant 3X predilection for AG in males.[12,13] AG may occur with increased frequency in various congenital syndromes, including Opitz syndrome, orofaciodigital syndrome, Beckwith-Wiedemann syndrome, Simpson-Golabi-Behmel syndrome, and X-linked cleft palate.[3]

Sequlae

The possible sequlae of AG remain controversial, and the range of suggested complications is great. Among the suggestions found in the literature are: (1) lower incisor deformity; (2) gingival recession; and (3) malocclusions.[14] It should be emphasized that, without further research, clinicians should not advise parents that the existence of AG will result in a malocclusion in their child.

Although there is a lack of scientific evidence proving a relationship between speech disorders and AG, a consensus seemingly exists that AG is not a cause of a delay in speech onset. AG may interfere with articulation, however, as will be described in forthcoming detail.

The existence of AG in the newborn may result in breast-feeding difficulties, including ineffective latch, inadequate milk transfer, and maternal nipple pain. An infant with AG may experience difficulty latching on to the nipple and may compress the nipple against the gum pad instead of the tongue, resulting in nipple pain and an inefficient, inadequate seal. A mother experiencing such pain may often contemplate switching the baby to a bottle. Indiscriminate or immediate clipping of all or most lingual frenula, however, is not universally recommended. It is crucial to understand the mechanism of feeding and its relationship with oral structures to comprehend the suggested role of AG in feeding problems. Many of the reports on this suggested mechanism are anecdotal,[15-17] and evidence-based studies are lacking. A recent study of 3,000 infants concluded that:

1. AG represents a significant proportion of breast-feeding problems.
2. Surgical interventions in the presence of significant AG facilitated successful and improved breast-feeding.[4]

Figure 1. Newborn infant with significant ankyloglossia. The lingual frenum extends from the alveolar ridge to the tongue, preventing the tip of the tongue to lift to the mid-mouth when crying. The tongue resembles an arrow or heart shape.

Dentists are encouraged to learn more about the mechanisms of breast-feeding in the lactation literature.

AG may have sequalae beyond those of speech or feeding difficulties. Children may be teased by their peers for their anomaly. Social issues include the inability to lick ice cream, play a musical wind instrument, and even kiss.[5]

Clinical assessment in infant

A thorough intraoral exam should be performed on the infant. Inspection of the tongue and its function should be part of the routine first dental visit. Parents should be advised regarding the presence and severity of AG and made aware of potential feeding, speech, and dental problems.[4] The newborn exam may show a membrane attached between the tip and middle portion of the tongue's inferior aspect—extending to the anterior floor of the mouth, just beneath or directly onto the alveolar ridge.

The clinician should examine the tongue's appearance when the tongue is lifted as the infant cries or tries to extend the tongue[4] (Figure 1). While lifting the infant's tongue, the frenum should be palpated and its elasticity determined. The attachment of the frenum to the tongue should normally be approximately 1 cm posterior to the tongue's tip. The frenum's attachment to the inferior alveolar ridge should be proximal to or into the genioglossus muscle on the floor of the mouth.

The mother should be interviewed regarding the infant's ability to breastfeed. Does the infant demonstrate frustration at the breast? Is the infant experiencing inability to sustain a good latch to the nipple? Does the mother experience any nipple pain or discomfort while the infant nurses? If any of these factors are present, a lactation specialist should be consulted for breast-feeding assessment.

Clinical assessment in preschool/school-age patient

Although there is a lack of scientific evidence proving a true relationship between speech disorders and AG, there seems

to be a consensus that AG may be the cause of specific speech disorders in certain individuals. AG does not prevent or delay the onset of speech, but may interfere with articulation. A simple speech articulation test has been suggested.[14] Although dentists lack training in phonetic analysis, it is nonetheless possible for individuals other than speech pathologists to judge the accuracy of a sample of patient articulatory production.[14]

If the elevation of the tongue tip is restricted, the articulation of 1 or more of the tongue sounds—such as "t," "d," "l," "th," and "s"—will not be accurate. The patient who can produce these sounds accurately is probably not a candidate for surgical correction. Patients who have difficulty should be referred to a speech pathologist for evaluation.[14]

As noted, it is important to remember that AG is not a cause of speech delay.[3] Children with AG are expected to acquire speech and language at a normal rate, although some may experience articulation difficulties for certain speech sounds, as previously indicated. Occasionally, parents with a speech-delayed child may erroneously ascribe the delay to AG and demand surgical correction in the hope that normal speech and language will result.[3] In such a patient, a potential cause such as audiologic or neurodevelopmental factors may be the etiology of the problem. Surgical repair should be delayed until obtaining the appropriate assessments and diagnosis.

Several suggestions have been made in the literature regarding a systematic protocol for AG assessment, lingual function, and need to for surgical correction.[14,18,19] Hazelbaker developed an assessment tool to quantify the function and appearance of the tongue in infants with AG.[19] The scoring and examination method is presented in Table 1. Kotlow introduced a simple classification, measuring the "free tongue".[5] This method can be used in older patients as well as infants. The term "free tongue" is defined as the tongue's length from the insertion of the lingual frenum into the tongue's base to the tongue's tip. The categories and definitions of Kotlow's protocol are presented in Table 2.

Lalakea recommended measuring lingual mobility in children and tongue elevation to document and define the degree of restriction and AG.[3] Mobility is evaluated by measuring in millimeters the tip of the tongue extended past the lower dentition. Elevation is measured by recording interincisal distance with the tongue tip maximally elevated and in contact with the upper teeth. Typically, children with AG have protrusion and elevation values of 15 mm or less, and 20 to 25 mm or greater in normal children.

Clinicians should remember that, despite all the methods previously mentioned, currently there is no way based on examination to predict which children are likely to develop speech or mechanical symptoms related to their AG.[3] Lalakea suggested that, given the minor nature of the surgery and significant potential for speech difficulties and later social and mechanical problems, it may be appropriate to consider surgery for children with significant AG at any age, including infants and toddlers who have yet to demonstrate overt symptoms. Parents should be informed that there is no way to predict which children will develop symptoms related to their condition and which may outgrow their condition. Although early intervention in all children may be unwarranted, delaying intervention until obvious difficulties emerge may commit some children unnecessarily to a period of speech therapy and social embarrassment.

Another consideration is that up to several months of age, a frenotomy can be performed quickly in the clinic without requiring general anesthesia (GA). In contrast, if surgery is deferred until the child is older, GA is usually required if a frenectomy is performed. Frenotomy can be accomplished, however, in children older than 1 year using conscious sedation (ie, nitrous oxide/oxygen inhalation with oral premedication). It should be noted that some experts categorically state that frenotomy should not be performed before 4 to 5 years of age.[6,20]

Treatment

Several AG treatment methods have been suggested. Management approaches range from very early treatment without anesthesia to the other extreme—that AG should never be treated.[21] Physicians may often delay recommending treatment of a short lingual attachment unless there are obvious speech or nursing difficulties.[5] Treatment options such as observation, speech therapy, frenotomy without anesthesia, and frenectomy under GA have all been suggested in the literature.

Clinical procedure

Frenotomy technique[3,4] (Figure 2)

The frenotomy procedure is defined as the cutting or division of the frenum. The procedure may be accomplished without local anesthesia and with minimal discomfort to the infant.[4] The discomfort associated with the release of thin and membranous frena is brief and quite minor.[3] The authors, however, highly recommend the use of topical anesthetic gel for pain control and to alleviate any parental concerns. Other clinicians suggest always using local anesthesia regardless of the age or extent of the attachment.[21]

The parent or an assistant holds and stabilizes head. The infant is placed supine with the elbows held securely close to the body. The tongue is lifted gently with sterile gauze and stabilized exposing the frenum. This may be achieved by the placement of 2 gloved fingers of the clinician's left hand placed below the tongue on either side of the midline, retracting the tongue upward toward the palate and exposing the frenum (Figures 2A and 2B).

The frenum is then divided with small sterile scissors at its thinnest portion (Figure 2C). The incision begins at the frenum's free border and proceeds posteriorly, adjacent to the tongue. This is necessary to avoid injury to the more inferiorly placed submandibular ducts in the floor of the mouth.

Occasionally, complete release may be accomplished with a single scissors cut. More frequently, however, especially

Figure 2A. The frenotomy procedure in a 1-week-old infant who had presented with breast-feeding difficulties.

Figure 2B. A topical anesthetic may be applied. Only a thin and membranous frenum should be corrected with the frenotomy procedure, as can be seen in this case. Frena of thicker and more fibrous/vascular nature are contraindicated for this procedure.

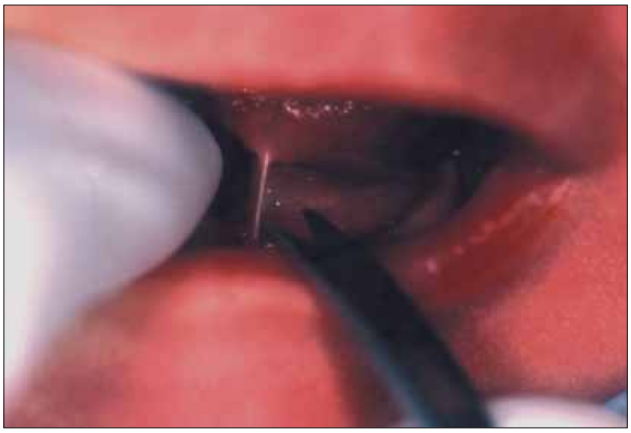

Figure 2C. The frenum is divided with small sterile scissors at its thinnest portion and above the submandibular salivary gland ducts.

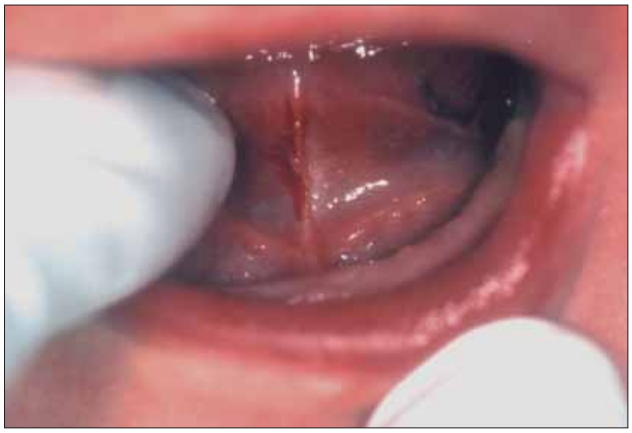

Figure 2D. Postoperative view immediately following first incision. Occasionally, complete release may be accomplished with a single scissors cut, but more frequently, 2 or 3 sequential cuts are required.

Figure 2E. The procedure is completed. There should be minimal blood loss. Bleeding can be controlled easily with a brief period of pressure applied with gauze. The incision is not sutured.

when the frenum is quite tight, 2 or 3 sequential cuts are required; each cut provides some release, allowing improved retraction and visualization for subsequent cuts.[4] Care is taken not to incise any vascular tissue. The frenum is poorly vascularized and innervated, allowing the clinician to accomplish the procedure without any complications.

There should be minimal blood loss (ie, no more than a drop or two, collected on sterile gauze[3]; Figure 2E). If needed, bleeding can be controlled easily with a brief period of pressure applied with gauze. The incision is not sutured (Figure 2E).

Crying is usually limited to the time the infant is restrained. Feeding may be resumed immediately and is without apparent infant discomfort. No specific follow-up care is required, except that breast milk is recommended for at least the next few feedings. Acetaminophen may be used for pain control, but is usually not necessary. Parents should be advised that a postoperative white fibrin clot might be seen to form at the incision site during the first couple of days. The parents should be reassured that it is

Figure 3A. The frenectomy procedure in a 7-year-old boy, referred by a speech pathologist for surgical correction. Note the fibrous and thick attachment compared with a thin, membrane-like frenum, as illustrated in Figure 2B.

Figure 3B. Following release and division of the frenum, sutures were placed. Note the relative complexity of the incision as compared with that of the frenotomy.

Figure 3C. Two-month postoperative view. Child is able to proximate the tongue to the buccal surface of maxillary incisors.

Figure 3D. Six months after surgery, the lingual frenum is fully healed.

Figure 3E. The child can fully protrude the tongue past incisors.

part of the healing process and not be mistakenly perceived as infection. Antibiotic therapy is not needed. Follow-up in 1 to 2 weeks should show that the incision is completely healed.

Frenectomy (Figure 3)

The frenectomy procedure is defined as the excision or removal of the frenum.

Frenectomy is the preferred procedure for patients with a thick and vascular frenum where severe bleeding may be expected, and in some cases, reattachment of the frenum by scar tissue may occur. The procedure in young children is performed under GA. Older children or adults, however, may tolerate the procedure with the use of local anesthesia alone. The frenum is released in a similar manner as in frenotomy although occasionally limited division of the genioglossus may be required for adequate release. The wound is sutured with a z-plasty flap closure.

Discussion

Clinicians who typically perform frenotomy include otolaryngologists, dentists, and pediatricians. Interestingly, 22% of a group of 425 North American pediatricians who responded to a survey indicated that they had performed frenotomies, although only 10% reported that they have

been taught the technique in residency.[2] This should encourage dentists not familiar with the procedure to study the technique and incorporate it into their practice. The technique, similar to all surgical procedures may, however, result in several possible complications. Complications of frenotomy include infection, excessive bleeding, recurrent AG due to excessive scarring, new speech disorders developing postoperatively, and glossoptosis (tongue "swallowing") due to excessive tongue mobility.[4]

One incident of a life-threatening complication after lingual frenotomy has been reported in the literature.[22] A 7-year-old boy with a tight lingual frenum was placed under GA with a nasal pharyngeal airway and face mask. The frenum was incised and sutured. Immediately after removal of the airway, upper airway obstruction occurred. The patient displayed evidence of upper airway collapse, which resolved spontaneously within an hour. The authors explained that, normally, contraction of the genioglossus muscle pulls the tongue and hyoid bone anteriorly—it being the principal dilator of the upper airway. A tight lingual frenum also holds the tongue anteriorly, and, after surgical release, the genioglossus muscle may not be able to generate sufficient force to prevent airway collapse.

It is not this report's intention to instruct readers to begin and perform frenotomies in their daily practice. Rather, it is suggested that clinicians consider performing this procedure for the benefit of their patients after obtaining further training regarding the technique. A clinician seeing an infant is encouraged to:

1. examine the frenum attachment;
2. diagnose AG if it is present and evaluate its severity;
3. be aware of the benefits of frenotomy;
4. refer patients to a qualified surgeon if unable to perform a frenotomy.

When this technique's relative simplicity is weighted against the severity of the consequences of untreated cases or the future treatment with the frenectomy procedure, pediatric dentists should consider the frenotomy technique. This report should facilitate early treatment of this relatively common disturbance.

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