Surgical Speech Disorders

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KEYWORDS

• Ankyloglossia • Frenotomy • Frenuloplasty • Velopharyngeal insufficiency
• Velopharyngeal dysfunction • Pharyngoplasty • Furlow palatoplasty

KEY POINTS

- Frenotomy is a common procedure treating ankyloglossia in infants with thin frenulum.
- The incision needs to be carried posteriorly until the tongue is sufficiently released before closing with interrupted sutures.
- Complete clinical history, including speech, communication, swallowing, airway, and sleep symptoms, is important in velopharyngeal insufficiency management.
- A team using a standardized approach should evaluate the patient and perceptual speech assessment should be conducted by a qualified speech pathologist to provide speech differential diagnosis.
- Furlow palatoplasty can optimize the levator veli palatini (LVP) muscular function and increase the length of the palate, and sphincter pharyngoplasty is best suited for patients with transverse orientation of LVP and poor lateral wall movement.

OVERVIEW

Speech is one of the main forms of communication. Speech production is a complex motor activity that requires generation of air pressure (respiratory control), vocal function (phonation), articulation, motor planning, and velopharyngeal (VP) function. Coordination of these components is needed to produce intelligible speech.[1,2] Most speech delays, such as dysfluency, articulation errors, and childhood apraxia of speech, are treated with speech therapy. However, 2 conditions, ankyloglossia and VP dysfunction (VPD), may require surgical intervention for their associated speech symptoms. This article discusses the surgical management of ankyloglossia and VPD.

ANKYLOGLOSSIA

There are several important structures required for correct articulation. The most important active articulator is the tongue. Ankyloglossia is a condition associated with a shortened lingual frenulum that restricts movement of the tongue tip. The clinical phenotypes vary from mild abnormalities to complete ankyloglossia in which the tongue is fused to the floor of the mouth (**Fig. 1**).

Symptoms of ankyloglossia may include breastfeeding difficulties, speech disorders, or problems with deglutition and dentition. Any of these symptoms may be an indication for surgical management. During infancy breastfeeding may be the most salient symptom. Ankyloglossia in infants is associated with a 25% to 60% incidence of difficulties with breastfeeding, including failure to thrive and maternal breast pain. Studies have shown that, for every day of maternal pain during the initial 3 weeks of breastfeeding, there is a 10% to 26% risk of cessation of breastfeeding.[3]

Speech production is another common indication for surgery. The effect of ankyloglossia on speech has been a subject of debate. Some children with tongue-tie are able to develop normal speech without treatment, whereas others have articulation difficulties. The speech problems associated with ankyloglossia are typically the

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Fig. 1. Ankyloglossia with thick frenulum that requires frenuloplasty. (*From* Anatomy & Physiology for Speech, Language, and Hearing by J. A. Seikel, D. King, & D. Drumright, 2010, 4E. Copyright © 2010 Delmar Learning, a part of Cengage Learning, Inc. Reproduced with permission.)

production of lingual dental sounds (such as t, d) and sibilants (such as z, s, th). Up to one-half of young children with ankyloglossia referred for otolaryngology evaluation have articulation difficulties.[4] The 2 main surgical approaches are frenotomy and frenuloplasty.

FRENOTOMY

The most common treatment of ankyloglossia in infants is frenotomy by incising a few millimeters into the lingual frenulum when it is thin. Frenotomy can be performed at the bedside or in the clinic with or without topical anesthesia. In general, the discomfort associated with release of thin frenulum is very brief. If desired, oral sucrose solution may be given a few minutes before the procedure to provide short-term analgesia.

The infant is positioned directly in front of the surgeon. Fingers or a groove retractor is placed on either side of the frenulum, and the ventral surface of the tongue is exposed. A hemostat is used to clamp the frenulum in order to reduce bleeding. Iris scissors are used to divide the frenulum. Care is taken to avoid injury to the submandibular ducts. Two or more sequential cuts may be needed to accomplish a complete release. The incision does not require sutures. Feeding is allowed immediately after the procedure. Bleeding is generally scant and controlled with pressure or breastfeeding. Complications associated with this procedure are usually negligible.

FRENULOPLASTY

In older children, frenuloplasty with sutures is generally performed to allow a more complete release. Local anesthesia in clinic may be considered for cooperative older children. If surgery is deferred until the child is more than 1 year old or the frenulum is thick, general anesthesia is normally preferred. When general anesthesia is used, intermittent mask ventilation is usually sufficient. Local anesthetic with epinephrine can be infiltrated at the surgical site to improve hemostasis and postprocedure pain. The tongue is retracted superiorly with a groove retractor or a penetrating clamp to expose the frenulum. The frenulum is sharply divided in a horizontal fashion to the level of ventral tongue. This division creates a diamond-shaped defect. The incision needs to be carried posteriorly until the tongue is sufficiently released to allow protrusion. Hemostasis is obtained with electrical cautery. The defect is then closed in a vertical fashion with interrupted absorbable sutures. For more severe ankyloglossia, Z-plasty reconstruction of the floor of the mouth may be considered. Prophylactic antibiotics are not prescribed because infection is rare.

VPD

VPD results in failure of the VP port to close appropriately during speech production. It is characterized by hypernasal resonance and nasal air emissions. VPD includes VP incompetence, VP mislearning, and VP insufficiency (VPI).

VP incompetence is caused by poor motor speech function despite adequate anatomy. Patients with VP incompetence are likely to improve with speech therapy. VP mislearning includes disordered speech behaviors such as compensatory misarticulations in spite of normal VP anatomy and function. VPI is caused by incomplete closure of the VP port during speech production.

Cleft palate is the most common congenital anomaly associated with VPI.[5] Unrepaired cleft palate predictably results in VPI. Speech production is the main indication for cleft palate repair. Patients who undergo cleft palate repair remain at risk for developing VPI, particularly if the misaligned soft palate musculature is not addressed, resulting in a situation similar to submucous cleft palate. The estimated frequency of VPI after cleft palate repair ranges from 10% to 40%.[5–7] Increased palatal cleft width may be associated with a higher risk of VPI after palate repair.[6]

Submucous cleft palate can also cause VPI. Submucous cleft palate is defined by the presence of bifid uvula, a bony notch at the caudal edge of the hard palate, and a translucent zone in the midline of the soft palate caused by the sagittal orientation of the LVP muscles. The abnormal insertion of levator palatini muscles may be associated with inadequate elevation of the soft palate