Evaluation of Speech and Resonance for Children with Craniofacial Anomalies

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KEYWORDS

• Cleft palate • Velopharyngeal insufficiency • Velopharyngeal dysfunction • Hypernasality • Resonance • Speech evaluation

KEY POINTS

- Speech and resonance disorders are common in patients with craniofacial anomalies, particularly those with clefts.
- Dental and occlusal anomalies can affect lingual-alveolar and bilabial sounds, whereas velopharyngeal insufficiency can cause hypernasality and/or nasal emission on pressure-sensitive sounds.
- In addition to an assessment of speech sound placement, manner of production, and voicing, the speech evaluation should also include an assessment of the presence of obligatory distortions or compensatory errors when there are oropharyngeal anomalies. The presence, audibility, and consistency of nasal emission on speech sounds are also important to note.
- The speech evaluation should always include an assessment of the type of resonance (normal, hypernasal, hyponasal, or cul-de-sac resonance). Severity ratings typically are not useful in determining appropriate management.
- Instrumental measures (whether high-tech or low-tech) can augment the perceptual evaluation and provide useful information for surgical management and measurement of outcomes.

Video content accompanies this article at http://www.facialplastic.theclinics.com.

INTRODUCTION

Children with craniofacial anomalies often demonstrate disorders of speech and/or resonance due to structural anomalies of the jaws, oral cavity, and velopharyngeal (VP) valve. These anomalies are most commonly caused by clefts of the primary palate and secondary palate.

Clefts of the primary palate (particularly complete clefts that go through the alveolus) often result in dental anomalies and/or malocclusion. Dental anomalies, such as misplaced or supernumerary teeth, can interfere with tongue tip movement, and affect lingual and even bilabial placement during speech. Because the tongue tip needs to be positioned under the alveolar ridge and the lips need to come together easily for production of many speech sounds, malocclusion of the jaws is an even bigger problem for speech. With a class III maloclussion (and often with just an anterior crossbite), the tongue tip is positioned anterior to the alveolar ridge, which can affect the production of lingual-alveolar sounds (t, d, n, l, s, z) and even bilabial sounds (p, b, m). With a severe class II maloclussion secondary to micrognathia,

Disclosure Statement: The author receives royalties from Cengage Learning for a text book entitled: *Cleft Palate and Craniofacial Anomalies: The Effects on Speech and Resonance*, 3rd edition. The author also receives royalties for a clinical device called the Oral & Nasal Listener (Super Duper Publications, Greenville, SC).

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Facial Plast Surg Clin N Am 24 (2016) 445–451
http://dx.doi.org/10.1016/j.fsc.2016.06.003

the tongue tip may be positioned behind the alveolar ridge and under the palatal vault, making lingual-alveolar and bilabials sounds virtually impossible to produce normally.

Clefts of the secondary palate often result in VP insufficiency (VPI), which is defined as abnormal structure of the VP valve. It is estimated that, despite palatoplasty, 20% to 30% of children with repaired cleft palate will demonstrate some degree of VPI, resulting in abnormal speech.[1,2] Depending on the size of the opening, VPI can cause hypernasality (an abnormality of resonance) and/or nasal air emission (an abnormality of airflow).

PERCEPTUAL ASSESSMENT OF SPEECH AND RESONANCE

Children with clefts and other craniofacial anomalies should receive yearly speech evaluations by a speech-language pathologist (SLP) (preferably one associated with a craniofacial team) during the preschool years until speech is age-appropriate. These children should continue to receive at least screening evaluations through puberty.[3]

What to Evaluate

As part of a typical examination of a child with craniofacial anomalies, the SLP will assess speech sound production, the presence of nasal emission on pressure-sensitive phonemes (speech sounds), and resonance.[3–10] The examiner will also attempt to determine the cause of abnormalities in speech and/or resonance that are found.

Speech sound production

After listening to an inventory of all speech sounds in the child's language, the SLP will note errors of placement, errors of manner (eg, nasal, plosive, fricative, affricate), and errors of voicing (eg, use of voiced for voiceless phonemes or vice versa). The examiner will determine if multiple errors are related phonologically, which is important for therapeutic intervention. The examiner will also determine if the errors are consistent (eg, the error occurs in all conditions and all word positions) or are not consistent. Developmental errors (those that are normal for the child's age) are also noted. Finally, when there are structural anomalies, including dental anomalies, occlusal anomalies, and VPI, the examiner will determine if there are obligatory distortions and/or compensatory errors.

Obligatory distortions occur when the child's articulation placement is normal but the abnormal structure causes distortion of the sounds. These distortions will self-correct with correction of the structure and, therefore, are not appropriate for speech therapy. Compensatory errors occur with the child alters his or her articulation to compensate for the structural abnormality. Common compensatory errors for anterior crowding of the tongue tip or for class III maloclussion are palatal-dorsal substitutions. Common compensatory errors for VPI include glottal stops and pharyngeal fricatives. These errors require speech therapy, ideally after the structure is corrected or at least improved.[5,6]

Nasal emission

Nasal emission is a release of air flow through the nasal cavity during the production of oral sounds. Nasal emission is most audible on voiceless plosives (p, t, k), voiceless fricatives (f, s, sh), and the voiceless affricate (ch). Therefore, these sounds are typically used for assessment. The examiner will determine if there is audible nasal emission, the loud and distracting nasal rustle (AKA nasal turbulence), or if the nasal emission is inaudible. **Box 1** describes the diagnostic characteristics of nasal emission.[10]

Inaudible nasal emission occurs with a very large VP opening where the airflow travels through the valve with relatively low impedance to the flow. The sound of this nasal emission is very low in volume and is masked by the hypernasality. Inaudible nasal emission will significantly reduce airflow in the oral cavity causing certain

Box 1
Nasal emission

Nasal emission affects oral airflow and the ability to build up air pressure during speech. Nasal emission:

- Is characterized by abnormal escape of the air stream through the nasal cavity during production of pressure-sensitive consonants (plosives, fricatives, and affricates).
- Is typically caused by VPI but can also be caused by an anterior oronasal fistula or even by abnormal articulation placement in the pharynx.
- Affects voiceless pressure-sensitive phonemes the most (ie, p, t, k, f, s, sh, ch).
- May be audible or inaudible. If inaudible (due to a large VP opening), it will also cause consonants to be very weak in intensity and pressure, short utterance length (due to the need to take more breaths during speech), and may cause a nasal grimace during speech.