Overview of Treatment Techniques for Velopharyngeal Insuffiency

What Is VPI?

Velopharyngeal Insufficiency (VPI) is a resonance disorder associated with a natural "pressure valve" in the back of the mouth that does not maintain air pressures that are needed in typical speech production.

- This "valve" consists of a ring of structures including the velum, the tonsils, the palate, and the back of the throat (Cleft Palate Foundation, 2000) (Polsdorfer, 1999).
- Valving occurs when the velum moves back against the throat, and the posterior and lateral walls of the throat constrict to create a barrier between the oral and nasal cavities to limit airflow through the nose.

How Does VPI Relate to Cleft Palates?

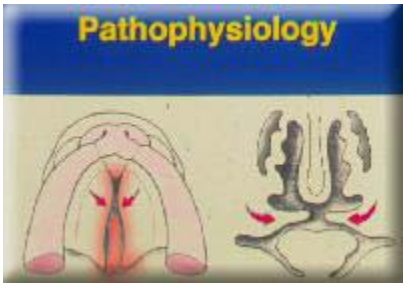
Because both repaired and unrepaired clefts affect the superior border of the velopharyngeal (VP) mechanism, velopharyngeal closure is more likely to be disrupted in both these cases.

- Unrepaired clefts: breathstream escapes through fistula (hole) in the palate and through nose
- Repaired clefts: six muscles associated with the palate; (a) levator palatini muscles, and (b) superior constrictor pharyngeus muscles most critical in speech (Witt, 2000)
  - (a) levator palatini: elevates soft palate
  - (b) superior constrictor pharyngeus and levator palatini: coordinate medial movement of lateral pharyngeal walls
  - (c) superior constrictor pharyngeus and the uvular muscle: increase mass of soft palate (posterior) to assist in VP closure
  - (d) surgery may disrupt these muscles/tissues, making VP closure difficult

peech affected by VPI is often characterized by a hypernasal, "through the nose" quality.

Left: Normal Palate

Right: Unrepaired Cleft



Treatment

Treatment for VPI directly relates to the severity of the inadequacy. According to Peterson-Falzone et al. (2001), behavioral treatment alone is not appropriate for those patients who have severe insufficiency. For these individuals, a surgical or prosthetic form of treatment is indicated, however surgical and prosthetic treatment decisions must be made to best suit the patient's individual needs. Following is a listing of some procedures:

- Palatal lift: a prosthetic device that raises the velum to obturate the nasopharynx, and is used in patients who have poor movement of the velum

- Palatal obturator: a prosthetic device that assists in closing the nasopharynx when the velum is not long enough or the nasopharynx is too deep for sufficient closure (Riski, n.d./2001(a))

- Temporary prosthesis: worn by the child, temporarily, while undergoing speech therapy. The size of the prosthesis is gradually reduced so that the muscles in the velopharyngeal sphincter adapt. (Dept of Speech Pathology and Audiology at the University of South Alabama, n.d./2001)

- Pharyngeal flap: a surgical procedure that involves creating a tissue bridge between the velum and the posterior pharyngeal wall that will assist in uncoupling the oral and nasal cavities (Peterson-Falzone et al., 2001)

- Sphincter pharyngoplasty: surgical method to reduce the size of the velopharyngeal opening so that the patient's velum is sufficiently large enough to close the opening (Riski, n.d./2001(a))

While medical and prosthetic management is appropriate for patients who have moderate-severe VPI, it is not so for patients who have borderline/marginal velopharyngeal insufficiency resulting in mild hypernasality (Peterson-Falzone et al., 2001). For these patients, speech therapy is appropriate. A trial period of speech therapy is also appropriate for patients who do not qualify for medical management as well as for patients who have already undergone surgical/prosthetic treatment. The following are examples:

- Techniques to increase oral resonance, such as increased mouth opening to increase oral resonance, and light articulatory contacts to

decrease audible nasal emission (Peterson-Falzone et al., 2001).

- Articulation therapy to establish correct articulatory placements: Incorrect articulatory movements such as the mid-dorsum palatal stop are often used by children with VPI to compensate for insufficient functioning of the velum (Michi et al., 1993). Articulatory exercises that encourage forward tongue movement are necessary for individuals who use backing of the tongue to compensate for VPI.

- Phonetic context: Researchers have developed programs that are designed to systematically decrease hypernasality using phonetic context. Speech sounds occur in a hierarchy ranging from least to most nasal. Therapy begins by addressing the hypernasality that occurs in the least nasal phonetic context and systematically moves to addressing hypernasality in the most nasal phonetic context (Peterson-Falzone et al., 2001).

- Nasometer: Using the Nasometer jointly with other therapy techniques such as light articulatory contacts and increase oral opening is the optimum approach to reduce perceived nasality (Dept of Speech Pathology and Audiology at the University of South Alabama, n.d./2001).

- A number of sucking and blowing exercises designed to improve velopharyngeal function are used to treat VPI, however, according to Riski (n.d./2001(b)), these techniques are inappropriate and ineffective.

Therapy Plan Rationale

Rationale Goal 1.0: Hypernasality Modification (HM) (Ray & Baker, 1990) is used for most evaluation and treatment strategies. The treatment process is based on a hierarchy beginning with sounds that are easier, or less nasal, and progressing gradually to more nasal sounds and identifying phonemic contexts that are "easier" for the client to produce. According to Peterson-Falzone et. al (2001), hierarchical approaches such as HM are most appropriate for patients such as Jane who demonstrate mild hypernasality.

- **Research:** Specific qualities in speech production are known to affect nasalance (Watterson, 1993).
  - **Decrease nasality:** closed syllables; high vowels; back vowels; shorter duration; higher intensity; vowels with higher fundamental frequencies; voiceless consonants; plosives; and consonants produced with strong oral breathstream (Ray & Baker, 1990, p. 4)
  - **Increase nasality:** isolated vowels; low vowels; front vowels; voiced consonants; fricatives; glides; liquids /r/ and /l/; consonants produced with a weak oral breathstream; and postvocalic nasals (Ray & Baker, 1990, p. 5)
- **Treatment Approach:** Treatment plans are sequenced to reflect hierarchy of difficulty/nasalance in 12 vowels and 16 consonant environments (see Table 1: Hypernasality Treatment Hierarchy)
  - **Evaluation:** In the HM evaluation, it is determined whether client's nasalance pattern reflects expected outcomes according to vowel and consonant hierarchies (see Resonance Evaluation Form 1); Sentence Intelligibility Test (SIT) and Phoneme Intelligibility Test (PIT) added to assess the general intelligibility of our client.
    - **HM Evaluation Results:** If atypical patterns observed, an individual program designed with unique hierarchical sequence is indicated (Jane's results appear typical).
  - **Stimuli:** For each vowel and consonant context identified, stimuli are presented in increasingly linguistically advanced contexts, i.e., monosyllabic words; multisyllabic words; spontaneous words; phrases; and sentences, through constructed **Drill Book** (Ray & Baker, 1990, p. 1990).

Goal objectives: For each vowel/consonant combination at the monosyllabic and multisyllabic single word levels, there are three levels of application to ensure that drills are generalized: (a) say word once; (b) repeat rapidly; (c) alternate with dissimilar word.

- **Spontaneous speech:** after multisyllabic level, client produces spontaneous one word responses to at least 10 prompts from clinician

- **Phrases/sentences:** begin with phrases; for each linguistic form, use same three levels of application as with single words, then add fourth (d), spontaneous production of phrase or sentence in response to at least 10 prompts from clinician

Rationale Goal 2.0: According to Michi (1993), some form of visual feedback is needed to treat misarticulations as auditory modeling alone is generally unsuccessful. Research indicates a broad range in nasometric values for typical speech; also, nasometric findings are not always consistent with perceptual evaluations (Bressmann et al, 2001), however a rule of thumb is that if results are two to three Standard Deviations (SDs) above or below reported means, there is hyper- or hypo-nasality (Biavati, 2001) (Nasometer Manual, Kay Electronics, 1994).

- **Therapeutic expectations:** Nasometric values may not coincide exactly with perception of hypernasal speech, but some overlap should be apparent (e.g., Jane's Nasal Sentences baseline is 3+ SDs over mean for children K-6; Zoo/Rainbow are 2+; all are perceptually hypernasal) with decreases in nasalance coinciding with perceptual decreases in hypernasality.

- **Therapeutic methods:** Using the Nasometer for feedback while using other treatment methods for VPI holds the greatest potential for reducing nasality (Department of Speech Pathology and Audiology at the University of Southern Alabama, n.d./2001). **(a)** Jane will use games on the Nasometer to receive direct feedback on nasalance to alter speech production; **(b)** Jane will speak problem sounds from Goal 1.0 into Nasometer in order to decrease nasalance with direct, objective feedback; **(c)** Jane will periodically read Zoo, Rainbow, and Nasal Sentences passages to decrease hypernasality through direct feedback.

Treatment Plan for Jane Venado: Goals and Objectives

Goal 1.0

By the end of Fall Term 2001, Jane will improve her resonance in the production of low vowels to an accuracy level of 90%.

- **Objective 1.1** By December 15, 2001, Jane will achieve proper resonance of three low vowels in a series of 16 hierarchically arranged phonetic contexts with a 90% level of accuracy as evaluated perceptually by the clinician through monosyllabic word drills at three levels of application per phonetic context: (a) single productions of words; (b) rapid repetitions of words; (c) rapid repetitions of dissimilar word pairs

- **Objective 1.2** By December 15, 2001, Jane will achieve proper resonance of three low vowels in a series of 16 hierarchically arranged phonetic contexts with a 90% level of accuracy as evaluated perceptually by the clinician through multisyllabic word drills at three levels of application per phonetic context: (a) single productions of words; (b) rapid repetitions of words; (c) rapid repetitions of dissimilar word pairs.

- **Objective 1.3** By December 15, 2001, Jane will achieve proper resonance of three low vowels with a 90% level of accuracy as evaluated perceptually by the clinician in at least 10 spontaneous productions of single word answers to questions posed by the clinician.

- **Objective 1.4** By December 15, 2001, Jane will achieve proper resonance of three low vowels with a 90% level of accuracy as evaluated perceptually by the clinician in the production of progressively more nasal phrases and sentences at four levels of application: (a) single productions of phrases/sentences; (b) rapid repetitions; (c) rapid alternations between dissimilar phrases/sentences; (d) the formulation of complete sentence replies to at least 10 questions posed by the clinician.

Goal 2.0

By the end of Fall Term 2001, Jane will decrease hypernasal speech production as measured by the Nasometer 6200-2 by at least 40%.

- **Objective 2.1** By December 15, 2001, Jane will reduce her mean hypernasal speech

production in the recitation of the Zoo, Rainbow, and Nasal Sentences passages by at least 40% in all cases, as evaluated by pre- and post-treatment data obtained from Nasometer measurements.

*Baseline nasalance values, August 1, 2001:

Zoo Passage = 24.6% (Average = 15.5%; SD = 4.9)

Rainbow Passage = 49.3% (Average = 35.7%; SD = 5.2)

Nasal Sentences = 86.4% (Average = 61.1%; SD = 6.9)

- **Objective 2.2** By December 15, 2001, Jane will decrease hypernasal speech production through nasality game activities on the Nasometer, as evaluated by pre- and post-treatment data of the recitation of the Zoo, Rainbow, and Nasal Sentences passages on the Nasometer.

- **Objective 2.3** By December 15, 2001, Jane will decrease hypernasality of problematic sounds in Goal 1.0 by 40% with a success rate of 90%, as evaluated by pre- and post-treatment analysis of nasometric data.

Related Links

American Cleft Palate-Craniofacial Association and the Cleft Palate Foundation (http://www.cleftline.org): This site is a must-see for SLPs and provides a wealth of information. The site contains information for both parents and professionals (parent information is available in both Spanish and English).

Blue Cross Blue Shield of Massachusetts' A Healthy Me: Health Topics A-Z: Velopharyngeal Insufficiency (http://www.ahealthyme.com/topic/topic100587645): At this site, J. Ricker Polsdorfer provides a brief description of VPI and diagnosis, treatment, and prognosis information.

Cleft Lip Palate (http://pedclerk.bsd.uchicago.edu/cleftLip.html): At this site, Dr. Schwab provides an outline of information about cleft lip/palate for medical students at the University of Chicago. Included in the outline is information on the physical exam of the cleft palate and categories of cleft lip/palate. Good site to visit for general information and for insight as to what a doctor may be thinking in evaluating a child with a cleft lip/palate.

Department of Speech Pathology and Audiology at the University of South Alabama(http://www.southalabama.edu/speechandhearing/Summary12.htm): This website contains information relating to a variety of behavioral treatment techniques for VPI.

How to Develop Your Non-instrumental Clinical Skills for Assessing Velopharyngeal Function (http://www.choa.org/craniofacial/speech-4shtml): As the title suggests, this site provides information on how to assess velopharyngeal function by John Riski. Some of the subject areas are screening for VPI, speech characteristics resulting from VPI, and constructing speech samples to test for hypernasality.

Kay Elemetrics (http://www.kayelemetrics.com/ProductInfo/ProductPages/NasometerIIModel6400/nasometerii.htm): This link will take you to the information page on the Nasometer II Model 6400 on the Kay Elemetrics website. Included on the site is product and application information as well as a link to purchasing information.

Speech Therapy for Hypernasality (http://www.choa.org/craniofacial/speech-3.shtml): John Riski discusses speech therapy techniques for treating hypernasality at this site. This is a good site for professionals who are new to working with this population and covers a variety of techniques.

Stickler Involved People (http://www.sticklers.org): This page provides general information about Stickler Syndrome. It provides a description of Stickler syndrome as well as a listserv. This site is a good site for those with Stickler syndrome to network with others as well as obtain news updates relating to the syndrome.