Understanding Palatal Lifts and Nasal Obturators

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Velopharyngeal Insufficiency

- Inadequate tissue with good innervation
- Classically associated with cleft palate

Velopharyngeal Incompetence

- Inadequate tissue with good innervation
- Classically associated with cleft palate

Our focus

- Velopharyngeal Incompetence
Velopharyngeal Dysfunction can have widespread on speech performance

- Diminished respiratory support
- Inadequate laryngeal function
- Distortion of vowels and consonants despite adequate articulatory function
- Reduced oral pressures for sound production
ICF Framework

Health Condition

Impairment

Activity Limitation

Participation Restriction

Environmental Factors

Changes in

- velopharyngeal closure for speech

Changes in speech intelligibility

Restrictions in involvement in life situations

Personal Factors

Changes in structure & function

Limitations in execution of tasks

Restrictions in involvement in life situations

E.g. velopharyngeal closure for speech

Changes in speech intelligibility
Velopharyngeal dysfunction falls under the Impairment parameter.

Efficient intervention approaches are ones that have an effect on subsequent parameters without direct treatment.

Management of velopharyngeal impairments can impact activity and participation.
Speech Characteristics Associated with VP Incompetence

- Hypernasality
- Nasal air emission
- Decreased intelligibility, primarily due to weak pressure consonants
  - Short breath groups
  - Loudness
A total of 33 intervention studies were obtained, analyzed for methodological rigor, and summarized in the table.

Interventions were classified into 3 categories:
- Prosthetic
  - Palatal lifts, nasal/nasopharyngeal obturators, palatal desensitization
- Surgical
  - Pharyngeal flap surgery, pharyngeal implants, teflon injections
- Exercise
  - Palatal training devices, resistance exercises with Continuous Positive Airway Pressure (CPAP)
Two prosthetic treatment strategies

- Palatal lift
  - Long-standing history
- Nasal obturator
  - More recent
Palatal lift – variety of styles – common characteristics
Function

- Props up soft palate
- Provides mechanical impedance to air attempting to enter the nasal cavity

Compared with palatal obturator for velopharyngeal insufficiency
Candidate Selection Criteria

- From Evidence based Practice Guidelines for Dysarthria: Management of velopharyngeal function
- Academy of Neurogenic Communication Disorders and Sciences
Neurophysiology of soft palate

- Better – flaccid
- Poorer – spastic
  - Tightness tends to make lift harder to retain

Articulation

- Better – adequate or recovering
- Poorer – Poor
  - Some modifications of lift can facilitate articulation, such as a dropped palate to decrease distance from tongue to alveolar ridge and palate.
Ability to inhibit gag, or absent gag

- Better – yes
- Poorer – no
  - Though desensitization procedures have been reported

Ability to manage saliva

- Better – yes
- Poorer – no
  - Presence of lift typically stimulates increased saliva production
  - Presence of lift can make swallowing more difficult
Cognition/memory/judgment

- Better – adequate
- Poorer – Poor
  - Difficult to keep track of appliance
  - Need external cues in place to monitor use
  - Need to establish habits such as where to keep lift when not in use (such as when sleeping)

Rate of neurologic change

- Better – stable or slow improvement
- Poorer – rapid improvement, degenerative
Use of palatal lift and palatal augmentation prostheses to improve dysarthria in patients with ALS: a case series

- Esposito, Mitsumoto, & Shanks, 2000
Participants

- Retrospective review of 25 individuals with ALS

Results

- 84% demonstrated reduced hypernasality, with 76% benefiting at least moderately for at least 6 months
- Patients reported easier to speak; less effort with prosthesis
Management note

- May need to modify lift/augmentation every month to compensate for degenerative nature of disease
Dentition

- Better – Adequate
- Poorer – Poor
  - But there are designs that allow for lift fitting with edentulous clients

Manual Dexterity

- Better – Able to insert and remove lift
- Poorer – Unable to insert and remove lift
Change in phonation/resonance with nasal occlusion

- Better – present
- Poorer – absent or minimal
Difference between intelligibility of pressure and other consonants

- Better – Pressure consonants much less because of inability to seal oral cavity
- Poorer – No or minimal difference between them

Difference between intelligibility of pressure and other consonants

- Better – Pressure consonants much less because of inability to seal oral cavity
- Poorer – No or minimal difference between them
Patient goals for speech

- Better – improved speech is critical
- Poorer – decreased function is acceptable

Patient Selection Criterion

- The most important part of the process
Reasons for inability to tolerate palatal lift

- All factor mentioned in patient selection criteria
- Most common
  - Discomfort
  - Gag
  - Saliva management
Assessment

- Behavioral (Nares occluded/unoccluded)
  - Nasal air emission
  - Intelligibility – word (plosives), sentence
  - Imprecise articulation
  - Subglottal pressure
  - Syllables per breath

- Instrumental
  - Acoustic measures
  - Aerodynamic measures
  - Nasal endoscopy
Intelligibility

- Overall
- Words with pressure consonants compared to words without pressure consonants
Acoustic Measures

- Nasalance scores using a nasometer
- Provides ratio of nasal acoustic energy to total oral plus nasal acoustic energy
- Less than roughly 28% considered to be WNL
- Nasalance varies by regional dialect
Nasalance measurements as outcome indices for palatal lift management: lift in versus lift out

- Karnell et al., 2004

Participants

- 19 patients – varied etiologies
- 8 with neurogenic disorder
- 3 with head injury
Results

- Mean nasalance life out – 37.5
- Lift in – 17.1
- Statistically significant difference
- With lift, adequate oral/nasal resonance
Collaboration of a dentist and SLP in the rehabilitation of a stroke patient with dysarthria: a case study

Fabricated lift using maxillary complete denture
Combination of treatments

- Before prosthetic treatment
- After placement of PLP
- After behavioral management

Tasks:
- Conversational task (Rater A)
- Conversational task (Rater B)
- Conversational task (Rater C)
- Reading task (Rater A)
- Reading task (Rater B)
- Reading task (Rater C)
Tachimura et al., 2004

- Nasalance scores in wearers of a palatal lift prosthesis in comparison with normative data for Japanese

Method

- 43 children with repaired cleft palates
- All had primary palatal closure with a palatal pushback procedure
- All demonstrated hypernasality or nasal air emission without compensatory articulation
Participants

- Lateral cephalograms confirmed the velum had sufficient length to close the VP post, but it did not elevate to touch the posterior pharyngeal wall
Stimuli – Kitsutsuki Passage

- Non-nasal Japanese passage
  - Kitsutsuki ga ki wo tsutsuku
  - Sudu suku sodatsu
  - Te wo tataku
  - Te go todoku
  - A woodpecker pecks a tree
  - Growing up more and more
  - Patting palms
  - A hand is reaching
Assessment Procedures

Prosthodontics
Dental Evaluation

- Patient history
  - Etiology
  - Family dentist
  - General dental needs
    - Examination
    - Stabilize decay and periodontal disease
    - Current radiographs
  - Review endoscopic evaluation
Dental Evaluation
Intraoral evaluation
Palatal Lift Design

- Number and position of teeth
- Space between teeth for wire clasps
- Shape of teeth for clasp engagement
- Acrylic versus metal
- Posterior extension to elevate
Palatal Lift Fabrication

- Designed in wax on a stone cast of the maxillary arch
- Converted to a high impact acrylic resin
- Metal or gold braid reinforcement for posterior extension for all acrylic prosthesis
- Safety and increased support for modification
Palatal Lift Design

- Prosthesis Retention Using Wire Clasps
  - orthodontic brackets
  - crowns
  - acrylic bonded to teeth
  - dental implants
  - Option for replacing missing teeth

- Prosthesis retention
  - Bonding composite resin to create ridge to engage clasps
  - Orthodontic bands or brackets
Palatal Lift – Intervention Goals

- Painless, efficient swallowing of secretions
- Unrestricted head movement
- Elimination or reduction of nasal emission
- Decrease respiratory effort/long breath groups
- Increased subglottal pressures; increased loudness
Palatal Lift – Intervention Goals

- Improved articulatory precision
- Improved speech intelligibility
- Normalized nasality
Prosthesis Delivery and Fitting

Team Approach – Speech Language Pathology
- Nasoendoscopic evaluation
- Perceptual assessment of nasal emission
- Perceptual assessment of articulatory precision
- Aerodynamic assessment
- Speech intelligibility
Palatal Lift Delivery

- Improving tissue adaptation
- Assessing retention
- Shaping posterior extension to lift soft palate

Adjusting Occlusal or Bite Interferences

- Prosthesis not designed for mastication
Prosthesis Modification

- Triad® Visible Light Cured Resin (Dentsply)
  - cost effective
  - single visit

  - Additional posterior extension at level of hard palate
Follow-up Assessment

- Prosthodontics
  - Soft tissue evaluation
  - Range of motion for head movements
  - Retention
  - Adaptation strategies
Follow-up Assessment

- Speech/Language Pathologist
  - breath groups
  - subglottal pressure
  - aerodynamic
  - SIT
  - Perceptual Assessment of Nasality
  - Speaking Rate
  - Social Communication Effectiveness
## Aerodynamic Results

<table>
<thead>
<tr>
<th>Months Post Onset</th>
<th>Aerodynamic Measure</th>
<th>Without Palatal Lift</th>
<th>With Palatal Lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 MPO</td>
<td>Oral Pressure</td>
<td>.59 cm/H2O</td>
<td>*8.3 cm/H2O</td>
</tr>
<tr>
<td></td>
<td>Nasal Airflow</td>
<td>356 cc/second</td>
<td>*Nares occluded</td>
</tr>
<tr>
<td>4 MPO</td>
<td>Oral Pressure</td>
<td>.9 cm/H2O</td>
<td>2.2 cm/H2O</td>
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<tr>
<td></td>
<td>Nasal Airflow</td>
<td>395 cc/second</td>
<td>599 cc/second</td>
</tr>
<tr>
<td>13 MPO</td>
<td>Oral Pressure</td>
<td>2.65 cm/H2O</td>
<td>2.9 cm/H2O</td>
</tr>
<tr>
<td></td>
<td>Nasal Airflow</td>
<td>574 cc/second</td>
<td>292 cc/second</td>
</tr>
<tr>
<td>22 MPO</td>
<td>Oral Pressure</td>
<td>2.0 cm/H2O</td>
<td>3.0 cm/H2O</td>
</tr>
<tr>
<td></td>
<td>Nasal Airflow</td>
<td>471 cc/second</td>
<td>118 cc/second</td>
</tr>
<tr>
<td>27 MPO</td>
<td>Oral Pressure</td>
<td>5.2 cm/H2O</td>
<td>6.85 cm/H2O</td>
</tr>
<tr>
<td></td>
<td>Nasal Airflow</td>
<td>366 cc/second</td>
<td>85 cc/second</td>
</tr>
</tbody>
</table>
Sentence Intelligibility Test Results

Word Intelligibility Test Results

Sentence Intelligibility

Word Intelligibility

Habitual
With Lift

Habitual
With Lift
Nasal Obturators

- Used as a speech enhancing prosthesis by occluding the nares and decreasing nasal airflow for patients with velopharyngeal insufficiency and velopharyngeal incompetence.
Indications

- Interim intervention while palatal lift is being fabricated and fitted
- Long term intervention for patients with
  - Reduced dexterity limiting use of palatal lift
  - Inadequate retention/support for palatal lift
  - Incomplete or comprised closure of velopharyngeal port when using a palatal lift
Nasal Obturation—latest developments

- Treatment prosthesis
  - SLP and/or prosthodontist
  - Diagnostic tool
  - Intervention plan

- Definitive prosthesis
  - Fabricated by prosthodontist
  - Modifications possible
Impression tray fabrication

- Fill Toby Nose Filter® with ExaBite II NDS® (PVS) bite registration material (GC America)
- Lubricate nares and trial fit matrix for relining with ExaMix® heavy body PVS impression material (GC America)
- Impression accuracy– rest breathing
Chairside Adaptation

- Lubricate the opening to the nares
- Lubricate the superior surface of nasal obturator; surfaces that do not need further revision
- Apply bonding agent and light cure, paint additional Triad Gel® (Dentsply Caulk) to improved seal
- Trim and polish to create clear smooth surface
Advantages

- Greater comfort compared to standard nose plugs
- In office fabrication
- Cost effective
- A possible alternative for individuals who are not palatal lift candidates

Disadvantages

- Esthetics
- Retention
- Long term retention uncertain
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