The Adjustable Palatal Lift Prosthesis

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The Palatal Lift Device
Purpose:
To address velopharyngeal dysfunction

Assists with:
• Speech
• Swallowing

The Palatal Augmentation Device
Purpose:
To address linguopalatal dysfunction

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Goals of Prostheses
“Restore”:
• Oral & Facial Balance
• Masticatory Function
• Swallowing
• Speech

Respiration, Resonation, Articulation, Phonation, Neurologic Integration

The Anatomy of the Lift
Where to extend/raise?
Junction of the middle and posterior thirds of the soft palate in close proximity to the posterior pharyngeal wall......
1. Level of the Hard Palate
2. C1
3. Passavant’s Ridge
4. Region of Greatest Constriction
VPI Pts Who may Benefit from a Lift

**Congenital**
- Cleft/Short Palate, Paresis
- Disease/Development: CP

**Acquired**
- Neuromotor Trauma: Cx Sx, RadTx, CVA, Removal of Tonsils and Adenoids
- Neuromuscular Diseases: MND, MG, Polio

Chasing/Compensating
At Dx, 28% of ALS pts have some bulbar impairment affecting m’s of speech and swallowing → Progresses to 80%

### Dysarthria
- Speech: Reduced rate, range and strength of muscle movement: Vocal Fatigue
- Respiratory Support Impaired
- Laryngeal Function: Impairment of vocal cords
- Soft Palate & Pharyngeal Fxn

### Dysphagia
- Dysphagia Varies from 48→100%
- Bulbar Spinal 4mths is the average onset
- Problems with liquid and saliva.

The Anatomy of the Drop

Mastication
Deglutition
Speech

Augmentation Prosthesis
Tongue
Soft Palate

A: Anterior Contact- /l/, /n/ 
B: Middle Contact- /d/, /j/, /g/ 
C: Posterior Contact- /k/, /c/ 

Nasal: /m/, /ŋ/ 
Fricatives: /f/, /v/- Labiodental 
Plosives: /b/, /p/- Bilabial 
Groetsma, Knowles, Goyal
Articulators

SP       HP     Linguodental
k,g      t,d     ch,j
sh,z,h,s,z th
ng n     Bilabial: m Labial Dental: f,v

1. PLOSIVE
2. AFFRICATIVE
3. FRICATIVE
4. NASAL

ORAL CAVITY

VOWELS

DIPHTHONGS

LARYNX

PHONEMES

Worth the Try??

Palatal Lift
- Gibbons, Bloomer JPD, 1958
- Lang, JPD 1967
- Gonzalez & Aronson, CPJ 1970
- Kipfmueller L.J, Lang BB, JPD, 1972
- Mazaheri, JPD 1976
- Lavelle & Hardy, JPD 1979
- Wolfaardt, JPD 1993
- Esposito, Mitsumoto, Shanks JPD, 2000
- Sato JPD, 1997
- Turner, Williams, JPD 1991
- Shifman, JPD 2000
- Eckert- Management of the SP Defect
- Texts: McKinstry, Beumer, Taylor, Mazaheri

Worth The Try?

Palatal Augmentation
- Marunick, Tselios JPD 2004 - Review of Literature: Functional Swallowing and Speech Efficacy is Supported
  - Wheeler et al., Swallowing and Speech
  - Cantor et al., Speech
  - Robbins et al, Swallowing and Speech
  - Weber et al, Swallowing Only (laryngeal suspension)
  - Leonard et al, Speech
  - Godoy et al, Speech
  - Shimodaira et al, Speech
  - Meyer et al, Speech and Swallowing
  - Davis et al, Speech and Swallowing

- Lavelle & Hardy JPD, 1979
- Esposito, Mitsumoto, Shanks JPD, 2000

Challenges
- The inherent limitation of what you are about to create
- Unrealistic Expectations
- Treatment Ongoing

Neuro 101

Neuromuscular Disease
- ALS, Progressive Bulbar Palsy, Motor Neuron Dz
  - Neuodegenerative: Dysphagia, Dysarthria → Anarthria
  - Generalized
  - 3 year average survival (1-25yrs)
  - Prosthesis Modification w/regeneration

Cerebral Vascular Accident
- Arteritis, Stenosis, Infarct
  - Deterioration, Stagnation, Regeneration
  - Localized, Generalized
  - Does not necessarily predict overall survival
  - Prosthesis Modification w/regeneration

Weakness       Tone
Upper Motor Neuron Dysfunction Spastic Dysarthria Hypertonia
Lower Motor Neuron Dysfunction Flaccid Dysarthria Hypotonia

Modification Needs
- Challenge Muscle Groups
- Accommodate Muscle Groups
- Recovery/Rehabilitation vs Deterioration
**Why consider Adjustable?**

- Progression vs Rehabilitation
- Test Tolerance
- Tonicity/Distension of tissue
- Quickly assess efficacy
- To achieve optimal height
- When reduced prosthesis retention is anticipated
- Do not have to wait for the lift section to be formed after the maxillary segment
- Modeling compound may displace
- Flexibility potentially counters some of the displacing force of the elevated soft palate
- Velar elevation should be gradual in order to put less pressure on the teeth retaining the prosthesis and to reduce the possibility of mucosal irritation (Mazaheri Ch 39 Cleft Palate & JPD 1976 35:319)

**Initial Appointment**

- Where do we detect improvement?
- How far back can patient tolerate?
- Reflects appropriate initial extension of prosthesis

**Amenable to Intervention?**

**Incorporate a moveable extension v.1**

- Process the palatomaxillary section and the palatopharyngeal section separately or segmentalize & retrofit after processing
- Available Materials: Resilient
  - Ni-Ti Ortho Wires
  - Spring Coils
  - Ortho Bands

**Swallowing Speech**

- Advantages: Physiologically, more desirable to have movable palatopharyngeal section to better simulate soft palate movement during speech and swallowing
- Disadvantages: Maintenance, Hygiene
Incorporate a moveable extension v.2

Adjust with firm pressure using Ortho pliers. Relinqu can subsequently be done of distal extension.

“Hinge movement” should be distal to vibrating line as determined clinically.
Adequate Extension Evaluated
Modify with above materials

- **Baseplate**
  - perform altered cast

- **Processed Base/Case**
  - invest modified area

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**Shaping the Extension**

- Ideally start with a Processed Base or Definitive Palatomaxillary prosthesis
- Use small vertical and posterior additions of impression (modeling) compound to a metal loop or acrylic extension.
- Lateral pharyngeal closure accomplished by addition of low fusing thermoplastic compound or wax
- Patient flexes neck fully to achieve contact of the chin to the chest and to shoulders
- Mouth temperature wax (Iowa/Correcta Wax) is used for final definition of the extension after optional relief

**Goal:** Plosive consonants such as /b/ and /p/ can be produced & nasal consonants like /m/, /n/ and /ng/ are not eliminated. Nasal breathing should be maintained

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Manual extension of the cast at the level of the hard palate can be performed when a patient cannot tolerate an extensive impression, or if there is a concern that the patient may aspirate material because of an ineffective cough reflex.

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...
Relief underneath posterior palatal strap meshwork.
C1 Def

Manual Dexterity?

Polished Embrasure Extensions: Cr-Co “Extensions”
Customized removal device can be fabricated to engage the “cingulum-like” embrasure extensions, if manual removal is difficult.
**Palatal Drop**

- Shaping the vault for speech:
  - Repeat linguovelar and linguoalveolar sounds while posterior and anterior palatal tracings are made

- Shaping the vault for swallowing:
  - Ask patient to swallow liquid and soft food
  - Softened impression compound or wax added sequentially to the base and then molded by the tongue
  - Coat the wax with PIP and observing how effectively the tongue can clear the coating. Use words with /k/ or /g/ are used to evaluate the results.

- Allow pt to adapt

**Goal:** Functional Palatal Impression of tongue range. Palatal Vault lowered to permit optimal swallowing and speech

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**Sample Speech Tests**

- **Mama**
- **Pa, Pa, Pa**
- **Ca, Ca, Ca**
- **Baby Boy**
- **Shhhhh**
- **Sissy Sees the Sky**
- **Table Top**
- **Kitty Cat**

- **Mommy Made Lemon Jam**
- **Pull the Baby Buggy**
- **Give Kate the Cake**
- **Five Fat Fish Swimming in the Sea**
- **Jim and Charlie Chew Gum**
- **1→10**
- **Ring the bell and Sing**

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**Attachment Possibilities**

- **Male**
  - Analog
  - Zest Anchors, 3i Locator

- **Hollow Drop**
  - Locator Analog
  - Shimodaira, JPD 1998
Chierici G, Lawson L. Clinical speech considerations in prosthodontics: Perspectives of the prosthodontist and speech pathologist. JPD 29:29; 1973

<table>
<thead>
<tr>
<th>Phoneme</th>
<th>Contact</th>
<th>Test Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>p,b,m</td>
<td>Bilabial contact</td>
<td>Bobby popped my balloon</td>
</tr>
<tr>
<td>K,g,ng</td>
<td>Linguo-velar contact</td>
<td>Go get the coat and bring it back</td>
</tr>
<tr>
<td>T,d,n</td>
<td>Lingual-alveolar contact</td>
<td>Tom did not do it</td>
</tr>
<tr>
<td>F,v,</td>
<td>Labio-dental contact</td>
<td>Father found some coffee</td>
</tr>
<tr>
<td>Th</td>
<td>Lingual-palatal contact</td>
<td>They thought there were three</td>
</tr>
<tr>
<td>L</td>
<td>Lateral lingual aperture</td>
<td>The little lamp was lit in school</td>
</tr>
<tr>
<td>R</td>
<td>Central lingual aperture</td>
<td>Roy Roger’s horse was Triggor</td>
</tr>
<tr>
<td>W</td>
<td>Widening labial aperture</td>
<td>Will you go with William</td>
</tr>
<tr>
<td>Y</td>
<td>Widening lingual aperture</td>
<td>You and your young sister will go next year</td>
</tr>
<tr>
<td>S,z</td>
<td>Lingual-alveolar contact</td>
<td>Six sisters saw the zebra in the zoo</td>
</tr>
<tr>
<td>Sh,zh</td>
<td>Lingual-palatal contact and wide air blade</td>
<td>She will wash the dish in the garage</td>
</tr>
</tbody>
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**Palatal Lift Tips**

- The further away from the fulcrum line the more effective the occlusal rests will be as indirect retainers.
- Closure is usually higher than you think
- Prosthetic stimulation should be initiated as soon as velar paralysis noted
- Speech and myofunctional therapy should be instituted in conjunction with prosthetic tx.

**Extension Shape- Prostheses**

- Prostheses vary greatly in configuration
  - The patient may have a relatively shallow oropharynx - needs limited lateral projection
  - Lateral cephs deceiving.

**Interim vs. Definitive**

- All-Acrylic: Amenable to Frequent Changes, Easy to remove, Easy to Repair
- Definitive may require an adaptive device for retrieval, or caretaker requires tutorial

**Palatal Lift Tips**

- Hypertonic:
  - pain in the lateral pharyngeal area
  - narrow palatal projection to bypass taut anterior faucial pillars
- ALS Patients: Exercise = Weaken

**Extension Shape- Prostheses**

- Food or Fluid Regurgitation → Impeded Nasal Breathing
- Inadequate Closure → Excessive Closure

With therapy, the ability to swallow safely may still be maintained even when voice and articulation abilities are such that oral communication is inefficient
**Featured:** Patient with trismus, large retromolar trigone tumor growth and other complications disallowing an acceptable initial impression of palatal contour and defect. **Option:** An adjustable impression tray or an interim prosthesis that can be later relined.