TROUBLESHOOTING TRACHEOESOPHAGEAL VOICE PROSTHESIS ISSUES

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Tracheoesophageal Speech

- Air expelled from the lungs into trachea and diverted via silastic prosthesis into esophagus when the stoma is occluded.
  - Results in vibration of the PE segment
- TEP can occur at time of surgery or as a secondary procedure
- Prosthesis can be placed at the time of the puncture or at a later time
TE Speech: Patient Selection

- Patient motivation vs being pressured by family, SLP, surgeon
- Stable mental and cognitive status
- Good manual dexterity
- Good visual acuity
- Adequate pulmonary support
- Patent stoma
- Functional PE segment?
Contraindications to TE Voice: Who Not to Puncture

- Reduced patient motivation
- Altered mental status/compromised cognition of patient
- Inadequate patient understanding of post-surgical changes in anatomy and mechanics of voice prosthesis.
- Insufficient manual dexterity and/or visual acuity to care for stoma and prosthesis
- Significant stenosis of the hypopharynx.
- Increased pressures within pharyngoesophageal segment
  - Inability to produce TE voice following esophageal insufflation via properly positioned esophageal catheter (the Taub test)
Contraindications to TE Voice: Who Not to Puncture

- Inadequate pulmonary reserve
  - Hx of COPD, emphysema, pulmonary fibrosis, interstitial lung disease, etc.
- Inadequate depth and diameter of stoma to accept prosthesis without airway compromise
- Recurrent Disease
- Unresolved fistula
- “Bad” Tissues
- Reduced Income
- Poor or No Insurance
- Transportation Issues
### TE Speech: Primary vs Secondary TEP

<table>
<thead>
<tr>
<th>Primary TEP</th>
<th>Secondary TEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>May allow for feeding through the TEP site (no need for DHT)</td>
<td>Allows time for healing</td>
</tr>
<tr>
<td>Patient does not have to undergo secondary procedure/return to OR</td>
<td>May promote more stability of TEP</td>
</tr>
<tr>
<td>Migration of the TEP as healing progresses</td>
<td>Can be done in the clinic (Surgeon specific)</td>
</tr>
<tr>
<td>Dilation of the TEP due to movement of catheter</td>
<td>May be able to place voice prosthesis at the time of the procedure</td>
</tr>
<tr>
<td>May be able to place prosthesis at time of procedure (location specific)</td>
<td></td>
</tr>
</tbody>
</table>
InHealth Technologies (Blom Singer) and Atos Medical (Provox)

Indwelling and patient changeable/non-Indwelling

Diameters: 16, 17, 18, 20, 22.5Fr

Lengths: 4-20mm, 22mm, 25mm, 28mm

Gel Cap, “forced” entry, and use of a tubed loading system

Duckbill (increased resistance)

Low pressure (less resistance)

Options

- Large tracheal and/or esophageal flange, increased resistance, custom lengths, altered strap length, yeast resistant
Prosthesis Selection

- 16Fr. at 1st fitting
- Tissue integrity
- Patient ability to manage
  - Visual Acuity
  - Manual Dexterity
- Gastric filling
- TEP location
- Transportation
- Stock Availability
- Cost/Insurance coverage
Prosthesis Insertion

- Placement generally coincides with clearance for oral intake for primary TEP, 5-7 days for secondary TEP *depending on integrity of tissue*
- Prefer initial placement to be a 16Fr. Prosthesis (14Fr. catheter placement at time of surgery is our preference)
- Dilate to 16 or 18Fr. Depending on tissue integrity
- Measure TEP
- Assess for TE sound production
- Insert voice prosthesis
Tracheoesophageal Voice Prosthesis

- Location of tissue vibration for voice
- Tracheoesophageal Puncture and Blom-Singer® Voice Prosthesis
- Esophagus
- Trachea and Air from Lungs

Speech

Stoma closure with thumb (Low Pressure prosthesis pictured).

Adjustable Tracheostoma Valve and Indwelling voice prosthesis.
Prosthesis Replacement

- Leaking through
- Leaking around
- Poor fit (too long or too short)
- Reduced or no sound
- Routine replacement after 6 months
Care and Maintenance of the Voice Prosthesis

- **Indwelling**
  - Clean In-Situ

- **Patient changeable**
  - Can remove to clean if/as needed
  - Can clean In-Situ (brand dependent)

- “Brush and Flush”
  - 2 to 3 times daily as needed

- Remove mucous away from face of prosthesis
Trouble Shooting
Leaking Through the Voice Prosthesis

**CAUSE**
- Valve contact with posterior esophageal wall
- Prosthesis length too short for puncture “pinching valve”
- Valve deterioration
- Fungal (yeast) colonization of the valve **most common**
- Back Pressure
- Mucous or Food Lodgement

**SOLUTION**
- Replace prosthesis to a different type or length
- Remeasure TEP and fit with appropriate length
- Replace voice prosthesis
- Nystatin/other antifungal agent and/or use of “yeast resistant” or dual-valve voice prosthesis
- Increased resistance prosthesis
- Cleaning prosthesis in-situ
Yeast Colonization
Care and Maintenance of the Voice Prosthesis: Leaking Through

- Brush and flush
- Plug shaft of prosthesis with Q-tip
- Consume 8 ounces of hot/carbonated beverage
- Produce loud “aah”
- Check for leak; if still leaking, repeat steps
- If still leaking, can place a plug (if Indwelling) during oral intake
## Leaking Around the Voice Prosthesis

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ TEP location</td>
<td>□ Allow TEP to close/repuncture</td>
</tr>
<tr>
<td>□ Unnecessary dilation of the puncture during initial or routine placement</td>
<td>□ Defer dilation or dilate only to size of voice prosthesis</td>
</tr>
<tr>
<td>□ Thin party wall (6mm or less)</td>
<td>□ Prosthesis selection/custom fit</td>
</tr>
<tr>
<td>□ Incorrect prosthesis length (too long)</td>
<td>□ Remeasure TEP/place correct size</td>
</tr>
<tr>
<td>□ Poor tissue integrity secondary to radiation, chemoradiation, diabetes, nutritional imbalance, thyroid issues, recurrence</td>
<td>□ Prosthesis selection/custom fit, check thyroid levels, manage medical issues, diet changes</td>
</tr>
</tbody>
</table>
Leaking Around: Management
Myths/What not to do

- Electro-cautery to “shrink” TEP
- Never insert larger prosthesis or larger tube/catheter to “plug” the TEP
- Placement of smaller catheter to allow for TEP stenosis (Temporary Solution-NOT a long term Solution)
Poor or NO TE Sound

**CAUSE**

- Prosthesis plugged
- Partial extrusion of prosthesis with closure of TEP
- PE spasm/hypertonicity
- Excessive digital pressure during phonation
- Prosthesis too long

**SOLUTION**

- Clean prosthesis
- Remove prosthesis, establish TEP if able, replace prosthesis, secondary TEP if needed
- Botox injection
- Patient training on “light touch”
- Remeasure TEP-down size prosthesis
# Prosthesis Extrusion: Partial or Complete

<table>
<thead>
<tr>
<th><strong>CAUSE</strong></th>
<th><strong>SOLUTION</strong></th>
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<tbody>
<tr>
<td>Poor Tissue Integrity</td>
<td>Prosthesis with Large Esophageal and or Tracheal Flange</td>
</tr>
<tr>
<td>Prosthesis fit (Tight A/P)</td>
<td>R/O diabetes, malnutrition, low TSH, Disease</td>
</tr>
<tr>
<td>Accidental</td>
<td>Remeasure TEP and adjust prosthesis length</td>
</tr>
<tr>
<td></td>
<td>Train Patient</td>
</tr>
</tbody>
</table>
## Poor Visualization of Voice Prosthesis

<table>
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<tr>
<th>CAUSE</th>
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<tbody>
<tr>
<td>□ Stenosis (small tracheostoma)</td>
<td>□ Silicone laryngectomy tube</td>
</tr>
<tr>
<td>□ Migration of TEP</td>
<td>□ Silicone stoma button such as a Barton Mayo Button or Lary Button</td>
</tr>
<tr>
<td>□ Location of TEP</td>
<td>□ Surgical revision of stoma</td>
</tr>
<tr>
<td>□ Shelf of tissue</td>
<td>□ Allow TEP to close/repuncture</td>
</tr>
<tr>
<td></td>
<td>□ Prosthesis selection</td>
</tr>
<tr>
<td></td>
<td>□ Allow TEP to close/repuncture</td>
</tr>
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</table>
Length of cotton tip = 15mm; width of stoma is approximately 8mm
## Gastric Filling

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<tbody>
<tr>
<td>Increased negative pressure in esophagus during inhalation resulting in inadvertent (prosthesis) valve opening</td>
<td>Prosthesis with increased resistance</td>
</tr>
<tr>
<td>Hypertonicity of PE segment</td>
<td>Botox injection</td>
</tr>
<tr>
<td>Stricture</td>
<td>Dilation</td>
</tr>
<tr>
<td>Excessive respiratory force during phonation</td>
<td>Teach “easy onset” voicing</td>
</tr>
</tbody>
</table>
Granulation Tissue

**CAUSE**

- Irritation associated with presence of foreign body (prosthesis)
  - Circumferential (“donut” of tissue)
  - Unilateral
  - Bilateral
  - Prosthesis fit too tight

**SOLUTION**

- Surgical removal (“donutectomy”)
- Reassess fit of prosthesis
# Hypertonic Voice

<table>
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<tr>
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<tr>
<td>□ PE spasm/hypertonicity</td>
<td>□ Botox injection</td>
</tr>
<tr>
<td>□ Excessive digital pressure</td>
<td>□ Patient training on “light touch”</td>
</tr>
<tr>
<td>□ Partial closure of TEP</td>
<td>□ Remove prosthesis, establish TEP, measure and fit with new prosthesis</td>
</tr>
<tr>
<td>(related to partial prosthesis dislodgement)</td>
<td></td>
</tr>
<tr>
<td>□ Prosthesis failure (worn out)</td>
<td>□ Replace prosthesis</td>
</tr>
</tbody>
</table>
Objective Insufflation

- Introduction of air into PE segment prior to or subsequent to formation of TE puncture
  - Determines capability for TE voice
  - Measures pressures within PE segment
  - Aids in assessment of TE voice capability
  - Can be completed transnasally or transtracheally
    - Transnasal method
      - Catheter placed 23, 25, or 28 cm along floor of nasopharynx to level of PE segment
      - Continuous airflow from wall source/patient’s pulmonary air flow introduced through catheter into PE segment
      - Pressures measured
    - Transtracheal method
      - Length of patient’s current voice prosthesis marked on tip end of catheter
      - Catheter inserted into TEP to current prosthesis length
      - Air then introduced into PE segment as in transnasal procedure
      - Pressures measured
- Above procedures advocated by Taub, Blom, and Lewin over last 40 years
Botox Injection

Marking

Injection
Botox Injection

Voicing to Mark

Injection
Botox Injection

Marking

Injection
Manometry

- Training aid for clinicians to teach patients how to self-regulate intra tracheal air pressure.
- Proper airflow control results in better voice quality, less fatigue, and longer duration of the tracheostoma adhesive housing seal.
- Use to check pressure ranges pre and post Botox.
- Pressure Ranges (cm of H2O)
  - 10-25 cm of H2O Excellent/green
  - 26-40 cm of H2O Good/blue
  - 41-120 cm of H2O High
## Hypotonic Voice

<table>
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<tr>
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<tbody>
<tr>
<td>Hypotonic PE segment</td>
<td>Digital pressure</td>
</tr>
<tr>
<td>Extended myotomy during TL</td>
<td>Pressure band</td>
</tr>
<tr>
<td>Repeated dilatations over prolonged period of time</td>
<td>Adjust diameter of prosthesis</td>
</tr>
<tr>
<td>Botox Injection</td>
<td>Allow time for Botox to wear off</td>
</tr>
</tbody>
</table>
Prosthesis extrusion/intrusion

- If you know where prosthesis is
  - Insert 14Fr. Red Robinson catheter into TEP
  - If unable to insert 14, try insertion of next smallest size
  - Continue until TEP stented with a catheter (#12, 10, or 8)
  - Insert all but 1-3 inches of the catheter
  - Tie a tight knot in the end
  - Tape end of catheter to peristomal skin close to stoma
- If you do not know where prosthesis is
  - Chest X-ray to locate prosthesis
  - Follow items listed above

Prosthesis aspirated

- Visualize or confirm via X-Ray
- Review options for removal with attending
- Insert 14Fr. Red Robinson rubber catheter (repeat steps listed to the left)
Voice Restoration After Free-Flap Reconstruction

- Voice/quality of voice dependent on type/extent of flap utilized
- May require increased vocal effort
- Intensity/quality of voice may be reduced
Final Thoughts

- NEVER use a larger diameter prosthesis to “plug” a TEP that is dilating/getting bigger
- Become familiar with the available products
- Get Training
  - Both Atos and InHealth offer training courses for their products
  - Seek advice from Local Experts
- Remember: There is skill required to place and manage a voice prosthesis. Know your limitations
Questions

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