10 Things You Might Not Have Known About the Total Laryngectomy!

Do I need to know this at all?
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Disclosures

Financial
- Employed by UNC Hospitals in Chapel Hill, NC.
- Employed by University of North Carolina as adjunct faculty.
- Occasional speaking engagements for ATOS Medical.
- Working with ATOS developing smart app.

Non-Financial
- Working with ATOS Medical hosting conference in Chapel Hill.

The 10 Things

- 1. The TL cannot breathe through the nose or mouth and live the rest of their lives with a permanent tracheostoma.
- 2. The TL gets fatigued easier than you and I and cannot lift heavy items.
- 3. The TL cannot speak ONLY because he cannot make sound. The TL CAN learn to speak fluently. So, why can’t I understand him?
- 4. The TL cannot moisturize, heat and filter pulmonary air or blow his nose.
- 5. The TL cannot aspirate while eating (except in case of leaking TEP prosthesis). SLP can still assess swallowing/assess voice prosthesis.
- 6. The TL cannot control goblet production and experiences pulmonary metaplasia, as well as mild volume loss.
- 7. Loss of airway resistance by larynx removal has been shown to result in lower oxygenation.
- 8. The TL cannot submerge.
- 9. The TL cannot employ olfaction and is usually has some reduced taste.
- 10. Larytube, stoma vents and other kinds of stoma apparati are not synonymous with tracheostomy tubes.

Trach tubes should not be kept in place long term.

Effects
- Increase in mucus production (immediate)
- Decrease in filtration of particulate matter from the surrounding air.
- Loss of voice.
- Change in tracheal airways at the cellular level.
- Irritation of the trachea.
- Cough
- Excessive sputum production
- Shortness of breath
- Cosmesis
- Depression


Living with a Permanent Tracheostoma

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Anatomy Change

Pre-Laryngectomy

Post-Laryngectomy

Tracheostomy vs. Stoma with TEP
Airway resistance is lowered.

- Increase in dynamic airway compression and lowering lung ventilation (theory)
- Ackerstaff found reduced Vcmax, FEV1, PEF, MEF50 and TLC.
- (Toremalm, 1960) described the benefits of HME use for post-tracheotomy care: in comparison to nasal breathing, a person breathing through a tracheostoma loses about 500 ml of water. By using an HME it is possible to retain 250 to 300 ml of this water loss in the respiratory system (Toremalm, 1960).


Cannot increase core stability. Unable to hold intrathoracic pressure, and the contraction created by the anterior abdominal wall. Difficulty stabilizing the spine throughout heavy lifting, helping to prevent spinal and abdominal rounding, loss of pressure and allowing for efficient force transfer.

- In short, can’t hold breath at glottis.
- CAN hold breath intrathoracic (limited)
Cellular Level Changes

- The histological changes of tracheobronchial mucosa include squamous metaplasia of the ciliary epithelium and chronic inflammatory changes of the lamina propria of mucosal membrane. In laryngectomized patients, lower respiratory tract infections significantly increase, especially during winter.


Moisture Loss and Heat Reduction

- The total laryngectomy has a diurnal loss of moisture from the pulmonary system related to Goblet cell production. Changes in mucosal lining.
  - During rest breathing in the total laryngectomy, ambient air of 71.6 degrees F. and 40% RH is only conditioned to 80.6-82.4 degrees F and 50% RH.
  - With HME in situ – 82 degree and generation of 70% RH. Substantial humidification. (Keck, et.al., 2005)
  - Greater production and thicker secretions.
  - Reduction in mucociliary clearance.
  - Nasal airway breathers see optimum values of 89.6 degrees F with 99% RH.
  - (TL-lose 500-700mL/day from breathing only)


What are the Effects?

- Subjective complaints of reduced QOL due to sputum production and coughing.
  - Irritation of the tracheobronchial mucosa
  - Excessive sputum production
  - Crusting (possible plugs)
  - Shortness of breath
  - And coughing

Problem with TC

- Almost never in actual place, whatever that is.
- Inconsistent presentation of moisture.
- Not measurable.
- Crusting occurs despite optimal use.
- How close is close enough?
- Bottle runs low or out.
- Can’t always wear elastic tightened.

Regaining Moisture (The HME)

- Reduce diurnal loss of water through exhalation by 60% (250–300 mL/day).
- Add some laryngeal-like resistance back into the system.
- Heat up the ambient (breathed-in) air.
- Filter larger particles. (Does not include bacteria, although some antibacterial Chlorhexidine is used in filter).
- Humidified Trach Collar?????
- HME’s increase the moisture within the lungs (subsequently leads to less mucus production)
- Decrease the viscosity of the airway secretions decreasing risk of mucus plugs
- And re-instating the normal airway resistance to the inhaled air which preserves the lung capacity.
- Reduce the inhalation of bacteria, viruses, dust and pollen. Inhaling less pollen can reduce the airway irritation during high allergens season.
- Wearing HME MAY reduce the risk of getting viral and bacterial infection, especially in crowded or closed places.

How Does an HME Work?

- Hygroscopic, antimicrobial properties to help retain moisture
- Water vapor condenses during exhalation & re-humidifies during inspiration
- Pulmonary heat & moisture (humidity) are retained
- Logical barrier to gross airborne matter
- HMEs cannot be rinsed out and reused
- A single HMEs should never be used beyond 24 hours


<table>
<thead>
<tr>
<th>HME/Non HME</th>
<th>3 mos</th>
<th>6 mos</th>
<th>3 mos</th>
<th>6 mos</th>
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<tr>
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<td>9.5</td>
<td>3.0</td>
<td>9.7</td>
<td>11.7</td>
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<tr>
<td>Sputum* Production</td>
<td>11.2</td>
<td>6.2</td>
<td>14.5</td>
<td>15.5</td>
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<tr>
<td>Forced** Expectoration</td>
<td>11.7</td>
<td>5.6</td>
<td>14.3</td>
<td>16.4</td>
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<td>Stoma** Cleaning</td>
<td>7.1</td>
<td>3.4</td>
<td>7.2</td>
<td>9.4</td>
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</tbody>
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*\( p<0.1 \), **\( p<.05 \)

Problems with HME at time of surgery.

- Special equipment.
- Ancillary staff \( might \) be needed (guidance or placement).
- Maintenance is crucial.
- Staff training is needed.
- NG tube necessary transnasal.
- Intrastomal vs. Peristomal attachment. (irritation possible)
Cannot Blow Nose

- Neck air expulsion only.

Aspiration?

Cannot Aspire (Generally)

- Remember anatomy.
  - No connection between upper and lower airway.
    - Larynx has been surgically removed.
  - Reasonable to think aspiration if diagnosis is in patient with TEP prosthesis. SLP can assess this.

Submerging/Showering

Shower Collar, Shield

- But wait…Larkel

Cannot Submerge in Water
Olfaction

- Cannot smell (anosmia—not in sense of function)
  - Why?
    - Sniffing increase the volume of flow of air across the olfactory region
    - No nasal airflow


Importance of Smell

- Miwa et al.
  - Surveyed patients and found most cited impairments (due to anosmia)
    - Spoiled food (75%)
    - Gas leak (61%)
    - Smoke (50%)
    - Problems with eating (53%)
    - And cooking (49%)
  - Only 50% reported satisfaction with daily life.

What is that?

Trachestoma Inserts. Intraluminal.

Leaving a Trach Tube in TL Long Term (Pressure Necrosis, Mucosal Friction and Inflammation)

References


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(64) Kranabetter R, Leier M, Kammermeier D, Just HM, Heuser D. The effects of active and passive humidification on ventilation-associated nosocomial pneumonia.


