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Laryngectomy: Basic Training

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Laryngectomy 101: Basic Training

Meaghan Kane Benjamin, MA CCC-SLP

Disclosures

- Meaghan Kane Benjamin is the Co-Director in the Educational Division of Atos Medical. Her financial relationship disclosure: She is employed by Atos Medical. She has no relevant nonfinancial relationships to disclose.

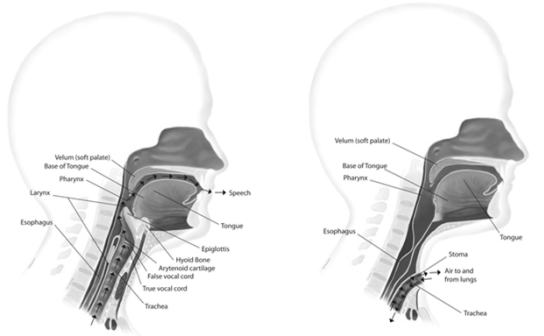
COURSE OBJECTIVES

- Identify Anatomical and Physiological changes due to removal of the larynx
- Identify 3 types of alaryngeal communication
- Describe Basic steps to Artificial Larynx (AL) training
- Identify 3 benefits of using Heat Moisture Exchanger (HME) system
- Identify two types of voice prosthesis
- Identify general post-operative communication and pulmonary goals

End Goals for Every Patient

- Cancer Free
- Independent
- Able to safely swallow a normal diet
- Able to functionally communicate in way that they are most comfortable
- Full acceptance of their new way of communication as well as having a permanent stoma
- Functioning at the same level or higher than prior to surgery

Anatomy Review



Pre-Op Post-Op

Pre-Operative Education/ The Role of the SLP

- Establish rapport
- General overview of impact of total laryngectomy on function
- Provide overview of rehabilitation process
- Initiate a functional communication alternative
- Important that surgeon and SLP are on the same page

Voice Restoration Options Post Laryngectomy

- Esophageal speech
  - PE segment as sound source
  - Injection of air from oral cavity
  - https://www.youtube.com/watch?v=wAaGbsHBacE
- Electrolarynx
  - Sound source is device
  - Oral/Neck
  - Interdental
  - http://youtu.be/mnAq-M6Ldtw
- Tracheoesophageal (TE) speech
  - PE segment as sound source
  - Pulmonary air
  - One-way valve TE prosthesis
  - https://www.youtube.com/watch?v=XJgPOpmhOKA

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Communication Options

- Must involve the patient regarding various choices for communication.
- Not limited to just one option
- Educate patient on all forms of alaryngeal voice restoration (i.e., artificial larynx, tracheoesophageal puncture (TEP), esophageal speech).

EVIDENCED BASED PRACTICE (EBP) ASPECTS

- 345 individuals with head and neck cancer, perceived quality of life and quality of voice for individuals using 3 communication forms
- TE speech users rated the intelligibility of their voice more positively than users of electrolarynx or esophageal speech

- *Generic Health-Related Quality of Life Amongst Patients Employing Different Voice Restoration Methods Following Total Laryngectomy . Farr and, P., & Duncan, F. (2007) Psychology, Health & Medicine, 12(3), 255-65

EBP

- Among the 3 methods, the success rate of electrolarynx and TE speech was significantly better than esophageal speech
- The intelligibility and speech quality of electrolarynx was lower than TE speech

*Effectiveness of Voice Rehabilitation on Vocalisation in Postlaryngectomy Patients: A Systematic Review. Xi, S. (2010). International Journal of Evidence-Based Healthcare, 8(4), 256-8

EBP

- Communication and perceived quality of life measured in 170 alaryngeal speakers
- Differences in quality of life between the groups dependent upon success as a communicator

***The Relationship Between Communication and Quality of Life in Alaryngeal Speakers.** Palmer, A. D., & Graham, M. S. (2004). Journal of Speech-Language Pathology & Audiology, 28(1), 6-24

Artificial Larynx

- Electrolarynx: A battery powered electromechanical device that moves a plastic or metal head, which generates a sound, or tone.
- When the head is held against the tissues of the neck or cheek, this tone is transmitted into the oropharynx, where sound is shaped into meaningful speech by movements of the lips, teeth, tongue and jaw.
- Tone can also be transmitted via an intraoral adapter

Neck Placement

Intraoral Adapter

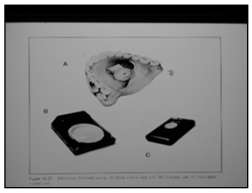
Artificial Larynx Selection: Factors to Consider

- Sound quality & intelligibility
- Ease of use (weight, preference, manual dexterity, etc)
- Neck contour & density
- Hearing Acuity
- Cost
  Warranty
- Battery Life/Type
- Durability
- Language Spoken

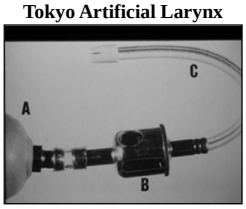
Different Styles

NuVois Electrolarynx

UltraVoice



Tokyo Artificial Larynx



Artificial Larynx Training

- Rationale
- Finding the right device for the patient: You have choices!
- How does it work?
- Placement – finding optimal placement
- Articulation
- The key to success is minimizing frustration!

Instructional Method for Teaching Use of an Artificial Larynx IPATPAL METHOD

(S. J. Salmon, Ph.D., 1983)

I = Information

The patient is informed on benefits of artificial larynges and selection of the proper device.

Influential factors:

- -Purchase price
- -Upkeep
- -Availability
- -Possible modifications
- - Expediency
- -Post-operative complications
- -Patient preferences

Instructional Method for Teaching Use of an Artificial Larynx

P = Placement

- Optimal Placement of the device to achieve the best clarity of sound and resonance
  - With intra-oral devices, appropriate placement of the intra-oral tubing to achieve the best clarity of sound and resonance

Instructional Method for Teaching Use of an Artificial Larynx

A = Articulation

Shaping sounds into speech using the tongue, teeth, lips and palate for precise sound production.

- Over-articulation or exaggerated movements of the articulators is often recommended to improve overall intelligibility
- Placement of the artificial larynx should not result in obstruction of mouth as some lip reading may be used by listener

Instructional Method for Teaching Use of an Artificial Larynx

T=Timing

- Effective on use of on/off button to coincide with appropriate phrasing
- Biggest challenge is the learning curve of when to turn the AL on and off
- Encourage them to turn device on when speaking is initiated and turn off at the end of the final word in a phrase
- Use 7-10 syllable phrases to train on/off timing

Instructional Method for Teaching Use of an Artificial Larynx

PAL = Pitch and Loudness

- SLP sets the pitch of the AL during the initial AL treatment session.
  - Adjust to an appropriate level for patient's age and gender
- Loudness/Volume should be set so that the patient can hear himself clearly.
  - Instruction on basic volume adjustments specific to individual's device should be offered within the first few treatment sessions.
  - Teach to modulate pitch for more natural intonation patterns by manipulating the pitch buttons on the external device

Distracting Behaviors

- Distracting Behaviors refer to any behavior that draws attention to patient in a negative way.
  - Stoma blast
  - Head tilted back
  - Grimaces
  - Atypical arm postures
  - Excessive use of on/off button
- These behaviors should be addressed during each session

Electrolarynx Comparisons: "Hello, how are you?"

- **TruTone**
- **NuVois**
- **Servox**

TE SPEECH SUCCESS FACTORS

- Candidate selection
- Patient education
- Knowledge, skill and experience level of the head & neck surgeon
- Knowledge, skill and experience level of the speech-language pathologist

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CANDIDATE SELECTION

- Cognitive function
- Manual dexterity
- Vision
- Pre-op Speech intelligibility
- Support system
- Financial issues
- Level of motivation
- Proximity to SLP

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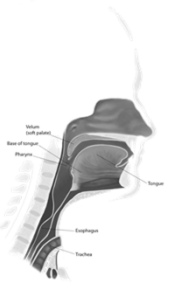
PREOPERATIVE CONSULTATION

- Review anatomy and physiology
- Review post-operative functional deficits
- Review Tracheoesophageal (TE) speech
- Review Pulmonary Rehabilitation
- Laryngectomee Visitation



Timing of Prosthesis Placement

Types of Voice Prostheses

- **Indwelling:** Placed by a professional
- **Non-indwelling:** Patient and/or professionally managed

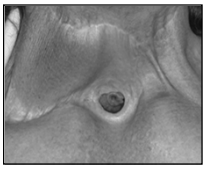
NON-INDWELLING VOICE PROSTHESIS

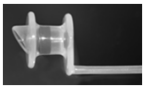
- Patient can be taught to change/manage prosthesis
- Can be cleaned and replaced
- Less upfront cost than Indwelling style

Video 1

Indwelling Voice Prosthesis

- Clinician managed
- Can be placed intraoperatively
- Can be placed in clinic
- Can be cleaned in situ





Examples of Prosthesis Placement

Video 2 & 3

Voice Prosthesis Sizes

Diameter:

Measured in French = Fr

1 Fr = 0.3 mm

- Standard diameter options:
  - 16 Fr = 4.8 mm
  - 17 Fr = 5.1 mm
  - 20 Fr = 6.0 mm
  - 22.5 Fr = 6.75 mm
- Standard industry length options:
  - 4-28 mm

diameter

length

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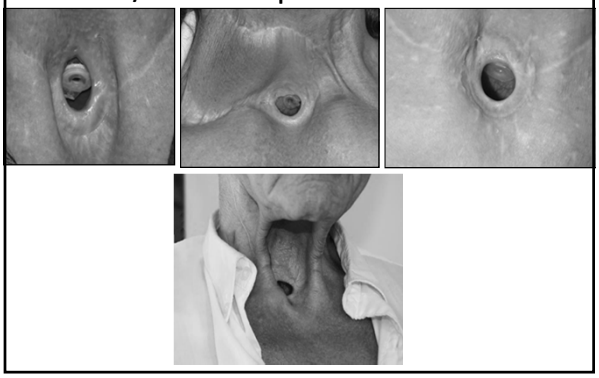
Stoma/TEP Comparisons



SIZING & DILATION OF THE TE TRACT

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Dilate Tract

- Dilator

Reasons for Use:
  - Upsizing of punctures
  - Maintaining puncture size during placement
  - Orient to tract direction
  - Keeps puncture open in event clinician can't get prosthesis properly seated

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Dilation Video

Video 4

Courtesy of Saint Louis University Cancer Center – Dennis Fuller

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Sizing the TEP

Measure devices

- Provox® Measure

- Blom-Singer Voice Prosthesis Sizers: 16 Fr and 20 Fr

- Blom-Singer Dilator-Sizers: 18 Fr and 22 Fr

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Sizing Device Inserted

Video 5 & 6

Checking the Fit of the Current Prosthesis

Using actual sizing device provides optimal results

The novice clinician should always resize and not guess

Video 7

Courtesy of Saint Louis University Cancer Center – Dennis Fuller

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Post-Laryngectomy Pulmonary Rehabilitation

- Best practice embodies an **inter**disciplinary team approach to tx the whole patient
  - Pt. Education
  - **Pulmonary Rehabilitation**
  - Voice Rehabilitation
  - Troubleshooting
  - Quality of Life (QOL) Issues

Immediate Post-Operative Pulmonary Goals

- Reduce some of the lost function of upper airway
- Less use of the moist air/suction
- Engage patient in postoperative stomal care
- Help nursing distinguish between patient who had a laryngectomy and patient who has a tracheostomy
- Work towards autonomy of the patient in the management of the stoma

Long Term Pulmonary Goals

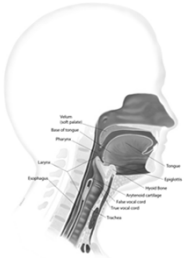
- Decrease mucus production and improve associated quality of life issues
- Improve overall stoma cleanliness
- Improve social acceptance
- Improve patient's overall self acceptance
- Explore optimal speech options for patient

Normal Respiratory Physiology

- **Trachea, bronchi, nose**
  - Lined with cilia that transport mucus
- **Mucus** – NOT abnormal, it's protective
- **Mucus Viscosity** – dependent on hydration, humidification, warming, infection, obstruction, environmental exposure
- **Mucus Production** - 14ml/day (Widdecombe & Widdecombe, 1995) to 100ml/day (Pride, 1997)

Normal Physiology of the Respiratory System

- **At The Nose**
  - Air Temp = 72^{0}F
  - RH=45%
  - Ambient Dirty
- **At the Bronchioles**
  - Air Temp = 98.6
  - RH = 99%
  - Filtered

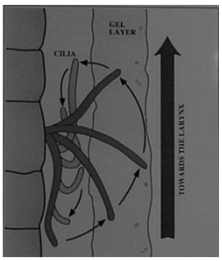


Physiology of the Post-Laryngectomy Respiratory System

- Upper Airway Function no longer intact
- **At The Trachea**
  - **Air Temp** = **72^{0}F**
  - **RH=45%**
  - **Ambient Dirty**
- Important:
  - Ciliary activity impaired when RH drops below 70%
  - Ciliary activity ceases when RH <50% RH at 37°C
- How do we compensate?

Ciliary Action

- 1000-1500 beats/minutes
- Mucus moves at approximately 10-20mm/min
- Dependent on temperature and relative (RH) humidity
- Impaired when RH falls below 70%
- Ceases when RH <50% at 37°C



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Post Laryngectomy Effects on Breathing

- Lost functions of the upper airway
  - Heating
  - Filtering
  - Humidity
  - Pulmonary resistance

Video 8

•References:
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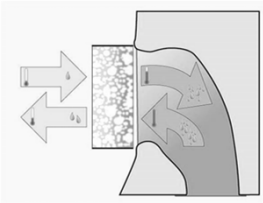
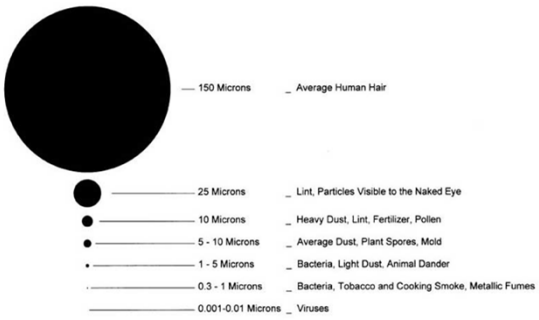
What is an HME and How Does it Work?

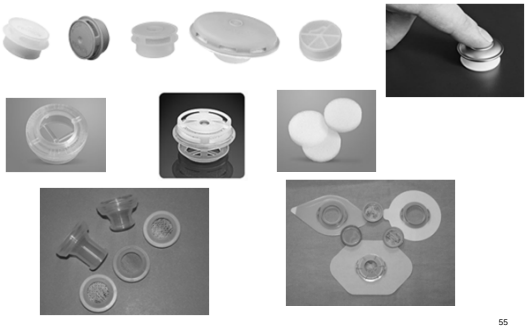
- HME stands for Heat Moisture Exchanger
- Water vapor condenses during exhalation & re-humidifies during inspiration
- Pulmonary heat is retained & exchanged
- Heat & humidity consistently maintained
- Logical barrier to gross airborne matter
- HMEs cannot be rinsed out and reused



Comparison of Gross Airborne Matter



HME Systems



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These are NOT HMEs

Pictures are compliments of Fashions for your Neck and Kapitex

HME BASICS

- How soon after surgery is the HME being introduced?
- Patient may require adaptation to HME resistance
- Amount of mucus/coughing may increase during the first days/weeks of use (thinning effect)
- Expected improvement in pulmonary function usually takes time (several weeks to months)
- HMEs can provide easier and more hygienic stomal occlusion with most users
- HMEs should be kept in a clean, dry, dark area at room temperature
- HMEs cannot be rinsed out and reused
- The transition may be easier the sooner the HME is introduced

Post Laryngectomy QOL

- N=59 TL
- Incidence & Severity of Respiratory Symptoms
  - 98% primary complaint = daily sputum production
  - 64% c/o excessive coughing
  - 57% c/o need for freq. forced expectoration (>5x/day)
  - 37% c/o freq. stomal cleaning (>5x/day)

Hilgers *et al.*, *Clinical Otolaryngology*, 1990; 18: 1-10.

Multi-center Study

Assessing Effects of Heat & Moisture Exchanger Use on Respiratory Symptoms & Voice Quality of Laryngectomized Individuals

N= 81 TL

- 62 men, 19 women
- Mean age 66
- Assessed 3 month usage of HME's

Results:

n=59 used HME on regular basis

	Increase	No difference	Decrease
Cough	4 (7%)	15 (25%)	40 (68%)
Mucus	3 (5%)	13 (22%)	43 (73%)
Airway clearing	5 (9%)	18 (31%)	36 (60%)
Stoma cleaning	3 (5%)	25 (43%)	21 (52%)

Ackerstaff AH, Fuller D, Irvin M, MacCracken E, Gaziano J, Stachowiak L. *Otolaryngology Head Neck Surg:* 2003; 129: 705-712

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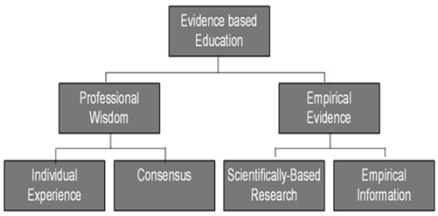
Evidence for Use of HMEs

- Results of the present basic physiology research and clinical phase II and III studies are "watertight" proof for the effectiveness of some HMEs (Level 1 Evidence).
- This evidence reinforces that pulmonary rehabilitation with postoperative introduction of an HME should be standard of care.



Final Outcomes

Video 9 & 10

Back to Living

Video 11

Words of Wisdom

- Success requires **commitment** from both you and your patient.
- It takes **time** and **troubleshooting** to find the best combination.
- Your **time & energy** well **worth** the overall **pulmonary health & QOL** benefits!!!

National Philanthropic Organizations

- Lion's Club
- Sertoma Club
- Easter Seal Society
- Rotary Club
- Delta Zeta Foundation
- Psi Iota Xi Foundation
- Friends of Man (www.friendsofman.org)
- Cancer Care (www.cancercare.org)
- United Way (www.national.unitedway.org)
- Catholic Charities (www.catholiccharitiesinfo.org)
- Patient Advocate Foundation
- (www. patientadvocate.org)
- National Cancer Institute (https://cissecure.nci.nih.gov/factsheet/FactSheetSearch8_3.aspx)
- National Cancer Financial Assistance Coalition (www.cancerfac.org)

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