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Dysphagia in the Trach and Vent Population

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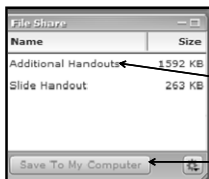


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DYSPHAGIA IN THE TRACH AND VENT POPULATION
PRESENTED BY
DR. ERIC BLICKER, M.A., CCC-SLP.D,
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TRACHEOSTOMY TUBE

- PROVIDES POSITIVE PRESSURE VENTILATION
- AIRWAY PATENCY
- AIRWAY PROTECTION FROM ASPIRATION: HEAD INJURY OR COMATOSE PATIENTS AND IN POST-OPERATIVE NEUROSURGICAL PATIENTS.
- PULMONARY CLEARANCE OF THE LOWER RESPIRATORY TRACT
- UPPER AIRWAY OBSTRUCTION CASES: TRAUMA, LARYNGEAL DYSFUNCTION, OSA

DYSPHAGIA AND TRACHEOSTOMY

- DYSPHAGIA MAY BE PRESENT AS A RESULT OF THE TRACHEOSTOMY TUBE PLACEMENT
- DYSPHAGIA MAY HAVE BEEN PRESENT PRIOR TO THE TRACHEOSTOMY TUBE PLACEMENT
- CLINICAL EXPERIENCE SHOWS THAT BOTH SCENARIOS MAY BE POSSIBLE
- TRACHEOSTOMY:
 - may result in scarred tissue that can cause fixation of trachea to overlying tissue, resulting in reduced laryngeal movement
 - unoccluded tube may not allow normal increase of subglottic pressure during swallow
 - can result in supra- and sub-glottic sensory receptors becoming desensitized

PHYSIOLOGICAL FUNCTIONS AFFECTED BY A TRACHEOSTOMY

- **Olfactory and gustatory changes:** There is a lack of airflow in the oral and nasal passages with cuff inflation
- **Secretions are affected:** Normal progression of evaporation and filtration through the mucosa of the upper airway is not accessible, as the upper airway is bypassed.
- **As a result, tracheal secretions quantity can increase.**
- **Further, the body responds to tracheostomy placement as a foreign body and creates more secretions as a result.**
- **When the trach cuff is inflated, the patient's ability to create sufficient airflow pressure for cough is reduced.**

SWALLOWING AND TRACHEOSTOMY TUBE CONNECTION

- **Open-ended tracheostomy tube:**
 - Laryngopharyngeal and pulmonary tract pressures are reduced.
 - Compare this to an open tube, where both ends have the same pressure.
- **Closed airway system for tracheostomy tube:**
 - Compare this to the same tube as above, but now one end is capped off.
 - Pressure will intensify behind the cap.
 - Likewise when a passy muir speaking valve (PMSV) is placed on the tracheostomy tube, a positive back pressure is created in the tube.
 - This pressure can enhance the pharyngeal pressures required for bolus peristalsis from the pharynx through to the esophagus.
- **Research has reported improvements in the patient's swallowing function during the MBS when a positive closure speaking valve is utilized (Gross, RD et al 1995).**

WHY USE A PMSV?

- **Decrease in secretions and improvements in olfaction (Lichtman, SW et al. 1995)**
- **May reduce aspiration risk, but does not eliminate the risk (Elpern, EH et al. 2000)**
- **The PMSV provides positive closure, which assists with re-distribution of airflow into the upper airway (Mason, M et al 1992)**
- **Research has reported that this restoration in airflow and sub-glottic air pressure from PMSV use has assisted in some tracheostomy patients transition from NPO to PO. These same patients were aspirating without the PMSV (Dettelbach, MA 1995)**

BLUE DYE TESTING

- When used alone, there is a high false negative rate. The blue dye test frequently misses aspiration that is captured on MBS (Peruzzi WT et al 2001).
- What does clinical experience tell us? Blue dye only shows if aspiration is present or absent. It does not tell *when* it is happening (before, during, after swallow)
- Blue dye test at bedside alone does not show the route of aspiration the bolus path is taking.
- Blue dye test at bedside alone does not show penetration without aspiration, which is still an aspiration risk predictor.
- Blue dye test at bedside may not likely show trace amounts of aspiration (Donzelli J et al. 2001)
- You can only test one consistency at a time. If you mixed consistencies and there is aspiration, you cannot be certain as to which consistency was aspirated with bedside blue dye.

IS THE TRACHEOSTOMY TUBE CAUSING DYSPHAGIA?

- Instead of the dysphagia manifesting as a direct consequence of the tracheostomy tube, certain studies have suggested that general medical condition, neuro function, and/or the presence of head and neck cancer were the principal components of swallowing function and dysphagia. (Leder , S et al. 2000)
- Other research has indicated that instead of the tracheostomy tube being the primary catalyst for dysphagia, the swallow function or dysfunction was based more on oral and pharyngeal physiology including tongue base functions and weakness within the pharynx (Stachler RJ et al 1996).

IS THE TRACHEOSTOMY TUBE CAUSING DYSPHAGIA?

- When the deficits begin to multiply and interact, for example with a tracheostomy patient with head and neck cancer, research has shown there is an enhanced aspiration risk potential (Muz, J et al. 1994).
- Clinical experience has shown the above to be true when there are alterations in the anatomy involved in airway protection in the supra-glottic space.
- Clinical experience has also shown that there are a multitude of aspiration severity risk factors for the tracheostomy patient, including, but not limited to, the presence of the tracheostomy tube itself.
- These dysphagia and aspiration risk factors may include, but are not limited to: Medicinal side effects; dependence on others for feeding; presence of tube feeding and gastrointestinal function; reduced mobility, cognitive awareness, and respiratory function.

LARYNGEAL ANATOMY AND PHYSIOLOGY

CLINICAL EXPERIENCE HAS SHOWN A LARYNGEAL FUNCTION EXAM TO BE CRITICAL IN ASSESSMENT OF THE TRACH AND VENT PATIENT WHEN THE CUFF CAN BE DEFLATED

FOR THIS WE MUST CONSIDER SOME OF THE TRUE VOCAL CORD FUNCTIONS

- PHONATION
- EXPECTORATIVE
- DEGLUTITORY
- TUSSIVE
- PROTECTIVE
- VALVULAR
- RESPIRATORY

AN IDEAL PLACE TO FOCUS ON THE ASSESSMENT AND TREATMENT IS REGARDING THE INTERACTION OF THESE SYSTEMS. CLINICAL EXPERIENCE HAS SHOWN A POTENTIAL FOR BREAKDOWN IN ONE OF THESE FUNCTIONS TO POTENTIALLY IMPACT THE OTHER ONES.

SWALLOW ASSESSMENT WITH TRACH AND VENT PATIENT

• **TRACHEOSTOMY TUBE CUFF: DEFLATE OR INFLATE?**

- The trach cuff is inflated for mechanical ventilation.
- Provides a closed, sealed airway to allow patient to get full volumes for respiration and gas exchange.
- To fully examine the functions of the larygopharynx, it is suggested that patients with cuffed tracheostomy tubes have the cuff deflated.
- Medical orders for cuff deflation are required.
- For the vent dependent patient, will need presence of RT to help transition from closed to open system by maintaining the vent settings (Bach JR et al 1990)
- This is needed since there will be leakage of air through the laryngeal and oral airways upon cuff deflation. (Manzano JL et al 1993)

TRACHEOSTOMY TUBE CUFF: DEFLATE OR INFLATE

• **What if they cannot tolerate full cuff deflation?**

- If cuff cannot be fully deflated secondary to increased ventilator support needs, then a minimal leak technique can be done (St John, RE 2004)
- This can be used during a swallowing test exam. In this scenario, since there is a minimal leak between trach cuff and tracheal wall, the SLP may be better equipped to detect the aspiration of food, liquid, secretions below the trach cuff.
- **If we use the minimal leak technique to assess and then the patient cannot sustain this leak for the length of a meal PO, does the assessment truly represent their function?**
 - Clinical experience has shown that chronic ventilator patients who need to maintain cuff inflation can be assessed with the cuff inflated with bedside FEES.
 - This exam allows aspiration and aspiration risk to be viewed without cuff deflation.
 - The same can be done with MBS if this was necessary.

WHAT DO WE NEED TO ASK OURSELVES ABOUT THE TRACH CUFF?

- Clinical experience has shown that full cuff deflation decision should not be made by SLP alone.
- Critical to have input from the RT as well as clearance from the pulmonologist.
- Need to consider the medical and functional implications of full cuff deflation.
- CAN YOU VENTILATE THESE PATIENTS ADEQUATELY IF THE TRACHEOSTOMY TUBE CUFF IS DEFLATED?
- IS THE VENT PATIENT MEDICALLY STABLE AND ALERT?
- CAN THE PATIENT TOLERATE AIR LEAKAGE?
- IS THE PATIENT HAVING SOME SPONTANEOUS BREATHING?
- IS THE PATIENT READY TO BE CONSIDERED FOR USE OF PMSV?
- Trach cuff deflation may facilitate more effective and timely laryngeal elevation for an adequate swallow.
- Furthermore, deflation can allow for increased airflow into the pharynx for improving sensation into the laryngopharynx and improved secretions expectoration.

TREATMENT OF THE TRACH/VENT PATIENT

• **CASE HISTORY:**

- | | |
|--------------------------------|--|
| -length of intubation | -multiple intubations |
| -why extubation failed | -emergent intubation |
| -traumatic intubation | -pre-intubation vocal disturbance |
| -pre-intubation dysphagia | -surgical vs percutaneous trach. |
| -cricothyoidotomy | -when was the tracheostomy tube placed |
| -access to surgical report | -was endoscopy done at time of surgery |
| -prior bronchoscopy reports | -reasons for prior trach/vent weaning failures |
| -presence of head/neck cancer | -oral/non-oral nutrition |
| -neurological status | -MRI/CT brain reports |
| -prior speech tx interventions | -pulmonary status prior to hospitalization |
| -tracheostomy tube type/size | -ventilator settings |

VENTILATOR DEPENDENCE

- Consider the level of dependence/support the patient has on the vent:
 - Where is the patient in the vent weaning process?
 - Is the ventilator weaning slow or fast?
 - Initiating ventilator weaning commonly fatigues the patients and their endurance can be impacted as they try to breathe on their own, liberating themselves from the machine.
 - We need to factor in that trying to begin oral intake in a tube-fed/npo patient can affect and possibly decrease the patient's endurance as well.
 - Clinical experience has shown that patients with a cardiac diagnosis or status post a cardiac surgery may often show reduced stamina when ventilator weaning is initiated.
 - Clinical experience has shown that there is no global rule, since patients needs do vary from case to case
- Generally, the goal is to wean from the ventilator if possible and then maintain or begin PO feeds. What do you think?

Need to consider vent setting and respiratory rate

- ASSIST CONTROL (AC): Produces a ventilator-assisted breath every time the patient attempts to initiate a breath. A pressure sensor reacts to the patient's own inspiratory effort. This results in a breath delivered from the vent. Besides the assisted breaths, the vent provides a controlled preset amount of breaths per min.
- SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION (SIMV): This permits some spontaneous breathing while also providing a set mandatory breath rate. Further, SIMV will sense a patient's spontaneous breath and provide the mandatory breath in synchronization with the spontaneous effort. This will not disrupt the patient's work of breathing.
- CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP): Used when a patient is increasing time off the vent as a weaning option. This has continuous flow and airway pressure that enhance and bolster the patient's spontaneous breathing efforts.
- Need RT to manage vent for volume loss, FI02, and PEEP

What if no cuff deflation is possible?

- If there is full cuff inflation where the cuff is in full contact with the tracheal walls, the clinical assessment cannot be entirely accurate.
- This scenario in a clinical exam will not allow the SLP to determine if the patient is aspirating.
- This is because the PO bolus and/or secretions can pool on the inflated cuff rather than spilling down into the lower pulmonary airway, where it can be cleared with suction, revealing the presence of absence of aspiration.
- Generally, clinical experience has shown a correlation. Many patients who are actively ventilator weaning and not medically ready to tolerate cuff deflation are also not medically ready to begin oral feeding.

TRACHEOSTOMY TUBE SIZING

- The most common size tracheostomy tube we see on admission is the 8 dct Shiley trach with ID 7.6mm and OD 12.2mm and a length of 79mm.
- When possible, prior to oral feeding trials, we try to change to 6dct cuffed tracheostomy tube non-fenestrated with ID 6.5mm, OD 10.8mm, and length 74mm when cuff is still needed.
- When able to downsize straight to cuffless, we prefer the 6 cfs cuffless Shiley non-fenestrated with ID 6.4mm, OD 10.8mm, and length 76mm.
- When the outer diameter is too large, the passage of air to the upper airway with the cuff deflated will be reduced. This can impact the ability to use the upper airway with cuff deflation.
- Typical sizing for tracheostomy tube fitting is 10 mm OD for women and 11mm OD for men. (Hess DR, 2005)
- Prior to tracheostomy tube downsizing, need to review presence of retained airway secretions with the RT.
- Need to find information on secretions quantity, thickness, and the frequency of suction needs.

MODIFIED BARIUM SWALLOW WITH TRACH AND VENT PATIENT

- **What to consider when making choice for this exam:**
 - Can patient be safely transported off of the floor?
 - Is the patient a high risk for aspiration of barium and what is their pulmonary reserve?
 - Your degree of medical back-up support, dependent on the level of ventilator dependence and patient medical stability?
 - Can the patient be positioned upright in the radiology suite space while on a ventilator?
 - If the patient is on trach collar oxygen during the day and the ventilator at night, do you bring both the vent and trach collar to be thorough in your assessment?
 - Considering the timing of the exam: Do you bring patient while they are in the midst of ventilator weaning or wait until liberated from the vent and on a trach collar?
 - Will you be able to generalize to real time situation with this time controlled procedure?
 - Is there a known cricopharyngeal deficit that will be better viewed on MBS?
 - Have they had MBS in the past and if so, what were the results and how long ago was it done?

MODIFIED BARIUM SWALLOW WITH TRACH AND VENT PATIENT

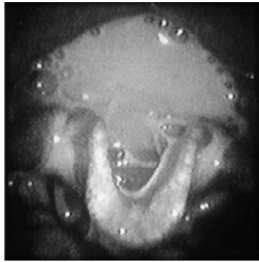
- Is there an NG tube in place?
- Is there suction set up in radiology and who will be performing the suction?
- Is there a known esophageal deficit that will allow better viewing on MBS?
- Are there orders for the test to be done on/off vent and on/off PMSV?
- Are there specific oral stage deficits that led to decision making for this exam?
- Will this provide better imaging for aspiration quantity with your trach patient?
- Clinical experience has shown that the most successful exams have a plan: Taking trach patients down to radiology who are liberated from the ventilator typically facilitates all aspects of the exam; having a goal for the patient, i.e., in terms of transitioning from NPO to PO; have an expectation based on the clinical exam.
- Allows unaltered view of the dysphagia patient at the height of the swallow.

FEES EXAM WITH THE TRACH AND VENT PATIENT

- Allows imaging of anatomical deviations: Trauma from prior intubation or prolonged NG tube use, edema and erythema from laryngopharyngeal reflux.
- Precise imaging if an NG tube or anatomical abnormality is impacting the swallow before giving PO.
- Ability to assess secretions: Is this a deficit area from bedside exam? Are there secretions leaking from underneath the neck flange? Is there wet dysphonia? Are there concerns about aspiration of secretions?
- Allows direct imaging of breath patterns and airway valving mechanisms prior to oral feeding.
- The ability to gather this information before giving a bolus can dictate if you are going to give PO and in what order you will give PO.
- Is sensory testing FEESST needed and available? What additional information could this provide?

FEES EXAM WITH THE TRACH AND VENT PATIENT

- Clinical experience with FEES exam has some noted advantages for this population:
 - More time allows for compensatory posture and strategy training.
 - Performed on the unit at bedside allows multiple staff caring for the patient to participate for immediate carryover
 - Greater ability to manipulate cuff, vent, PMSV in terms of time and space
 - When performing the exam with pulmonologist and RT, there is potential for trach change and subglottic viewing as part of the exam with pulmonologist as the endoscopist
 - Excellent method to assess patient fatigue, as it is not time controlled
 - Ideal imaging for consequences of laryngopharyngeal reflux, including viewing refluxed tube feedings



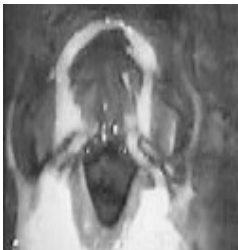
Laryngeal penetration, pyriform sinus bilateral pooling, lateral channels bilateral pooling, and valleculae pooling on FEES exam.
From entandallergy.com



Laryngeal penetration (thick arrow) and/or tracheal aspiration (thin arrow) may occur as a result of post swallow residue in the valleculae.
From medscape.com

MBS and FEES images

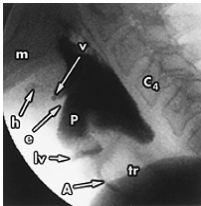
- MBS post swallow oral residual (thick arrow) and pharyngeal residual in valleculae (thin arrow) in a patient (from medscape.com). FEES residue in the vallecular space, lateral channels, and pyriform sinus (feesst.com)



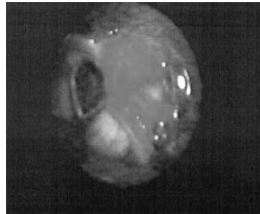
FEES compared to other exams

- Article: FEES vs MBS: Wu et al. (1997)
 - FEES was found to be more sensitive in detecting pharyngeal stasis, laryngeal penetration, tracheal aspiration, effective cough reflex, and velo-pharyngeal incompetence.
 - They concluded FEES is a safer, more efficient, and sensitive method than MBS in evaluating swallow safety.
- Article FEES and simultaneous Blue Dye swallow exam: Doznelli J et al. (2001)
 - Showed blue dye by itself failed to identify any of the trace aspiration events which were occurring. Aspiration was present in 53% of the FEES studies done. Blue dye alone should only be used as a screen for gross aspiration was concluded.

MBS and FEES image comparison



Lateral projection MBS exam showing aspiration of liquid barium. (m = mandible; v = vallecula; C₄ = body of fourth cervical vertebra; h = hyoid bone; e = epiglottis; p = barium that has penetrated into the laryngeal space; lv = laryngeal ventricle outlined by barium; tr = trachea; A = aspirated barium in trachea) Note the shoulder shadow over the trachea. (<http://www.aafp.org/afp/20000415/2453.html>)



Bolus residual that is in the left pyriform sinus. This spills over the left arytenoid cartilage into the left side of the larynx and then into the trachea between the abducted true vocal cords.

FEES and secretions

- **Murray and colleagues reported that patients who demonstrate trouble clearing oropharyngeal secretions from the larynx will also most likely demonstrate similar difficulty with food or liquid while swallowing. (Murray et al, 1996).**
- **For treatment planning, the secretion level can be very helpful in determining the risk/benefit ratio for the decision to present a bolus during the FEES exam.**
- **Deferring a bolus when there is gross amounts of secretions aspiration on the exam may be quite a different exam in comparison to a patient who has a mild level of secretions and can safely be assessed on a full battery of food and liquid consistencies.**

Clinical FEES experience

- **Clinical experience has shown FEES to be valuable among patients with vocal fold adduction deficits, including patients with brainstem stroke.**
- **There is a supplemental benefit for these types of patients during visual biofeedback training for compensatory strategy use, including the super-supraglottic swallow.**
- **Mendelsohn et al (1993) reported that since there was such high variability in breath holding in normal subjects, that laryngoscopy should be used with all patients learning the supraglottic swallow.**

FEES VS MBS: IS THERE A GOLD STANDARD?

- **Critics of FEES may indicate that it may just assess the pharyngeal and laryngeal mechanisms as they relate to the swallow, rather than evaluating swallow physiology regarding bolus transit from mouth to esophagus like MBS does.**
- **Critics of MBS may indicate that there are limitations in visualizing the anatomical detail of structures in the laryngopharynx, something that FEES can provide.**
- **Critics of MBS may indicate that it must be turned off between swallows because of the radiation exposure; thus there may be components of pharyngeal residue management that are not captured.**

FEES vs MBS: IS THERE A GOLD STANDARD?

- **In most fields of medicine, disorders have the potential to be assessed and diagnosed with a variety of methods.**
- **FEES generally has the same goals as an MBS, but achieves them in a different modality.**
- **Ideally, the best of both worlds would have each test available, allowing the clinician to base test choice on patient need, based on clinical information.**

FEES vs MBS: IS THERE A GOLD STANDARD?

- **False Negative Rate (FNR):** determines the failure of a test to identify a group at high risk.
- **Study that compared the FNR for aspiration pneumonia between patients who were tested with FEESST and MBS.**
 - The study showed that the FNR for MBS was over 20% and that for FEESST, the FNR was 0%. (Aviv, J et al 1997)
 - This work supports the declaration by Dr Leder at Yale that “even if the clinical exam is negative, visualization of the pharyngeal swallow is necessary” (Leder, S et al 2002)

TEAM APPROACH FOR TRACHEOSTOMY PATIENTS

- **FEEDING AND SWALLOWING TEAM:** The multidisciplinary team approach is combined of physicians and non-physicians.
- In my facility we have RT, pulmonologist/medical director, and SLP perform FEES exams on all ventilator dependent patients who are being considered for PO.
- We have come to the conclusion that the bedside clinical exam is at best, a screening exam.
- These patients are in long term acute care.
- Our tracheostomy patients off of the ventilator may go off the floor for MBS, always with SLP and RT.
- These patients may have FEES exam as well if clinically indicated.

TEAM APPROACH FOR TRACHEOSTOMY PATIENTS

- In these facilities we do not take ventilator dependent patients off of the unit
- It is not uncommon to have the supra-glottic space assessed and then the MD scoping through the tracheostomy tube down to the carina.
- We frequently deflate cuff, add PMSV, and may alter tracheostomy tube type and size during the FEES exam.
- In these long term acute hospital floors within acute care hospitals, we have found that the multidisciplinary approach works well because the patients' needs are so diverse.
- Another member of the team is the otolaryngologist. They are typically the physicians who place the tracheostomy tube, may assess upper airway abnormalities, and assist with tracheostomy tube sizing needs.

TEAM APPROACH FOR TRACHEOSTOMY PATIENTS

- **Other members of this team include a pharmacist.**
 - Their input may involve deciding on use of medications to dry up secretions.
 - They are also involved in decisions on the safest way to administer medication with a tracheostomy patient.
- **The nutritionist is part of our multidisciplinary team. A large component of ventilator weaning is nutritional status.**
 - The nutritionist is involved with the SLP in terms of checking prealbumin levels of patients who are tube feed weaning. The nutritionist is involved with SLP for calorie counts as well.
 - SLP and nutritionist also interact to determine which consistency is safest for oral nutritional supplements.
 - Additionally, the SLP and the nutritionist work together to establish tube feeding and PO intake schedule so they can coordinate and maximize patient nutrition.
- **The other member of the team that SLP works closely with is the physical therapist.**
 - The primary interaction is with patient positioning issues.

TREATMENT APPROACH

- **Although each patient has specific requirements to meet their medical needs, there are some universal areas that are involved in assessment and treatment.**
- **The primary areas of focus we assess before oral feeding is considered are:**
 - Cognition
 - medical status
 - pulmonary status
 - airway secretions management
 - airway patency
 - lung compliance
 - level of care

TREATMENT APPROACH

- Gradual cuff deflation trials
- Adduction exercises involving phonation
- Airway secretions management training
- Family education
- Gradual PMSV use in-line with ventilator
- Postural and behavioral compensatory strategy training
- Visual bio-feedback with FEES
- Staff education
- Vocal re-education therapy
- Anti-aspiration and anti-reflux training
- Transitioning from NPO to PO feeding

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