

Managing Swallowing Dysfunction in Tracheostomy- Dependent Patients

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Types/Classification of Respiratory Failure

Respiratory failure is a syndrome of inadequate gas exchange due to dysfunction of one or more essential components of the respiratory system

Type I: Hypoxemic ($\text{PaO}_2 < 60$): Failure of Oxygen Exchange

Causes: Pneumonia, Pulmonary Edema, Pulmonary fibrosis, Atelectasis

Type II: Hypercapnic ($\text{PaCO}_2 > 45$): Failure to eliminate carbon dioxide

Causes: Central hypoventilation, asthma, COPD

Type III: Perioperative Respiratory failure: Increased atelectasis due to low functional residual capacity in the setting of abnormal wall mechanics

Type IV: Respiratory failure associated with Shock: Patients who are intubated and ventilated in the process of resuscitation for shock

Early Mobilization and Rehabilitation



- One-third of critically ill patients have ICU acquired weakness
- Hashem et al. Prospective study followed 222 survivors of ARDS for 2 years
- The duration of bed rest was the only risk factor for significant weakness during and up to 24 months post.
- There was a 3%-11% decrease in muscle strength for each additional day of bedrest
- Early mobilization had a statistically significant impact on reducing LOS in ICU

We need to apply these tenants to the prescription of voice and swallowing therapy

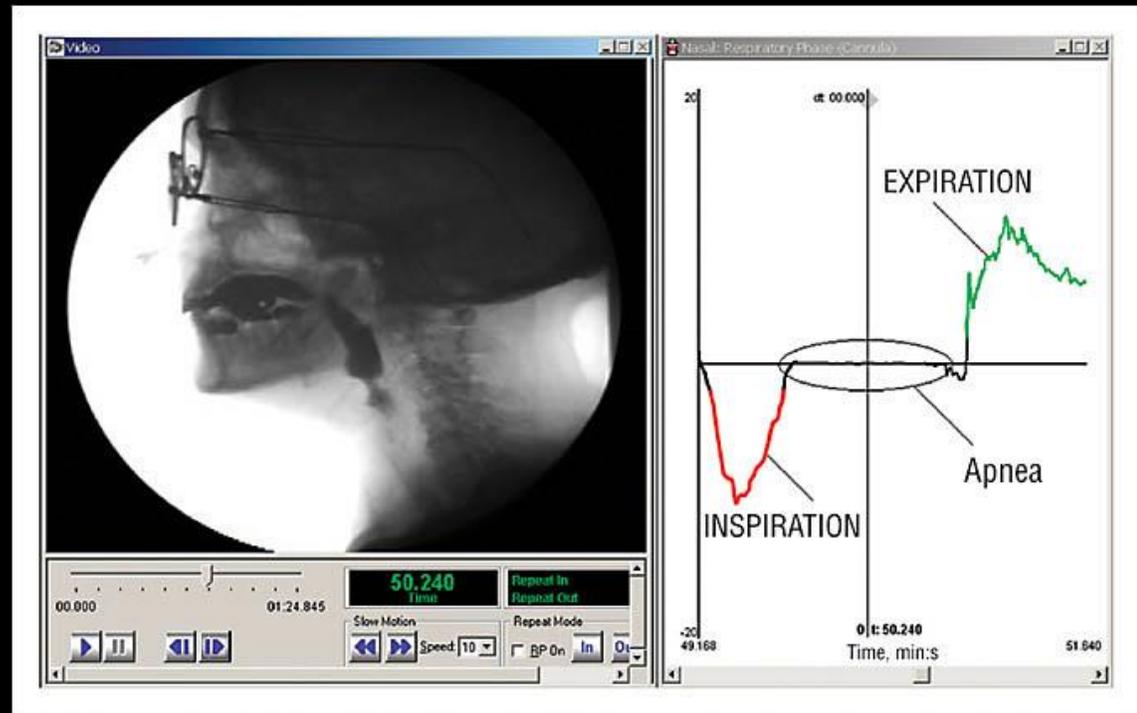
Indications and timing of tracheostomy

- Unrelieved upper airway obstruction
 - In non-neurologic critically ill patients, the intubation duration was independently associated with developing PEA. Additionally, duration was positively correlated with dysphagia severity, and it may be helpful for identifying patients who require a swallowing evaluation after extubation. (Kim et al)
 - Need for prolonged mechanical ventilation
 - Secretion management
 - Pt comfort
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- Mucosal damage to laryngeal structures can peak at 1 week (Whiled et al)

Respiratory-Swallow Coordination

- Breathing and Swallowing share a common pathway
- Studies have shown that swallowing in normal/healthy individuals most commonly occurs within the expiratory arm at mid-low quiet breathing lung volumes (McFarland et al)

Mechanical Ventilation can disrupt this relationship



DVD



THE GREAT

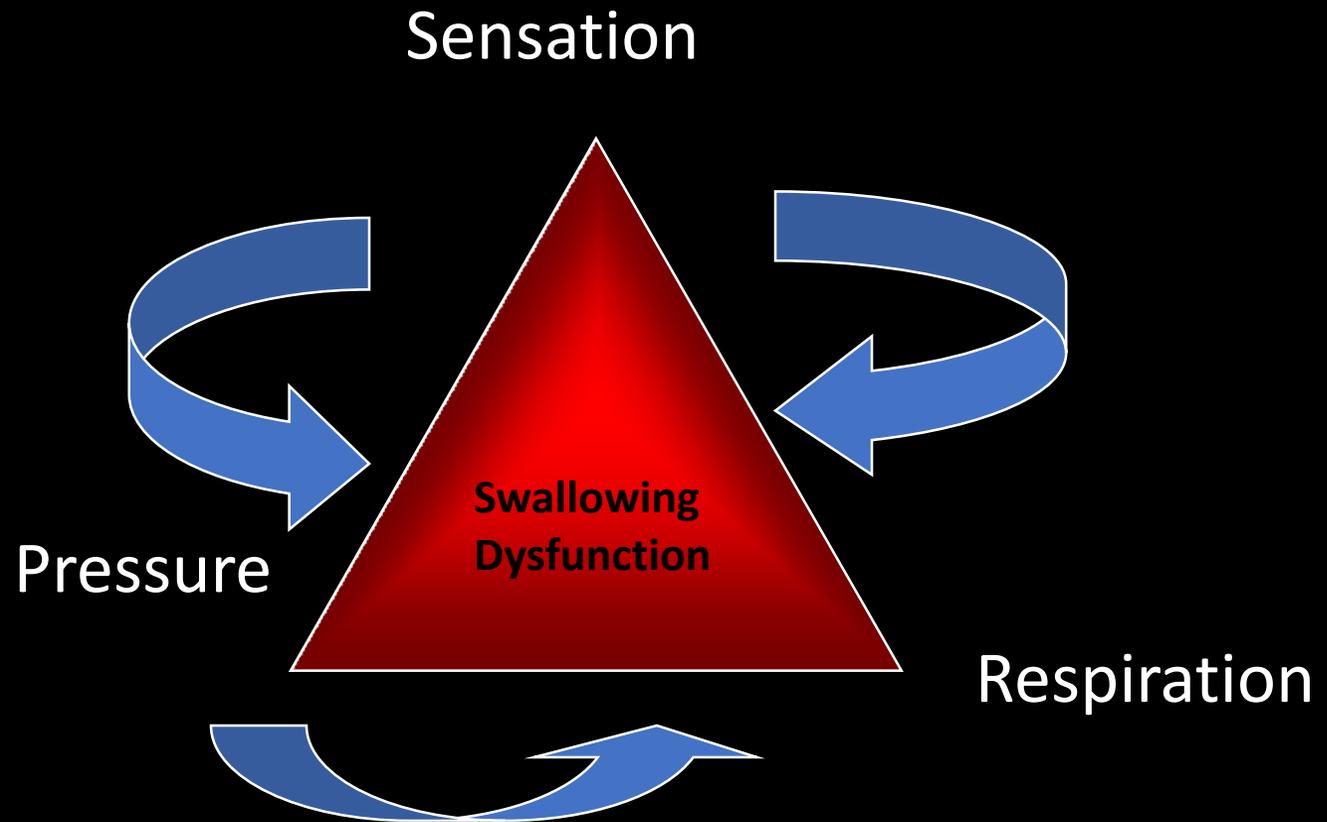
Tracheostomy

=

Swallowing
Dysfunction

DEBATE

The proposed theories...



School of Thought #1

- Presence of tracheostomy tube is inherently linked to elevated incidence of swallowing dysfunction secondary to:
 - Decreased laryngeal elevation caused by laryngeal “tethering” (Elpern et al, Bonanno et al)
 - Shaker, R. (1995): Patients with open trach tube evidence significantly decreased duration of VF closure vs. closed trach tube (CAP/PMV)
 - Seo et al. explored swallowing function in stroke patients +/- trach. Results revealed reduced vertical and horizontal hyoid displacement in trach group vs. no trach group.
 - Disruption in pharyngeal transit time and altered laryngeal reflex (Suiter et al, Sasaki et al)
 - Altered subglottic pressure (Gross et al)
 - Desensitization. Theisen reviewed 40 trached patients and found that secretion levels and altered sensation correlate with aspiration (78.9% silent)

School Of Thought #2

- Leder et al. Found that 95% of patients exhibited the same rates of aspiration before and after decannulation
- Leder et al. Tracheostomy occlusion status had no impact on aspiration rates
- Kang et al. explored relationship of tracheostomy and swallowing. Found no change in laryngeal elevation, pharyngeal constriction or UES opening (average duration of tracheostomy: 104 days)

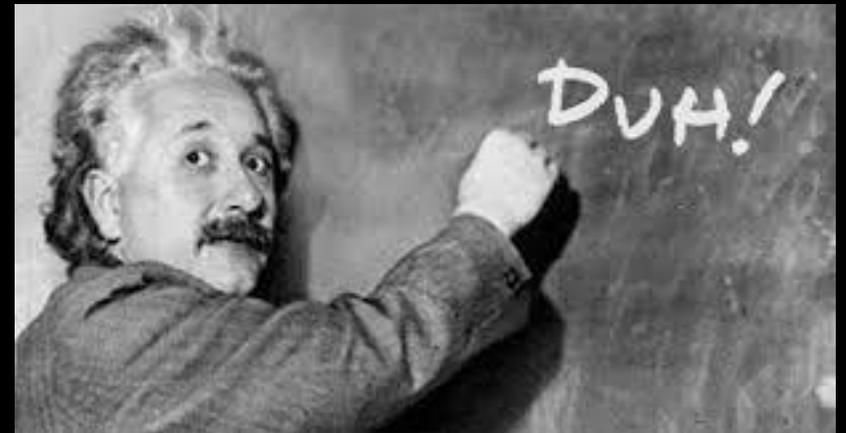
Tracheal cuff pressure

- Increasing cuff pressure (20-25cm H₂O) had a direct impact on:
 - Increased latency time to trigger swallow reflex (2.3 fold) (Amatheiu et al.)
 - Decreased laryngeal elevation accelerometry
 - Decreased peak EMG activity of submental swallow muscles
 - This study proposed that increased trach cuff pressures not only impact integrity of tracheal wall mucosa, but also may inhibit afferent pathways and subsequent efferent firing mechanisms.
 - Davis et al compared aspiration rates with cuff inflated vs deflated. Rates decreased from 17.8% to 6.5% with cuff deflation

In a study of 93 consecutive patients with artificial airways, only 27% had properly inflated cuffs, Sangupta et al.

Are we missing something
really basic?

**What was their swallowing like before
tracheostomy?**



COPD and Swallowing Dysfunction

- The inherent disruption in breathing-swallow paradigm in this population creates elevated risk for Dysphagia+aspiration
- Good-Fratturelli et al. found evidence of dysphagia in 85% of COPD VA patients with penetration +/- aspiration in 70%
- Park et al. found that Stroke + COPD had statistically increased PAS scores (4.67+/-2.15) compared to Stroke - COPD (2.89 +/-1.71)

These and other studies suggest that the relationship/influence of COPD and Dysphagia is bi-directional. Discoordination triggers dysphagia. Dysphagia triggers exacerbations of COPD

SLP Role

- Integration of SLP goals must be holistically integrated into the larger POC
 - Support the goal of weaning and decannulation
 - Must incorporate objective testing (FEES, VFSS) to generate accurate analysis of swallowing function
 - Timing of SLP interventions should never interfere with attempts to progress towards decannulation (discuss weaning/SV, downsizing, WOB/flow resistance)
- **Emphasis MUST be on optimizing safe and efficient communication and swallowing against the backdrop of weaning and full-body rehabilitation**

One-Way Speaking Valves

- Restores airflow through the upper airway, allowing for recruitment of true vocal cord vibration and potential enhancements in swallowing c/b
 - Increased subglottic pressure for improved airway protection
 - Restoring cough
 - Enhanced laryngeal sensation, taste and smell
 - Increasing hyolaryngeal excursion
- Sutt, et al.: Speaking valve use facilitated an increase in end-expiratory lung impedance in tracheostomised cardiothoracic ICU patients weaning off mechanical ventilation.

Using FEES to predict safe decannulation

Warnecke et al.

- Prospective study evaluated 100 consecutive tracheostomized adult ICU patients with neuro impairments
- Decisions regarding swallowing decannulation were made using CSE +/- FEES
- Clinical decisions with CSE vs CSE + FEES resulted in 29 and 58 decannulations respectively
- Most salient endoscopic finding that prevented tube removal were pooling of secretions, silent aspiration, reduced frequency of swallow
- FEES carries strong clinical utility and predictive value for safe decannulation. CSE may offer false positive findings that delay decannulation
- FEES allows for incremental upgrade in PO intakes

EMST and IMST

- Prescription of EMST regimen on COPD patients increased expiratory muscle (Weiner et al).
- IMST was found to have favorable impact on improving dyspnea and exercise performance in patients with COPD
- Troche et al explored efficacy of EMST on PD patients. They reported a significant post EMST decrease in penetration-Aspiration scores with increased hyolaryngeal excursion



Let's try to make sense out of this...



- What we do know
 - The relationship between tracheostomy tubes and swallowing dysfunction is complex
 - Pre-existing conditions that impact the respiratory system may have a deleterious impact on swallowing
 - Prolonged bed rest/ICU stay and intubation correlates with swallowing disorder
 - Occlusion of the tracheostomy tube via one-way speaking valve, has favorable impact on communication, cognitive status and swallowing
 - A dedicated multi-disciplinary tracheostomy team can have tangible impact on all aspects of weaning and rehabilitation

Thank You

