HOW YOU BREATHE MATTERS:
SWALLOWING SAFELY

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Course Objectives
• Describe normal aerodigestive physiology and common swallowing issues diagnosed in the tracheostomized and ventilator dependent population and recognize clinical symptoms placing patients at risk for swallowing problems, including aspiration.

• Discuss the role of subglottic pressure and the timing of the swallow during the respiratory cycle and how this is affected by the placement of a tracheostomy tube.

• List goals and formulate a treatment plan utilizing the Passy-Muir® Valve and team approach for diagnosis and treatment of common issues facing the tracheostomized ventilator patient.
Outline

• What is Normal?
• Respiration & Swallowing: A Shared System
• Dysphagia - Aspiration
• Interruptions to Normal Breathing Patterns
• Complications of a Tracheostomy Tube
• The role of the Passy-Muir® Valve in dysphagia treatment
• Treatment Plans
• Importance of the Team Approach
• Q & A

Normal Respiration

• CNS control
  – Responds to changes in CO₂
  – Brain stem, Medulla & Pons, Phrenic & Thoracic nerves
• Muscles of respiration
  – Diaphragm
  – Intercostal
  – Abdominal
• Pressures and Inspiratory Flow
• Compliance, Resistance and Lung Recoil
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**Lung Volumes and Capacities**

**Normal Swallow**
- Anatomy
- Mechanical
- Pressure Driven
- Airflow
- Phases of swallow
- Timing of swallow

**ANATOMY OF SWALLOW**
- Nasal Cavity
- Oral Cavity
- Pharynx
- Larynx
- Esophagus
MECHANICS OF A SWALLOW

- Phases of swallow
  - Anticipatory
  - Oral Preparatory
  - Oral
  - Pharyngeal
  - Esophageal

Subglottic Pressure: Role in Swallow

- Positive Pressure - Subglottic
  - Lung recoil: pressure increases

- Negative pressure - Esophageal
  - Opening of UES: pressure decreases

Timing of Swallow

The usual pattern in healthy adults is to time swallows to occur at mid-exhalation. Healthy individuals also nearly exclusively follow each swallow with exhalation. This pattern assures there is sufficient air pressure below the vocal folds during a swallow to inhibit aspiration of food residue after the swallow.

Inhale - Exhale - Swallow - Exhale
Inhale - Swallow - Exhale

Dr. Roxann Diez Gross 2009
Timing of Swallow

In natural tasks such as cup drinking, the onset of breathing cessation seemed to be variable. When instructed to take a cup and bring it to their mouth, many patients discontinue breathing well before it reaches the lips.

Dr. Bonnie Martin-Harris 2007

Timing of Swallow-Lung Volumes

Breathing and Swallowing: A Shared System

- Anatomy
- Timing
- Pressures
- CNS Control

- Dysphagia – difficulty swallowing
- Aspiration – any material that penetrates below the level of the vocal folds.
Disruption to Normal Breathing Patterns

- Illness:
  - Neuromuscular
  - COPD
  - Restrictive disease
- Medications
- Tracheostomy
- Mechanical Ventilation

Dysphagia & Aspiration Risk

- AGE
- ILLNESS
- ARTIFICIAL AIRWAY
  - TRACH TUBE
    - Tube size and type
    - Cuff
    - Airflow
    - Laryngeal tethering
    - Reduced airway protection
    - Loss of positive airway pressure
    - Disuse atrophy
- MECHANICAL VENTILATION

Clinical Complications: Inflated Cuff

- Over-inflated cuff
- Cuff affect on aspiration
Documentation of Aspiration

- Diagnostic tools
  - Bedside evaluation-Blue Dye (?)
  - FEES
  - MBS

- Signs and Symptoms of Aspiration
  - Wet sounding voice
  - Drooling
  - Multiple swallows
  - Coughing while eating
  - Recurrent RLL pneumonia

FEES vs. MBS

Treatment Plan: A Team Approach

Co-treatment Strategies
Shared Goals - RCP & SLP

- The Patient Will:
  - Communicate
  - Manage secretions - oral and tracheal
  - Tolerate cuff deflation
  - Swallow without signs or symptoms of aspiration
  - Participate in weaning and rehabilitation efforts
  - Be liberated from continuous mechanical ventilation
  - Decannulate

Benefits of the Passy-Muir® Valve

- Restores normal physiology-reconnects the upper and lower airway & closed system
  - Airflow
  - Positive airway pressure
  - Laryngeal movement &
  - Airway closure
- Is “physical therapy” for the upper airway

Compensatory and Treatment Strategies

The Role of the Passy-Muir® Valve
Clinical Benefits of Passy-Muir® Valve Use

- Restoration of normal physiology and improved:
  - Speech and communication
  - Secretion management
  - Taste and smell
  - Oxygenation, reduce atelectasis
  - Swallow and may reduce aspiration
  - Participation in rehab (Massery 2010)
  - Weaning and decannulation time
  - Infection control
  - Quality of life

Compensatory & Treatment Strategies

- To improve swallow the SLP might suggest:
  - Cuff deflation and Passy-Muir® Valve use
  - Modifications in diet
    - Textures
    - Method of eating/drinking
  - Posture or position during and after eating
  - Timing of the swallow
  - Strengthening maneuvers
    - Mendlesohn, Shaker Head-Lift,
    - Inspiratory and/or Expiratory muscle training
  How does this involve the RCP?

Co-treatment: SLP & RCP

- Mechanical ventilation & Passy-Muir® Valve in-line
  - The RCP can make necessary ventilator modifications to enhance Passy-Muir® Valve tolerance and ability to perform treatment modalities. (I-time, RR, Volume)

  - The SLP can cue the patient and perform and or assist with treatment or compensatory strategies during mechanical ventilation. (Swallow, I/E muscle training)

  - Co-treatment, collaborative reassessment and care planning as warranted enhances the rehab experience for the patient.
Co-treatment

- Swallowing during mechanical ventilation
- EMT during mechanical ventilation

Conclusion: How You Breathe Matters

- There is likely an “interactive cooperation” between swallowing and respiration. (Gross 2009)

We have a responsibility as Health Care Practitioners to co-operate and take a team approach in the assessment and treatment of tracheostomized and mechanically ventilated patients.

Questions?

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Resources

Resources
• Gross RE, Atwood CW, Ross SB; et al. (2009) The coordination of breathing and swallowing in COPD. American Journal of Respiratory and Critical Care Medicine, 179 (7): 559-565.

Resources