THE ART OF SWALLOWING THERAPY
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LEARNING OBJECTIVES
At the culmination of this session, participants will be able to:
• List the basics of exercise physiology in its application to dysphagia management.
• Understand how cross-systems function (e.g., respiration and swallowing) and its impact on swallowing.
• Provide a framework for current best practices in making functional gains for patients with dysphagia.
• Discuss factors to consider when reviewing complex dysphagia cases.

What do we know?
• Aspiration by itself is not sufficient to cause pneumonia, that there must be other factors (Langmore et al., 1998; Cook et al., 1999)
• Aspiators aspirate more than just food and liquid; they also aspirate saliva and reflux. (Feinberg et al.,1990; Feinberg et al.,1996)
• The lungs have defense mechanisms of their own and are not simply receptacles for pneumonia (Raz, 2007)
• It is possible to rehabilitate the swallowing mechanism but that it’s not possible to plan this without instrumentation (Crary et al., 2012)
• We don’t rehabilitate simply a trachea and a pharynx, but a patient, who has choices (Leslie & Krival, 2016)
• Without adequate nutrition and hydration, the human organism is far more susceptible to disease due to the impact on the immune system (Chandra, 1997)
• Altered diets don’t necessarily lead to improvements in nutrition and hydration (Vivanti et al., 2009; Sura et al., 2012)
• The best way to be sure that patient with “comply” with a treatment plan is to develop the treatment plan with the patient (Leslie & Krival, 2010)

Exercise Physiology

- When proteins are activated in a repetitive cycle a muscle contraction occurs
  - Muscle contraction must meet intent in order to result in functional movement
- A coordinated series of contraction (agonist) and relaxation (antagonist) produces purposeful movement
- The types of fibers that make up a muscle determine the force produced (strength) or how well a muscle responds over time (endurance)
- Muscle fibers are type I or type II based on how it uses fuel and its force generating capacity

Muscle Fibers

**Type I**
- Smaller in diameter
- Utilize low force
- High-endurance activities
- Can perform many repetitions without a load

**Type II**
- Structurally superior for force
- Predisposed to fatigue
- Quick forceful movements
- Heavier load needed fewer repetitions

Dysphagia and Exercise Physiology

- A concentration of Type I and IIA fibers are found in the anterior tongue
- Type II fibers are best suited for quick ballistic movements such as driving a bolus through a hypopharynx and toward the esophagus
- The majority of upper aerodigestive tract muscles are type IIA—high concentration of Type II fibers are found in the tongue base and pharyngeal constrictors

Principles of neuroplasticity:
- Use it or Lose it
- Use it and improve it
- Neuroplasticity is experience-based
- Repetition Matters
  - Performance does not mean learning
  - Intensity matters
  - Unless a system is pushed beyond its normal capacity, change will not occur
- Salience Matters
  - Change is best when movement is purposeful and tied to the behavior being changed

Adaptation

- In order to learn a new skill and achieve adaptation and neuroplasticity high repetitions are required
- Principles of adaptation:
  - When you take a break there is a period of de-adaptation
  - When you re-start the exercise you re-learn the movement
  - The rest breaks help to get faster, more neuroplastic change

SWALLOWING & RESPIRATION
**Swallowing and Breathing Relationship**

- Swallow and respiratory event occur within 2 seconds of the swallow.
- Cessation in respiration during a swallow.
- Most single swallows are both preceded and followed by expiration (71-100% of healthy individuals).
- An inspiratory/inspiratory pattern becoming a dominant pattern is associated with high incidences of aspiration during a MBSS.

**Coughing Physiology**

- Cough and swallowing are sensorimotor behaviors that involve highly coordinated sequences of structural movements that require reconfiguration of the ventilatory breathing pattern (Bolser, Poliacek, Jakus, Fuller, & Davenport, 2006; Davenport, Bolser, & Morris, 2011; Troche, Brandimore, Godoy, et al., 2014).
- Can be triggered on command (voluntarily) or in response to a sensory stimulus (reflexively).
- The effective production of voluntary and reflex cough requires timely coordination of the respiratory and laryngeal systems during three phases:
  - First phase of cough is the inspiratory phase
  - Second compression phase during which the vocal folds adduct
  - Third expiratory muscles are contracting which then results in high expiratory flows once the glottis opens.

**SWALLOWING EXERCISES:**

**Effortful Swallow**

- **Directions:**
  - As you swallow push hard with the tongue against the hard palate and squeeze your neck and throat muscles hard as you swallow (Logemann, 1999).
- **What it does:**
  - Increases posterior tongue base movement to facilitate bolus clearance. (Yorkabee & Steeves, 2006)
  - Arouses swallows by high effort, may facilitate long-term adaptations and improved swallowing function (Clark & Shetler, 2014).
  - Lengthens laryngeal vestibule closure, improved pharyngeal response duration, UES opening.
  - Airway is protected longer, offering a smaller window of opportunity for material to be aspirated (Hind & Nicosia, 2001).

- **Mendelsohn Maneuver**

- **Directions:**
  - Put your hand on your throat and feel when you swallow. You can feel your Adam’s apple move up. Now, when you swallow I want you to hold your Adam’s apple up for a few seconds, squeezing your throat and neck muscles and not letting go (Logemann, 1999).
- **What it does:**
  - Significantly increases maximal vertical hyoid displacement during swallowing (Bulow et al., 1999; Ding et al., 2002; Hind et al., 2001; Lazarus et al., 1993; Logemann, 1999).
  - Positively affects displacement and duration of the hyoid movement. Hyolaryngeal elevation and hyolaryngeal excursion increased after 2 weeks of using only the Mendelsohn maneuver. 30 to 40 Mendelsohn maneuvers seem to have a rehabilitative effect. (McCullough, 2012).
**CASE STUDIES**

**Case Number 1: Anterior Cervical Neck Discectomy and Fusion (ACDF):**
- Case History: 62-year-old man, went to doctor with axial cervical pain, consistent with cervical myelopathy. Imaging showed stenosis of C4-7 and spinal cord compression. Patient underwent a C4-7 ACDF.

- Past Medical History: Meige syndrome, torticollis, mild reactive airway disease, hypertension.

- Meige Syndrome: Rare neurological movement disorder, involuntary contractions of muscles of jaw and tongue and involuntary muscle spasms of muscles around the eyes. [https://rarediseases.org/rare-diseases/meige-syndrome/](https://rarediseases.org/rare-diseases/meige-syndrome/)

- Swallow Status: After 2 MBSS’s he was placed on a puree and nectar thick liquid diet.

**ACDF:**
- Involves removing a damaged disc to relieve spinal cord or nerve root pressure.
- Risks include vagal neuropathy including superior laryngeal nerve, recurrent laryngeal nerve and pharyngeal plexus issues.
- Early swallowing issues are likely to include aspiration, incomplete laryngeal inversion, increased pharyngeal wall thickness, decreased stripping wave and PES opening.

**Recommendations:**
- **Diet Recommendations:**
  - Continue Puree and nectar thick liquid diet.
- **Swallow Strategies:**
  - ½ tsp bite size boluses
  - Self feed
  - Avoid distractions
  - Dry swallow 3-4 times after each bite of food/drug
  - Eat slowly

- Should this patient receive therapy?
  - Yes!

**Swallow Therapy:**
- Upgraded diet to mechanical soft and nectar thick liquids.
- Used sEMG to identify coordination of swallow.
- Worked on different bolus sizes and textures, focusing on function and coordination of swallowing rather than strength.
- Patient participated in over 15 swallowing therapy sessions.

**Recommendations:**
- **Diet Recommendations:**
  - Upgraded diet to soft solids and thin liquids.
- **Swallow Strategies:**
  - Avoid distractions
  - Oral care
  - Alternate solids/liquids
  - Take 2 swallows for each bite of food.

- Should swallow therapy continue?
  - Maybe...but yes.
ACDF Case Continues:

- Decreased frequency to 1x/week instead of 2x/week
- Focusing on larger boluses, including puree consistency
- Discharged on a regular and thin liquid diet; patient will always be at risk for aspiration secondary to dysphagia

Case Number 2: Brainstem stroke

- 59 year old male, had a brainstem stroke at outside facility in 2016. Received inpatient rehabilitation in 2016. Discharged home end of 2016.
- PMH: CABG x2, diabetes, multiple TIA’s
- MBSS at outside facility current swallow status: NPO

Brainstem Stroke

- Typically multisymptomatic due to location of cranial nerves in nuclei
- The brain stem mechanisms contributing to the sequential and rhythmic motor events involved in swallowing
- Bilateral and/or asymmetric pharyngeal paresis

Swallow therapy:

- Patient participated in 13 therapy sessions in 2017 with inconsistent attendance.
- Completed swallowing exercises including masako, hard swallows and tongue based exercises.
- Continued to expectorate saliva into cups throughout the day
- Continued NPO with ice chips only
- Was discharged because of non-compliance with appointments

Recommendations:

- Diet Recommendations:
  - Begin oral diet of nectar thick liquids and soft foods
  - Continue to supplement using feeding tube (family wanted it out!)

- Swallow Strategies:
  - Stay upright, eat slowly
  - Dry re-swallow every 5 bites, wait until throat feels clear before swallowing again
  - Cough after every 2-3 bites

- Is swallow therapy recommended?
  - Yes!

Therapy continued:

- Patient participated in 12 therapy sessions
- Focused on improving strength and coordination of swallow, using iEMG
- Caregiver had feeding tube removed despite recommendation
- Patient continued to eat self diet and nectar thick liquids, with a lot of protein shakes
- Patient was admitted to hospital and therapy ceased
Recommendations:

Diet Recommendations:
- Continue oral diet of nectar thick liquids and soft foods
- May do ice chips in between meals, after oral care

Swallow Strategies:
- Stay upright, eat slowly
- Dry re-swallow every 5 bites, wait until throat feels clear before swallowing again
- Cough after every 2-3 bites

Is swallow therapy recommended?
- Yes!

Case Number 3: Head and Neck Cancer

Case History:
- 62 year old male, diagnosed with head and neck cancer of the left aryepiglottic fold with invasion into the thyroid cartilage and vocal cords in January of 2018

Social Situation:
- History of frontal lobe injury (TBI) after a motor cycle accident, he is very anxious

Dysphagia status:
- At baseline, no complaints of difficulty swallowing
- Patient was seen throughout chemotherapy and radiation and by mid-treatment was using his feeding tube for nutrition
- Post-treatment odynophagia, and coughing with thin liquids and nectar thick liquids

Head and Neck Cancer Treatment:

Chemotherapy:
- Designed to slow or stop the growth of rapidly dividing cancer cells in the body, amplify effect of radiation

Side effects:
- Taste changes, fatigue, nausea, vomiting, hair loss, and mouth care

Radiation:
- Directed from a machine outside the body to shrink tumors, destroy cancer cells and alleviate cancer-related symptoms

Side effects:
- Xerostomia, mucositis, dysphagia, odynophagia, complex nutritional needs, body image challenges, psychosocial challenges

Head and Neck Cancer:

Swallowing and speech functioning could regress during radiation due to:
- Edema
- Reduced salivary flow
- Increased fibrosis of the musculature

Recommendations:

Diet Recommendations:
- Begin pleasure feeds of puree and nectar thick liquids

Swallow Strategies:
- Sit upright, eat slowly, no TV while eating
- Alternate solids/liquids
- Dry re-swallow 2-3 times per bite
- Oral Care

Should this patient participate in swallow therapy?
- Yes!

Head and Neck Cancer Case...Continued

Patient came to therapy, working with sEMG to improve strength, coordination of swallowing

Goal to complete 75-100 swallows per day

Barriers to therapy:
- Odynophagia, ongoing pain and fear of swallowing
**Recommendations:**

- **Diet Recommendations:**
  - Continue small quantities of puree and thin liquids and/or ice chips.
- **Follow up with MD**
  - Patient was placed on a short course of steroids to decrease inflammation.
- **Continued with swallow strategies**
- **Does this patient need therapy?**
  - Yes!

**Works Cited Continued**

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- Does this patient need therapy?
- Follow up with MD
- Diet Recommendations:
  - No!