Exercises, Exercises, and More Exercises!
Evidence-Based Treatment for Every Swallowing Impairment.

Accelerated Care Plus (ACP) Synchrony sEMG Biofeedback (Surface Electromyography)

- Electrodes are placed on the muscles to receive a visual or auditory signal from the muscle.
- Takes away the guess-work when seeing if a patient is producing an effortful swallow vs. a typical swallow.
- Can be submental or suprathyroid placement
- Compare the muscle activation during the exercise compared to rest
- Can be much more stimulating and engaging for the patient than traditional exercise
- Can measure the duration of swallow
- Does NOT provide physiological impairments

The average person swallows on average 500 times per day.
Need much more than 5-10 swallows are needed to improve the swallow!

Dr. Jeff Kleim wrote a seminal paper outlining principles of neuroplasticity:

- Lab rats do 175 repetitions in an hour of a new skill
- Monkeys do 300 repetitions in an hour of a new skill
- People practice a new skill only about 25 times, shows the need for much higher repetitions!

Why are your patients not improving?

- too little repetitions of the skill
- BORING! need to be more engaging
- mentally prepare your patient for the amount of swallows needed
- allow your patient short breaks during sets

Principles of adaptation: when you take a break there is a period of de-adaptation, and when you re-start the exercise you re-learn the movement, the rest breaks help to get faster, more positive neuroplastic changes.

- Mendelohn is an isometric exercise so try aiming for 3-4 sets of 10 repetitions with a 5 minute rest break
- Effortful swallow is NOT isometric, so we need higher reps, try aiming for 1 swallow every 10 seconds- this creates 50 swallows per 10 minutes, or aim for 3 sets of 25.
  - Maggie Huckabee study, Dr. Crary’s studys' had their subjects perform as many swallows as possible in an hour - averaged between 70-100
Should patients do these exercises with a bolus?

- Very difficult to do high reps of swallows without a bolus
- Helps to improve hydration
- What if my patient is NPO?
  - We aren't reducing their aspiration risk (they can still be aspirating on their saliva or refluxed gastric contents)
  - NPO patients with PEG tubes have higher rates of aspiration pneumonia and morbidity
  - Look at report to see if they are truly NPO
  - Appropriate times to make someone NPO?
    - When there is no UES opening
    - When there is no swallowing reflex present

Having feedback (Mendelsohn maneuver, sEMG, fluoro, etc.) makes the concept of “do what I’m doing” less abstract, and improves visual feedback

- What does the effortful swallow do?
  - Tongue pressure increases along a wide part of the hard palate during effortful swallow
  - Increase tongue to palate contact
  - Increase tongue base retraction (Cathy Lazarus, 2002)
  - Increase hyolaryngeal elevation
  - Increase pharyngeal pressure
  - Increased duration of UES opening (Hind- looked at normals)
  - Improved esophageal motility
  - If we see oral stasis, that may indicate a need for improved tongue to palate contact (Fukuoka 2013, Clark 2014, Huckabee 2005)
  - Long meal times correlate to reduced lingual pressures
  - The tongue plays a critical role in bolus propulsion through the oral cavity and pharynx- her study looks at the lingual impairment and overall oropharyngeal swallowing impairments after treatment for head and neck cancer
    - Residue in the valleculae after the swallow, residue in the pharynx after the swallow, residue in the pyriform sinus after the swallow- any of these symptoms may indicate an appropriate candidate for effortful swallow.

- What can a mendelsohn maneuver do?
  - Very similar to benefits of effortful swallow
  - Benefits:
    - Improve hyolaryngeal movement
    - Increased duration of hyoid elevation
    - Increased duration of hyoid excursion
    - Increase duration of UES opening
    - Prolonged and increased tongue to palate contact at the posteriorcircumferential parts of the tongue
    - Improved coordination and timing of pharyngeal swallowing events
Episode 013:
Featuring Rebecca Levy

- Hyolaryngeal Displacement:
  - After two weeks of intensive therapy using only the Mendelsohn maneuver both hyolaryngeal elevation and hyolaryngeal excursion increased.
  - This study found that 20 treatments incorporating 30 to 40 Mendelsohn maneuvers seemed to have a rehabilitative effect. (McCullough, 2012)

MBSiMp Physiologic Impairments: (See attached chart!)
- Oral impairment:
  - Lip closure
    - Straw sucking against resistance (against different consistencies of thickened liquids or even your finger to create strong resistance), isometric exercise - 30-40
    - Lip press can’t control the resistance
  - Tongue Control During Bolus Hold
    - Tongue exercise against resistance
    - IOPI or tongue depressor to assist in measuring tongue pressure
    - Can use sEMG Biofeedback on the muscular side
  - Bolus Prep/Mastication
    - Jaw grading (bite and hold) - increase the grade of the jaw (how far open the jaw is), add in bite blocks or increase number of tongue depressors between the molars
  - Bolus Transport/Lingual Motion
    - Tongue exercises against resistance
      - Any direction EXCEPT out!
  - Tongue Base Retraction (TBR)
    - Effortful Swallow
    - Tongue Pull-backs - hold tongue with a piece of gauze and have the patient pull their tongue back
    - Masako does NOT improve TBR - can be maladaptive and counterproductive

- Pharyngeal Impairment
  - Initiation of the pharyngeal swallow
    - Increasing bolus volume or viscosity (the thicker the liquid, the more pressure required to swallow)
  - Soft Palate Elevation - N/A
  - Laryngeal Elevation
    - Effortful Swallow
    - Mendelsohn Maneuver
  - How to measure hyolaryngeal elevation:
    - You only need a SINGLE frame for this measure, which is the frame of peak position.
    - Measure the distance from peak position to the anterior inferior corner of the C4 vertebrae, and the difference should be 1.5 times the C2-C4 length
    - The instructions on how to do this can be found on Dr. Catriona Steele’s lab website at [http://steeleswallowinglab.ca/srrl/best-practice/hyoid-movement](http://steeleswallowinglab.ca/srrl/best-practice/hyoid-movement)
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- Range in normal of hyolaryngeal elevation can be anywhere from 5.8mm – 25mm
  - Anterior Hyoid Excursion
    - Effortful Swallow
    - Mendlesohn Maneuver
  - Epiglottic Movement
    - Tongue Pullback
    - Mendlesohn Maneuver
    - Effortful Swallow
    - Shaker/Chin Tuck Against Resistance
  - Laryngeal Vestibular Closure:
    - Effortful Swallow
    - Mendlesohn Maneuver
    - EMST (Expiratory Muscle Strength Trainer)
  - Pharyngeal Stripping & Contraction:
    - Effortful Swallow
- Esophageal Impairment
  - Upper Esophageal Sphincter Opening:
    - Effortful Swallow
    - Mendelsohn Method
    - Chin tuck against resistance/ Shaker

References:


McCullough, G., (2014). One step back and two steps up and forward: The superior movements of research defining the utility of the Mendelsohn Maneuver for improving UES function. SIG 13 Perspectives on Swallowing and Swallowing Disorders. 23:5-10.


Murray, J., Doeltgen, S., Miller, M., Scholten, I. Does a Water Protocol Improve the Hydration and Health Status of Individuals with Thin Liquid Aspiration Following Stroke? A Randomized Controlled Trial. Dysphagia (2016)


From MBSimp assessment to treatment:
What are we looking for, what cranial nerve/ muscles are involved, & how do we treat?
(Please take the MBSImP Course to learn the proper scoring protocol!)

<table>
<thead>
<tr>
<th>MBSimp physiological component</th>
<th>What are we looking for?</th>
<th>Involved musculature</th>
<th>CNs</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lip closure</td>
<td>Any labial escape?</td>
<td>Orbicularis oris</td>
<td>CN VII</td>
<td>Straw sucking against resistance</td>
</tr>
<tr>
<td>2. Tongue control during bolus hold</td>
<td>Cohesive bolus or escape?</td>
<td>Intrinsic tongue, tensor veli palatini, palatoglossus</td>
<td>CN V, X, XII</td>
<td>tongue exercise against resistance (IOPI or tongue depressor)</td>
</tr>
<tr>
<td>3. Bolus prep/mastication</td>
<td>Able to chew/mash bolus?</td>
<td>muscles of mastication, intrinsic tongue muscles , buccinator</td>
<td>CN V, VII, XII</td>
<td>Jaw grading (bite and hold) - increase the opening of the jaw while biting</td>
</tr>
<tr>
<td>4. Bolus transport/lingual motion</td>
<td>speech/coordination of tongue</td>
<td>Intrinsic tongue muscles</td>
<td>CN XII</td>
<td>Tongue exercises against resistance (Any direction EXCEPT out!)</td>
</tr>
<tr>
<td>5. Oral residue</td>
<td>Able to clear it?</td>
<td>Intrinsic tongue muscles, buccinator</td>
<td>CN VII, XII</td>
<td>N/A</td>
</tr>
<tr>
<td>6. Initiation of pharyngeal swallow</td>
<td>Where is the bolus head when the swallow is triggered?</td>
<td>Sensory only</td>
<td>CN IX, X</td>
<td>Increasing bolus volume or viscosity</td>
</tr>
<tr>
<td>7. Soft palate elevation</td>
<td>Any bolus escape?</td>
<td>Levator veli palatini</td>
<td>CN X</td>
<td>No evidence of any effective treatment</td>
</tr>
<tr>
<td>8. Laryngeal elevation</td>
<td>Hyoid movement? Approx. of the arytenoids?</td>
<td>Longitudinal pharyngeal muscles, thyrohyoid</td>
<td>CN IX, X</td>
<td>Effortful Swallow, Mendelsohn Maneuver</td>
</tr>
<tr>
<td>9. Anterior hyoid excursion</td>
<td>Present or absent ?</td>
<td>geniohyoid</td>
<td>Spinal nerve C1</td>
<td>Effortful Swallow, Mendelsohn Maneuver</td>
</tr>
<tr>
<td>10. Epiglottic movement</td>
<td>Yes or no?</td>
<td>suprahyoids</td>
<td>C1 and CN V</td>
<td>Tongue Pullback, Mendelsohn Maneuver, Effortful Swallow, Shaker/Chin Tuck Against Resistance</td>
</tr>
<tr>
<td>11. Laryngeal vestibule closure</td>
<td>Complete or incomplete?</td>
<td>intrinsic laryngeal and base of tongue muscles</td>
<td>CN X, XII</td>
<td>Effortful Swallow, Mendelsohn Maneuver EMST (Expiratory Muscle Strength Trainer)</td>
</tr>
<tr>
<td>12. Pharyngeal stripping wave</td>
<td>Yay or nay?</td>
<td>pharyngeal constrictors</td>
<td>CN X</td>
<td>Effortful Swallow</td>
</tr>
<tr>
<td>13. Pharyngeal Contraction (A/P view)</td>
<td>unilateral or bilateral bulging?</td>
<td>pharyngeal constrictors, longitudinal pharyngeal muscles</td>
<td>CN IX, X</td>
<td>Effortful Swallow</td>
</tr>
<tr>
<td>15. Tongue base retraction</td>
<td>Contrast between tongue base and pharyngeal wall?</td>
<td>extrinsic tongue muscles</td>
<td>CN X, XII</td>
<td>Effortful Swallow, Tongue Pull-backs, (NOT the Masako!)</td>
</tr>
<tr>
<td>16. Pharyngeal residue</td>
<td>How much?</td>
<td>cricopharyngeus, pharyngeal constrictors, base of tongue muscles</td>
<td>CN X, XII</td>
<td>N/A</td>
</tr>
<tr>
<td>17. Esophageal clearance</td>
<td>Any retention?</td>
<td>longitudinal muscles of the esophagus</td>
<td>CN X</td>
<td>Effortful Swallow, Mendelsohn Method, Chin tuck against resistance/ Shaker</td>
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</tbody>
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