TheModifiedBariumSwallowas a Tool: Assessing Deficits, Evaluating Strategies, Determining Treatment

"The clinician working on swallowing without benefit of data from a radiographic study is likely to make a number of erroneous management decisions relative to swallowing physiology."

Jeri Logemann, Evaluation and Treatment of Swallowing Disorders

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Disclosures

- Financial:
  - Clinical Manager–Ohio for MBS Envision, Inc.
  - Portable Modified Bariums Swallows
- Non–financial
  - none

Why MBS?

- Screening tools—risk for aspiration, not swallow impairment
  - 3 oz water swallow test
    - (Suiter, 2008; Mari, 1997)
  - Oxygen desaturation test
    - (Gulati et al., 1995; Smith et al., 2000)
  - Gugging Swallow Screen
    - (Trapl et al., 2007)
  - Cervical auscultation
    - (Esli et al., 2004)
  - BSE?
    - (Bajlow et al. 2009)
    - Examined accuracy of clinical judgment during BSE with and without postural changes compared to MBS results.
    - In the 90s for determining no aspiration, around 50% in determining aspiration, with or without strategy use
  - FEES?
    - 96% agreement with regard to aspiration detection (Rao, 2002)
    - Cannot visualize oral structures, hyolaryngeal movement, base of tongue retraction, and the actual moment of swallow, all of which aids in clinical decision making

- Aspiration
  - Garon et al., 2009
  - 2,000 MBS completed
  - 51% aspirated
  - 55% of those who aspirated were SILENT aspirators
- Clinical signs
  - 74% accurate for detecting aspiration
    - Smith Hammond et al., 2009

Why MBS?

- Evidence Based Practice
  - Treatment should be based on best available evidence
    - Integration of
      - Clinical expertise
      - External best evidence
      - Patient/caregiver perspectives
- ASHA Preferred Practice Guidelines
  - The purpose of the MBS
    - Assess anatomy and physiology
    - Evaluate airway protection
    - Evaluate effectiveness of posture, maneuvers, strategies
    - Determine optimum delivery of nutrition/hydration
    - Determine therapeutic techniques
    - Gain information for collaboration

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**Clinical Utility** (Martin-Harris et al., 2000)
- Examination of 608 swallow studies
  - 10% “normal”
  - Aspiration in 32.4%
  - Swallow abnormality without aspiration 57.2%
  - Needed referral to specialist 26.3%
  - Strategies that improved swallow function 48.4%
  - Therapy recommended 37.2%
  - Changes in mode of intake 31.4%
  - Diet texture changes 43.8%

**Cost effectiveness**
- (Wilson and Rowe, 2012)
- Cost analysis of screening with MBS vs. BSE vs. both
- Cost of pneumonia treatment, quality of life years
- MBS is cost-effective and can save costs compared to BSE alone or combined

**Thickener cost**
- $200/month avg for thickened liquids
  - (Robbins et al., 2008)

**QOL**
- Making a decision for a patient that changes their QOL is a BIG DEAL! So make sure that you are sure!!

**Identifying Deficits During MBS**
- Poor oral manipulation and control
- Impaired A-P transfer
- Delay in swallow onset
  - Poor tongue base retraction
  - Incomplete hyoid/yoga excitation/excursion
- Inadequate pharyngeal contraction
- Disordered UES opening

**Oral Phase**
- Important to visualize as part of the MBS
  - Patient may appear outwardly to manipulate bolus appropriately, but during the MBS, SLPs can directly view the process

**Assess**
- Timing of mastication onset
- Adequacy of mastication
- Formation and cohesion of bolus
- Control of bolus
- Transfer of bolus

**Oral Phase**
- Inadequate Mastication
- Poor Bolus Formation
Oral Phase

—Strategy: Head back posture
- Use with patients with oral holding or poor A-P transfer
- Can be fully reclined, or semi-reclined
- Uses gravity to help in the transfer of the bolus
- Needs to be assessed during MBS, since it can increase the risk of aspiration with delayed airway closure
  - Can be combined with the supraglottic swallow to increase airway protection
  - (Logemann, 1998)

Oral Phase

—Strategy: 3 second prep
- Use with patients with poor oral control
- Patient is given a bolus, holds orally for 3 seconds, then is cued to swallow
- Many research studies have been completed comparing cued swallows vs. involuntary swallows (Nagy et al, 2013)
- Cued swallows have been shown to activate brain areas more widely (Michou & Hamdy, 2009)
  (Nonaka et al., 2009)
- Cued swallows have also been shown to decrease the frequency of bolus spillage to the pyriforms prior to swallow onset in healthy adults (Nagy)

Oral Phase

—Strategy: Dump & Swallow
- Use with patients with poor lingual control, impaired anterior to posterior transfer of bolus
- Instructions:
  - Hold breath tightly
    - While holding breath toss head back and dump liquid into throat all at once
    - Keep holding breath while swallowing 2-3 times or until liquid clears
    - COUGH to clear residue liquid.
- Also called the extended supraglottic
  - (Logemann, 1998)
  - Originally developed for patients with glossectomy

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Oral Phase
–Strategy: Cold Sour Bolus
› Adding a cold and sour stimuli to bolus can decrease oral transit time (Gatto et al. 2013)
› Shorten pharyngeal time (Logemann et al. 1995)
› Assess during MBS
  (Logemann, et al., 1995)
  (Gatto et al., 2010)

Oral Phase
–Strategy: Cold Sour Bolus

Oral Phase
–Strategy: Sensory Stimulation
› Used with patients with oral holding, impaired A–P transfer (Logemann et al., 1995)
  › Change in flavor (sour) (Logemann et al. 1995)
  › Change in texture (carbonation) (Bulow et al. 2003)
  › Change in temperature (cold) (Bisch et al. 1994)
  › Change in volume (Bisch et al. 1994)
  › Thermal–tactile stimulation (Kaatzke–McDonald et al. 1996)

Oral/Pharyngeal Phase
–Treatment
› Lingual Strengthening
  › Resistance exercises (Lazarus et al., 2003; Robbins et al., 2005, 2007)
  › Increasing effort with progression in therapy
    (Robbins et al., 2005, 2007)
› IOPi
  › Iowa Oral Performance Instrument
  › Increased oral swallowing pressures
  › Increased airway protection with liquids
    (Adams et al., 2013)
› Madison Oral Strengthening Therapeutic Device
  › MOST
  › Increased lingual strength, swallowing pressures
  › Increased airway protection
    (Coyle et al, ASHA, 2013)

Pharyngeal Phase
–Delay in Swallow Onset
› Generally, we expect to see onset of the swallow as the head of the bolus passes posterior angle of the mandible
› Variability throughout normal swallows, especially in older population.
  (Humbert et al, 2009)
  (Martin–Harris et al., 2007)
› Not necessarily a disordered swallow

Pharyngeal Phase
–Delayed swallow

Generally, we expect to see onset of the swallow as the head of the bolus passes posterior angle of the mandible
Pharyngeal Phase

- **Strategy: Chin down posture**
  - Useful for delayed swallow, since valleculae space is larger, as well as incomplete hyolaryngeal movement (Logemann, 1993)
  - Chin is tucked down to front of neck
  - Moves anterior pharyngeal structures posteriorly
  - Narrows the laryngeal vestibule
  - Decreases distance from the arytenoids to the epiglottis
  - Airway is more protected, since opening is more narrow

- Not always effective (Shanahan, Logemann et al., 1996; Nagaya et al., 2004; Terre et al., 2012)
- Weaker pharyngeal contractions (Bulow et al., 1999)
- Use of chin tuck can be ineffective or worsen severity of aspiration with patients with weak pharyngeal constrictor muscles
- Remember Baylow study! 50%!
**Pharyngeal Phase**

**Strategy: Supraglottic Swallow Maneuver**
- Use for delayed onset, incomplete airway closure
- Inhalation with breath hold at level of folds, swallow, cough on exhalation
- Closes the airway at the level of the true vocal folds before and during the swallow
  - (Logemann, 1983)

**Pharyngeal Phase**

**Treatment: Swallow Delay**
- Thermal tactile stimulation
  - Cold stimulation to anterior faucial pillars
  - Innervated by trigeminal and glossopharyngeal nerves
  - Increased cortical activity
  - Research ongoing to determine efficacy
    - (Teismann et al., 2009)
    - (Rosenbek et al., 1996)
    - (Rosenbek et al., 1998)
    - (Regan et al., 2010)
    - (Sciortino et al., 2003)

**Pharyngeal Phase**

**Reduced Tongue Base Retraction**
- Results in
  - residue in pharynx after swallow
  - Reduced airway closure

**Pharyngeal Phase**

**Strategy/Treatment: Effortful Swallow**
- Use with reduced base of tongue retraction
- Swallow and squeeze all your throat muscles
- Improves posterior tongue base movement
- Increased pharyngeal contraction
  - Hind et al, 2001
  - Huckabee et al., 2005
  - Kahrilas et al., 1991
**Pharyngeal Phase**

**-Treatment: Masako maneuver**
- Used for tongue base retraction as a compensatory exercise
- Hold tip of tongue between teeth and swallow
- Increases the strength and bulging of the pharyngeal constrictor muscles
- Increased BOT contact and pressure
- Compensatory for decreased base of tongue retraction

Logemann, ARKSHA, 2013

**Pharyngeal Phase**

**-Treatment: Base of tongue retraction**
- Tongue pull-back
  - Tongue retracted to posterior pharyngeal wall
  - Hold with effort
- Yawn
  - Pretend to yawn
  - Hold tongue at maximum for 1 second
- Gargle
  - Hold tongue at maximum retraction for 1 second
- NOT /K/ AND /G/ WORDS
  - Not the right movement of the tongue, this is not base of tongue retraction

Veis et al., 2000
Logemann, ASHA, 2013

**Pharyngeal Phase**

**-Incomplete Hyolaryngeal Movement**
- Results in
  - Incomplete airway closure
  - Residues in pharynx, especially pyriforms
  - Decreased movement of epiglottis

Logemann, 1993

**Pharyngeal Phase**

**-Strategy: Super-supraglottic swallow maneuver**
- Use with incomplete hyolaryngeal movement, incomplete airway closure
- Inhalation with breath hold at level of folds, bear down hard, swallow, cough with exhalation
- Improves closure of airway vestibule
- Tilts the arytenoids forward, so more narrow opening

**Pharyngeal Phase**

**-Strategy/Treatment: Mendelsohn Maneuver**
- Use with incomplete hyolaryngeal movement
- Hold your swallow when you feel it lift up, hold the squeeze for several seconds
- Increases extent and duration of hyolaryngeal elevation (Lazarus et al. 1993)
- Increases the width and duration of the opening of the UES (Cook et al., 1989)
- Can improve the overall coordination of the swallow (Lazarus et al. 1993)
**Pharyngeal Phase**

- **Strategy: Mendelsohn Maneuver**
  - Effortful swallow
  - Patient is instructed to swallow with effort
  - Increased elevation of hyoid at the initiation of swallow (Bulow et al. 1999)
  - Increased tongue base and pharyngeal wall pressure and length of contact increased (Lazarus et al. 2002)

- **Shaker exercise**
  - Patient to lie flat and keep their shoulders on the floor
  - Raise their head high enough to see their toes, maintaining this position for maximum 1 minute
  - Repeat this activity 3 times
  - Followed by 30 consecutive repetitions of the same action, perform this exercise 3 times per day for several weeks.
  - (Mepani, Shaker, 2009)

- **Pitch glides**
  - Ask patient to start with a low “ah” and glide up the scale to a high “ee”
  - Should be effortful
  - Higher pitch raises larynx
  - (Pearson, 2013)

- **EMST**
  - Expiratory Muscle Strength Training
  - Exhalation against pressure
  - Shown in healthy volunteers to improve
    - neuromuscular control of suprhyoid muscle
    - cough strength
    - pulmonary function
    - vocal loudness
  - (Wheeler et al. 2007; Troche et al. 2010; Pitts et al. 2008; Wingate et al. 2007; Chiara et al. 2006; Saleem et al. 2005)

**Pharyngeal Phase**

- **Unilateral Pharyngeal Weakness**
  - Frequently seen with strokes
  - Need an A–P view, or oblique view

**Pharyngeal Phase**

- **Strategy: Head turn posture**
  - Turn head to weaker side
  - Directs bolus to stronger side

- **Strategy: Head tilt posture**
  - Head is leaned to stronger side
  - Directs bolus to stronger side
**Pharyngeal Phase**
- **Impaired Pharyngeal Contraction**
  - Aids in clearing bolus from pharynx during swallow, so impaired pharyngeal contraction will result in pharyngeal residue after swallow
  - (Kahrilas et al., 1992)

**Pharyngeal Phase**
- **Treatment: Pharyngeal Contraction**
  - Masako
    - Tip of tongue held gently between teeth during a swallow
    - Not to be used WITH a bolus, as it can increase the risk of aspiration
    - A resistance exercise, as it increases the effort needed by the pharyngeal constrictor muscles during a swallow
    - (Fujiu & Logemann, 1996)
    - Used for poor tongue base retraction as a COMPENSATORY exercise
  - Effortful Swallow

**Pharyngeal Phase**
- **CP dysfunction**

**Pharyngeal Phase**
- **Treatment: CP dysfunction**
  - Shaker exercise
  - Mendelsohn
    - Prolongs the UES opening during swallowing by extending laryngeal elevation
    - (McCullough et al., 2012)

**Esophageal Phase**
- Important part of the swallow process
- Can present at bedside as a oropharyngeal dysphagia
  - Ex: Cough after swallow–residues v. retrograde flow
- Esophageal dysfunction can be a result of reduced motility or obstruction
  - Motility–Ex. Achalasia, GERD
  - Obstruction–Ex. Esophagitis, Web

**Esophageal Phase**
- **Motility**
Esophageal Phase
- Obstruction

Esophageal Phase
- Treatment
  > Nope! Not our scope of practice

Why MBS?

Why MBS?
References