

The Normal Swallow: Is It Really What You Think It Is?

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Disclosures

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What is normal?: Oral

- Oral tongue under voluntary control
 - Manipulates bolus in mouth for chewing
 - Senses volume and viscosity
 - Subdivides food as needed
 - Seals against lateral and anterior alveolar ridge
 - Propels bolus posteriorly
 - Upward movement of midline
 - Keeping pressure against tail of bolus
 - Bolus is cleared from oral cavity

Logeman, 1983

What is normal?: Pharyngeal

- Moves into involuntary control
 - Soft palate elevates
 - Laryngeal elevation
 - Hyoid excursion
 - Laryngeal vestibule closure
 - Pharyngeal stripping wave
 - Pharyngeal contraction
 - PES opening
 - Full BOT retraction
 - Clearance of bolus through PES

Martin-Harris et al, 2008

What is normal?: Esophageal

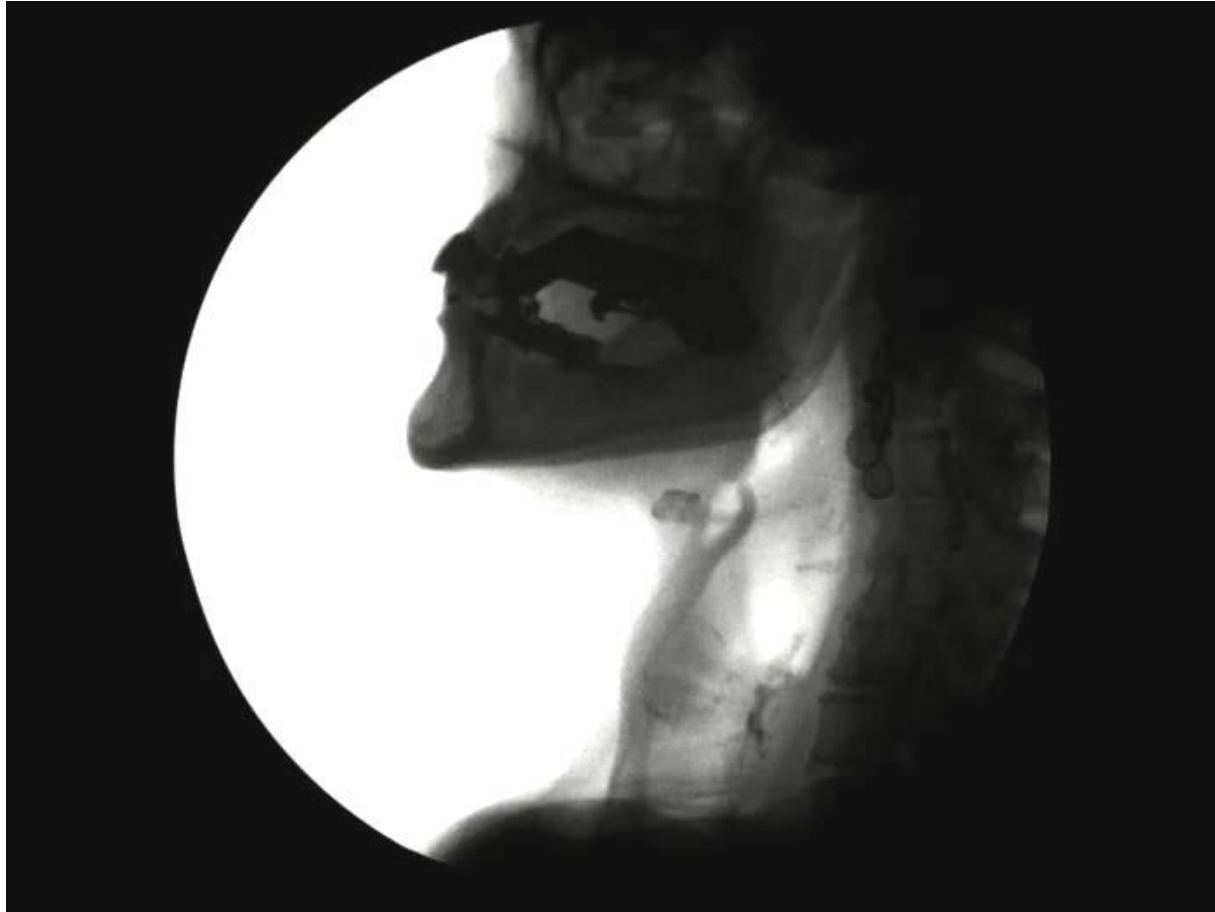
- Involuntary (except for the extremely talented)
 - Relaxation of esophagus and LES
 - Peristaltic contraction
 - Bolus cleared into stomach by gravity and contraction

Goyal, 2006

What is disordered?

- “A disruption to the normal functioning”
 - Oxford dictionary

The perfect patient



Normal?: Test your skill!



Variations on normal?

- Can vary with:
 - Age
 - Structural changes
 - Congenital conditions
 - Acquired conditions

Age Related Variations

- Increased time through all phases of swallow
 - Oral:
 - Slower bolus formation
 - Longer transfer
 - Pharyngeal:
 - Increased time of bolus in pharynx prior to swallow
 - Increased time of maximum hyolaryngeal excursion
 - Pharyngoesophageal:
 - Increased time for UES relaxation
 - Esophageal
 - Slower clear
- Reaction time to sensory stimuli increases

Tracey, Logemann 1989; Shaw et al, 1990/1995; Robbins et al, 1992; Soergel, 1964

Age Related Variations

- Sarcopenia
 - Age related loss of loss of muscle mass, organization and strength (Robbins et al, 2006)
- Reduced strength in swallowing mechanisms
 - Reduced isometric tongue pressure
 - Atrophy of the pharyngeal muscles
 - Increase in pharyngeal residues
 - Decrease in amplitude of peristaltic waves in esophagus, decreased pressure in LES and UES
- **SWALLOWING IS SUBMAXIMAL**

Age Related Variations

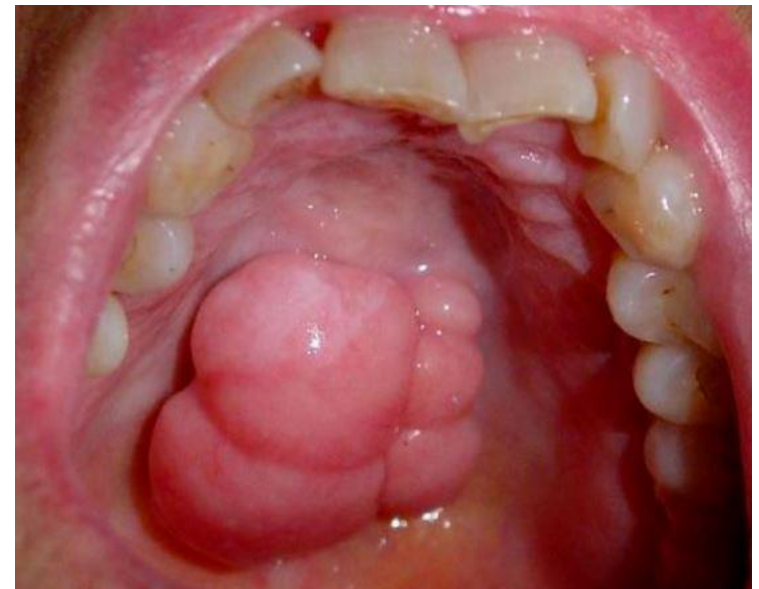
- Decreased functional reserve
 - Our ability to adapt to stress
 - Illness
 - Changes in structures
 - Changes in activity level
 - When faced with acute illness, certain medications, etc can be more prone to dysphagia

Structure Related Variations

- Certain structures can change “normal” swallow patterns
- Apples vs Oranges?

Structure Related Variations: Torus Palatine

- Bony protrusion on palate
 - Midline
 - Fairly common
- Increases oral phase time and coordination
- Can increase in size with age



Neville et al., 2002

Structure Related Variations: Dentition

- Full dentures=Normal dentition?
 - More muscle activity
 - Larger bolus particles
 - Mastication in denture wearers near to mastication of people with neuro impairment Woda et al, 2006
- Longer deglutition
 - Increased time for total swallow in edentulous normal
 - Gokce et al, 2012

Aortic Arch

- Aortic arch snug against esophagus
- Just below the clavicle
- Slow down of bolus at this impingement
- Can increase with age
- Also the area of lowest amplitude of peristaltic wave

Human Related Variations

- Differences in “normal”
- Normal vs Perfect
- What is normal for YOU??

Human Related Variations: Mastication

- How do you assess mastication?
 - Time? Strokes? Pattern?
 - Clinically vs Instrumentally
- Time, pattern, strokes wide variability
 - More consistent is granularity of bolus
 - Mishellany et al, 2006
- Influencing factors
 - Salivary flow
 - Bolus type, size

Human Related Variations: Piecemeal Deglutition

- Multiple swallows per bolus
- Normal
 - Dziadziola, 1992
 - Incidence of multiple swallows per bite across disordered and normal for liquids and paste
 - Ertekin, 1996
 - Seen in normal in bolus size larger than 20 mL

Human Related Variations: Premature Spillage

- Normal
 - Saitoh, 2007
 - accumulation of solid bolus into pyriforms
 - One subject with bolus in pyriforms for 14 seconds
 - Stephen et al, 2005
 - distance between head of bolus and tongue base/ramus intersection varied from 47.4 mm above to 34.9mm below among subjects
 - within subjects varied 25.8 above to 15.5 below
 - Mendel, Logemann, 2007
 - 100 normal subjects
 - Timing in relation to UES opening
 - Wide variability with volume, consistency and age

Premature Spillage

- Premature? Spillage?
 - Implications of terminology
 - Passive loss vs Active propulsion
- Disordered
 - Impaired bolus containment/control
 - Delayed pharyngeal onset

Penetration

- 2010 Allen et al: Penetration found in 11% normal
 - 9.3% under 65 years; 14.3% over 65 years
 - More likely with liquids, more likely with larger bolus size
- 2007 Dagget et al: Penetration found in normal
 - 7.4% of swallows under 50; 16.8% swallows over 50
 - No sensorimotor response to penetration
- 1999 Robbins et al: Normal vs abnormal penetration
 - All penetration in “normal” group: 2 or 3 on PAS
 - No scores of 4 or 5 in the healthy group

Aspiration

- Normal?

- Robbins et al, 1999

- During development of PAS
 - Normal subjects with worse PAS score on first swallow of new condition
 - Normal subject with aspiration

- Butler et al, 2009

- Normal subjects with aspiration
 - 3% of 545 swallows resulted in aspiration

Aspiration

- Normal?

- Sleep studies

- Gleeson et al, 1997

- Found aspiration of secretions during sleep in healthy normal

- Huxley et al, 1978

- Aspiration in 45% of normals during sleep
 - Non-aspirators slept poorly

Condition Related Variations

- Apples vs Oranges?
- Normal vs Perfect

Down's Syndrome

- Oral anatomical differences
 - Macroglossia, small oral cavity, hypotonia, hypersensitivity
 - No correlation between severity of oral differences and aspiration
 - (Frazier, Freedman, 1996)
 - Oral phase dysphagia
 - 63%
 - Not a predictor of pharyngeal dysphagia, aspiration
 - Jackson et al, 2016
- Higher incidence of digestive disorders

Dementia

- Motor and sensory changes
- Oral holding/pocketing
- Anterior oral bolus loss
- Longer length of time in pharynx prior to swallow onset
- Age related changes?

Easterling & Robbins, 2008

ALS

- Anterior oral bolus loss
- Difficulty with bolus formation/transfer
- Slowed initiation of pharyngeal phase
- Increased meal duration
- Fatigue with meal progression

The ALS Association. Criteria for diagnosis of ALS. www.alsa.org

Parkinson's

- Prolonged oral transfer
- Increased tongue movement
- Prolonged oropharyngeal transit
- Decreased sensation
 - Silent aspiration
- Slowed clear through esophagus and LES
- Slowed return to pre-swallow position

Bushmann et al, 1989; Johnston et al, 1995; Leopold & Kagel, 1997;

Normal or Disordered????

- Think critically about your patient
- ASHA Preferred Practice Guidelines
 - Swallow assessment should include description of **normal and abnormal** structures and physiology
- ASHA Training Guidelines for assessment
 - VFSS: Identification of normal and abnormal anatomy and physiology
 - FEES: Identification of viewable normal and abnormal anatomy and physiology
 - Clinical: Knowledge of normal and abnormal anatomy and physiology

Normal or Disordered???

- What other clues??
 - Lung status
 - Patient QOL
 - Dental status
 - History
 - Nutritional status/hydration
 - Weight maintenance
 - PO intake
 - Co-morbidities
 - Cognitive status
 - Mobility

Ethical Considerations

- ASHA: Evidence Based Practice

- Integration of

- Clinical expertise
 - External scientific evidence
 - Patient values/preferences

- Medical Necessity

- Medicare defines:

- Service that is reasonable and necessary for the diagnosis or treatment of an illness or injury, or to improve the functioning of a malformed body member.

In Conclusion:

- Think critically about the whole patient
- Swallowing: It's complicated
- What is risk?
- What are we trying to save our patients from?

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