Compensation and Decompensation of Swallowing Function in Adults with Neurogenic Dysphagia

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The Normal Swallow

- A highly integrated and complex set of behaviors
- Usually divided into three phases:
  - Oral phase
    - Preparation (mastication)
    - Transfer of the bolus into the pharynx
  - Pharyngeal phase
    - Transport of the bolus past the larynx and through the upper esophageal sphincter in to the esophagus
  - Esophageal phase
    - Transport of the bolus through the lower esophageal sphincter into the stomach
- Constantly changing to accommodate changing demands on the system

Bass, 1997

Neurogenic dysphagia

- Defined as swallowing impairment resulting from neurologic disease
- It is much more common for neurologic disease to impair the oral and pharyngeal phases of swallowing than the esophageal phase

Buchholz, 1994

Adjustments to the swallowing process

- Adaptation
  - The ability to adjust the normal swallow to constantly changing variables, such as:
    - Consistency, viscosity, volume, temperature of the bolus
    - Changing head and neck postures
- Compensation
  - Adjustment or alteration to an impaired swallow
  - There are two types of compensation

Buchholz, Bosma, & Donner, 1985; Bass, 1990

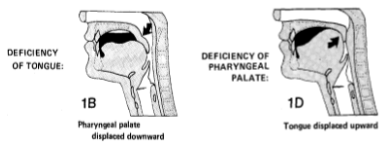
Types of compensation

- Voluntary compensation
  - Conscious choices made by patients to make swallowing easier, may include:
    - Smooth textures
    - Smaller bites/bolus size
    - Chewing food more thoroughly
    - Swallowing strategies such as
      - Head turn/tilt
      - Multiple swallows
      - Neck pressure
- Involuntary compensation
  - Adjustments to the swallowing process made without conscious choice
  - Often cannot be readily observed by the patient, clinician, or caregivers without radiologic evaluation

Buchholz, 1987b; Buchholz et al., 1985; Bass, 1990; Bass, 1997

Patterns of Involuntary Compensation:

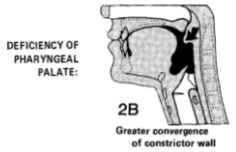
- Deficiency of the tongue (e.g. atrophy, weakness) may be compensated by downward displacement of the palate and, conversely, palatal deficiency may be compensated by upward displacement of the tongue



Buchholz et al., 1985, p. 236

Patterns of Involuntary Compensation (cont.):

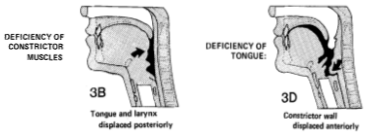
- Deficiency of the pharyngeal palate may be compensated by greater convergence of the pharyngeal constrictor muscles



Buchholz et al., 1985, p. 236

Patterns of Involuntary Compensation (cont.):

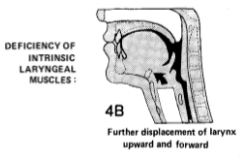
- Deficiency of the constrictor muscles may be compensated by exaggerated upward and posteriorward displacement of the tongue and larynx. Deficiency of the tongue in bolus compression may be compensated by anterior displacement of the constrictor wall



Buchholz et al., 1985, p. 237

Patterns of Involuntary Compensation (cont.):

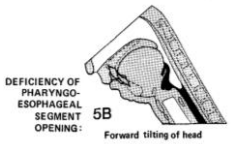
- Deficiency of epiglottic tilting or glottic closure may be compensated by increased upward and anteriorward displacement of the larynx.



Buchholz et al., 1985, p. 237

Patterns of Involuntary Compensation (cont.):

- Deficiency of laryngeal displacement in contributing to opening of the pharyngoesophageal segment may be compensated by forward tilting of the head and forward thrusting of the jaw



Buchholz et al., 1985, p. 237

Neuroplastic Compensation

- Neuroplasticity is the "ability of the central nervous system to alter itself morphologically or functionally as a result of experience" (Martin, 2008, p. 208)
- Recent studies using magnetoencephalography (MEG) to look at hemispheric lateralization during volitional swallowing showed significant differences in cortical activation between study participants with Kennedy Disease and normal controls
  - The control group showed primary activation in the motor cortex of the left hemisphere during the oral phase of swallowing
  - The patient group showed an early, large, and persisting right-hemisphere dominance for activation during swallowing (Dziewas et al., 2009)

Decompensation

- When compensation is no longer sufficient to overcome the deficiency in the swallowing process, **decompensation** occurs

Possible Causes of Decompensation

- Underlying neurogenic disease may progress past the point where compensation is effective
  - Postpolio syndrome
  - Parkinson's disease
  - ALS
- A patient with compensated dysphagia due to a previous stroke/CVA may suffer a second lesion that causes decompensation

Bass, 1997; Bird et al., 1994; Buchholz & Jones, 1991; Jones, Buchholz, Ravich, & Donner, 1992; Miller et al., 2006; Higo, Tayama, & Nito, 2004; Kawai et al., 2003; Miller, Noble, Jones, & Burn, 2006; Nilsson, Ekberg, Olsson, & Hindfelt, 1998; Perry & McLaren, 2007

Possible Causes of Decompensation (cont.):

- Multifactorial causes
  - Decompensation may occur when multiple causes of impaired swallowing combine, even though any one alone might be successfully compensated
- Some of the changes associated with aging may also contribute to decompensation, such as:
  - Loss of teeth
  - Muscle weakness

Buchholz, 1994; Buchholz & Jones, 1991; Ekberg & Wahlgren, 1995;

Conclusion

- This discussion is intended to explain the difference between adaptation, compensation, and decompensation, and to demonstrate now patterns of compensation and decompensation can impact a patient's swallowing function.
- Clinicians who deal with patients with neurogenic dysphagia need to be aware of these patterns in order to effectively monitor and treat their clients.
- Swallowing is a physiological process, but eating is a social activity, and compensatory processes facilitate the social aspect of eating as much as they facilitate safe swallowing.

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