An Overview of Dysphagia in the Stroke Population

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Dysphagia Outline

- Normal Swallowing
- Neuroanatomy of Swallowing
- Evaluation of Dysphagia in Stroke
- Evidence-based Treatment of Dysphagia
  - Compensatory strategies
  - Rehabilitative intervention

Phases of Swallowing

- Oral Stage
  - 1-1.5 s
- Pharyngeal Stage
  - 1 s
- Esophageal Stage
  - 8-20 s
  - Extends from the UES to the LES

Oral Stage of Swallowing

- Extends from the lips to the angle of mandible
- Divided into 2 phases
  - Oral preparatory
  - Oral transport

Pharyngeal Stage of Swallowing

- Extends from the angle of the mandible to the upper esophageal sphincter (UES)
  - Onset of the pharyngeal swallow
  - Velopharyngeal closure
  - Laryngeal closure
  - Movement of the hyoid and larynx (anterior, superior)
  - UES opening
  - Tongue base retraction
  - Contraction of the pharyngeal constrictors

Proposed Neural Network of Swallowing

Daniels SK & Huckabee ML (2008). Dysphagia Following Stroke
Dysphagia in CNS Disorders: Demographics

- Neurogenic dysphagia: >500,000 worldwide
- Occurs in ~55% of acute stroke patients
- 40% demonstrate aspiration on instrumental exam
- 40%-70% demonstrate silent aspiration
- Oral, pharyngeal, and esophageal stages of swallowing may be affected in patients with neurologic diseases

Screening of Dysphagia in Stroke

- Swallowing involves a distributed neural network
- High % acute stroke patients are at risk for dysphagia and aspiration
- Need for rapid administration of aspirin in acute stroke
- Swallowing should be screened in all acute stroke patients and other critical populations
  - Nursing?
  - SLP

Screening of Dysphagia in Stroke

- TOR-Bsst® (Martino et al., 2009)
  - Only validated screening available
  - Validated only in stroke patients
    - Administered by nursing
    - Involves assessment of vocal quality, tongue symmetry, and water swallows
    - Can take up to 10 minutes to administer
    - Requires 4 hours of training

Screening of Dysphagia in Stroke

- TOR-Bsst® (Martino et al., 2009)
  - If fail any single item, screening is stopped and patient is NPO until SLP evaluation
  - If pass entire test, oral intake is initiated
- Feasibility is questioned and concerns about non-SLPs administering water
- Is an observational screening equally valid?
- If not, is SLP screening of all patients or select populations feasible?

Clinical Swallowing Examination

- Goals:
  - Identification of patients warranting instrumental examination
  - Develop hypotheses of etiology of dysphagia
  - Development thoughts management program
  - Cannot base management on results of the CSE

Clinical Swallowing Examination

- Focus:
  - History and patient interview
  - Assessment of cognition and communication
  - Cranial nerve examination
  - Swallowing
    - Cannot identify pathophysiology
    - (risk of missing silent aspiration)
**Instrumental Evaluation**

**Purpose**
- Evaluate biomechanical and physiologic function and dysfunction
- Determine swallowing safety
- Identify effects of compensatory strategies and maneuvers on swallowing
- Determine appropriate diet

**Videofluoroscopic Swallow Study**

**Advantages of VFSS**
- Allows for direct assessment of oral cavity, pharynx, and esophagus
- Can evaluate what is occurring during the swallow without need to infer
- Radiation exposure—limits time
- Difficulty positioning patient
- Taste/texture of barium

**Disadvantages of VFSS**
- Radiation exposure—limits time
- Difficulty positioning patient
- Taste/texture of barium

**Instrumental Evaluation: VFSS**

**Discrete Swallow**
- Single swallow
- 5 ml, self-regulated cup-sip, semi-solid, mastication
- 2 to 3 trials per volume/consistency

**Sequential Swallow**
- Continuous swallows without pause

**Effects of compensatory strategies**

**VFSS-Interpretation**

**Anatomic abnormalities**
- Cervical osteophyte
- Zenker’s diverticulum
- Mass

**Bolus flow**
- Timing
- Direction—laryngeal penetration, aspiration
- Clearance

**Structural movement—spatial, temporal**
- Velar elevation
- Hyolaryngeal elevation
- Base of tongue retraction
- Laryngeal closure
- UES opening

**Response to compensatory strategy**

**Treatment plan**
Swallowing Treatment

- Swallowing is a patterned response
- Amenable to treatment

Goals of management:
- Rehabilitation of dysfunction
- Prevention of aspiration, dehydration, and malnutrition
- Re-establishment of oral intake

RCT (Carnaby et al., 2006)
- Swallowing treatment significantly associated:
  - Obtaining functional swallowing
  - Reduced dysphagia-related medical complications
- High-intensity treatment significantly associated with return to normal diet, functional swallow, and ↓ chest infection as compared to usual care and low-intensity treatments

Compensatory Strategy
- Benefits are immediate, not permanent
- Aimed to secure safe and adequate oral intake

Rehabilitative Treatment
- Alter swallowing physiology
- Permanent improvement

Not always a clear distinction between the two

Compensatory Strategies
- Posture
- Sensory enhancement
- ↑ volitional control of oral transfer
- Bolus modification
Swallowing Treatment: Compensatory

- **Posture**
  - Chin Tuck (Welch et al., 1993)
    - Laryngeal surface of epiglottis closer to PPW
    - Narrows entrance to airway
  - Chin Tuck (Shanahan et al., 1993)
    - ↓ aspiration for preswallow pooling to level of the valleculae
    - No ↓ in aspiration with preswallow pooling to level of the pyriform sinuses

Swallowing Treatment: Compensatory

- **Changing Consistency**
  - Thickened liquids—Clinical Trial (Logemann et al., 2008)
    - Immediate effects
      - ↓ aspiration w/ honey thick as compared to nectar thick and thin liquid w/ chin tuck posture
    - Over ½ participants continued to aspirate with compensatory strategy
    - Patient satisfaction: posture>nectar>honey

Swallowing Treatment: Rehabilitative

- **Lingual Strengthening**
  - Lingual resistance (Robbins et al., 2005, 2007)
    - Compressing air-filled bulb between tongue and hard palate
    - Dose: 30 reps, 3X/day, 3days/week for 8-weeks
      - ↑ tongue volume
      - ↑ isometric and swallowing pressures
      - ↓ oral transfer time
      - ↓ Penetration-Aspiration Scale score

Swallowing Treatment: Rehabilitative

- **Head-Lift Exercise (Shaker Exercise)**
  - Designed to increase upper esophageal sphincter (UES) opening by targeting anterior hyoid movement
  - Use with patients with pyriform sinus postswallow residual due to UES opening caused by ↓ anterior hyoid movement (Shaker et al., 1997)
  - Evaluated in heterogeneous group with chronic dysphagia and tube feeding—all had postswallow hypopharyngeal residual with aspiration (Shaker et al., 2002)
    - ↑ anterior laryngeal movement
    - ↑ UES opening
    - ↓ postswallow aspiration
    - All individuals resumed oral intake
  - Designed to be performed independently, but compliance issues—have patients return for follow-ups to check on progress (Easterling et al., 2005)

Swallowing Treatment: Rehabilitative

- **Neuromuscular Electrical Stimulation (NMES)** (Ludlow DRS 2008)
  - With intramuscular stimulation, can target specific muscles
  - With transcutaneous electrode, stimulate superficial muscles, difficult to target specific deep muscles
Swallowing Treatment: Rehabilitation

- Transcutaneous NMES: VitalStim
  - Review of research 2006 and prior (Huckabee & Doeltgen, 2007)
  - "Studies using non-blinded subjective outcome measures based on non-validated rating scales reported potential success of VitalStim treatment."
  - "If blinded and more objective measures were used, no positive effect was reported."

Rehabilitation

Swallowing Treatment: Rehabilitation

- Transcutaneous NMES (VitalStim)
  - Adults w/ chronic neurogenic dysphagia
  - 5 ml VFSS swallows w/o NMES, low NMES, max NMES
  - Significant hyoid descent at rest
  - In preswallow pooling and aspiration w/ low NMES in patients who could overcome depression by volitional elevation

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Swallowing Treatment: Rehabilitation

- Transcutaneous NMES (VitalStim)
  - Adults w/ chronic dysphagia
  - 15 1-hour sessions (5 days/week for 3 weeks)
  - VitalStim paired with swallow hard and fast
  - Pre- and post-TX VFSS-no significant change in physiologic measures, but significant changes in functional measures
  - Was it the VitalStim, mass practice or combination of the two that produced results?

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Swallowing Treatment: Neuroplastic Effects

Peripheral Electrical Stimulation

- Fraser et al. 2002
  - N = 16 acute stroke patients with dysphagia
  - Randomized to stimulation or sham
  - 5 Hz, 75% max tolerated stimulation, 10 minutes
  - Videofluoroscopic swallow study (VFSS) pre- and post-stimulation/sham

Results

- ↑ excitability of response in contralesional hemisphere
- Significant change in temporal and airway invasion measures post-stimulation for the stimulation group