THE SPEECH MENTOR
Survival Guide for the Speech Pathology Student

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DIAGNOSIS & MANAGEMENT OF SWALLOWING STUDY PACKET

CONCEPTS COVERED INCLUDE:

- BASIC PRINCIPLES & ANATOMY
- ANATOMY & PHYSIOLOGY OF NORMAL DEGLUTITION
- DISORDERS OF DEGLUTITION (SIGNS & SYMPTOMS & NEUROLOGIC DISEASE)
Swallowing Study Guide 1

I. Definition of Dysphagia: difficulty moving food from mouth to stomach.
   a. 6% incidence (# of new cases in a population over a period of time)
   b. 22% prevalence >50 years (% of population with dysphagia at a certain time)

II. Signs vs. Symptoms
   a. Sign: What clinician identifies/observes (i.e. reduced laryngeal elevation)
   b. Symptom: What a patient reports (i.e. shivering chills)

<table>
<thead>
<tr>
<th>III. Dysphagia: difficulty moving food from mouth to stomach</th>
<th>IV. Deglutition: Swallowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. Aspiration: bolus falls below the vocal folds.</td>
<td>VI. Penetration: bolus enters the larynx; stops at level of vocal folds.</td>
</tr>
<tr>
<td>VII. Bolus: bite of food/sip of liquid</td>
<td>VIII. Masticate: to chew</td>
</tr>
<tr>
<td>IX. Residue: Food/liquid left over after a swallow.</td>
<td>X. Pneumonia: disease resulting from food getting into the lungs and hosting bacteria.</td>
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XI. Complications of Dysphagia
   a. Pneumonia
   b. Malnutrition
   c. Dehydration
   d. Depression
   e. Social Restriction
   f. Anxiety
   g. Developmental deficits

XII. Signs & Symptoms of Dysphagia
   a. Inability to recognize food
   b. Difficulty in putting food in mouth
   c. Inability to control food/saliva in mouth
d. Frequent coughing toward end or after meal
e. Weight loss
f. Gurgling vocal quality
g. Patient complains of swallowing difficulty
h. Runny Nose (rhinorrhea)
i. Sneezing
j. Residue observed in mouth

XIII. Anatomy Review: Memorize these structures (labeling)
b. Pyriform sinuses are formed by the overlay of the inferior constrictor muscle and the thyroid cartilage.

The vallecula is formed by the base of the tongue and the epiglottis.
d.

e. The 3 Constrictors: Superior, Medial & Inferior
   i. Bulge down with base of tongue to squeeze down bolus

f. Pharyngoesophageal Segment (PES)
   i. AKA Cricopharyngeal m., Upper Esophageal Sphincter (UES) OR Cricopharyngeal CP region. PES=UES=CP
   ii. CLOSED (tonic state) when at rest. RELAXES for bolus when active
   iii. Prevents backflow of food and air from entering esophagus

g. Esophagus: collapsed muscular tube
   i. Bordered by UES and Lower esophageal sphincter (LES)
   ii. Sits behind trachea in front of C6

h. Significant Spaces
   i. Oral Cavity, Pharynx,
   ii. Larynx: ACTS AS A VALVE
       1. Keeps air in lungs
       2. Keeps food out of lungs
3. Expels foreign substance from larynx/trachea
4. **Located C3-C6**
5. Borders
   a. Anterior=Epiglottis
   b. Lateral=aryepiglottic folds & arytenoids
   c. Inferior= vocal folds
iii. Lateral Sulcus: space between cheeks and gum
iv. Anterior Sulcus: space between bottom lip & teeth
v. Valleculae: base of tongue + superior portion of epiglottis
vi. Pyriform Sinuses: space between arytenoids and posterior pharyngeal wall.
vii. Aditus: Opening to the larynx aka laryngeal vestibule
viii. Ventricles: (2) space between false & true vocal folds
ix. Glottis: space between vocal folds
i. Salivary Glands
   i. Parotid
   ii. Submandibular
   iii. Sublingual
j. Role of Saliva
   i. Neutralize stomach acid
   ii. Prevent tooth decay
   iii. Aid in digestion
   iv. Facilitate taste
   v. Contribute to cohesion of the bolus
   vi. Helps clear residue

**XIV. Physiology of the Normal Swallow**
a. Oral Prep Phase (voluntary)
   i. Sensory recognition of food approaching mouth and being placed into mouth
   ii. Labial seal retains food in mouth
   iii. If it’s a liquid...
      1. Bolus is held between tongue and ant. Hard palate.
      2. Sides of tongue seal against lateral alveolus
      3. Tipper: bolus held between midline of tongue and hard palate with tongue tip elevate and touching alv. Ridge
4. Dipper: bolus is held on floor of the mouth in front of the tongue

iv. If it's solid food....
   1. The tongue transports the food to the surface of the molars where it is crushed in a rotary fashion.
   2. The action stimulates the saliva glands whose secretions lubricate the bolus for easier transport and enhance its shape.
      a. Bolus viscosity dictates the amount of mastication necessary.

b. Oral Phase (voluntary) 1-1.5 seconds
   i. Initiated when tongue beings to move bolus posteriorly
      1. "Stripping action": midline of tongue sequentially squeezes bolus posteriorly against hard palate.
   ii. Moves the readied bolus to the point where the swallow response is triggered. The tongue moves the bolus posteriorly as its edges make contact with the hard palate.
   iii. The amount of pressure behind the bolus increases as it moves toward the pharynx (an area of lower pressure).
   iv. The velum also elevates to seal the off nasopharynx, thus preventing nasal regurgitation.
   v. The vallecular spaces split the bolus into half and it travels down the lateral channels.

c. Pharyngeal Phase (involuntary)
   i. Begins after the head of the bolus passes between the anterior faucial pillars.
      1. Which sends sensory information to the nucleus ambiguous and triggers the pharyngeal swallow response.
   ii. The pharyngeal swallow causes the velum to elevate and retract and results in closure of the velopharyngeal port.
      1. This closure increases the pressure behind the bolus.
      2. The base of the tongue acts as a ramp and makes contact with the posterior pharyngeal wall in order to pass the bolus into the pharynx.
3. Hyoid and larynx elevate and move anteriorly
4. Larynx closes
5. Cricopharyngeal sphincter opens
d. **Esophageal Phase (involuntary) 3–20 seconds**
   i. The esophageal phase is signaled by the bolus entering the UES.
   ii. Subsequently, the esophagus’ contractions result in a sequential pushing of the bolus downward (known as the peristaltic wave).
   iii. This continues until the bolus reaches the lower esophageal sphincter, which responds by opening and permitting the bolus to enter the stomach

**XV. 5 levels of Airway protection**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Location</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>True &amp; False Vocal folds</td>
<td>Larynx</td>
<td>Closes airway by adducting</td>
</tr>
<tr>
<td>Hyoid Bone with attached Larynx</td>
<td>Larynx</td>
<td>Elevates and moves anteriorly</td>
</tr>
<tr>
<td>Epiglottis &amp; arytenoids</td>
<td>Larynx</td>
<td>Hyolaryngeal excursion causes epiglottis to invert. Arytenoids rock inward &amp; forward to narrow space in vestibule</td>
</tr>
<tr>
<td>Vallecular spaces</td>
<td>Oropharynx</td>
<td>Split bolus and direct down lateral channels</td>
</tr>
</tbody>
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**XVI. Hyolaryngeal Excursion**

a. Upward & forward pull of hyoid & larynx (superior, anterior)
b. Enlarges pharynx; helps close larynx
c. Creates vacuum in hypolarynx pulling bolus downward
d. Helps PE segment relax

**XVII. 3 Mechanisms contributing to PES opening**

a. Central Nervous System reacts to pharyngeal contraction by relaxing it.
b. Mechanical traction (pulling) from laryngeal excursion
c. Edge of bolus reaches top of CP segment and adds downward pressure causing the opening to widen.

**BOLUS MOVEMENT IN TERMS OF PRESSURE**

- Sip is taken into mouth, lips are sealed (closed valve)
- Bolus is formed by tongue and hard palate
- Palate is down, contacting BOT (closed valve)
- Tongue begins to push bolus back (pressing tongue against palate creating + pressure behind the bolus)
- Laryngeal elevation begins to occur, resulting in drop in pressure (-) as space in pharynx increases, drawing bolus down
- Larynx closes off, Pharyngeal constrictors are contracting from top to bottom, squeezing bolus ahead of it by placing + pressure behind the bolus
- UES opens (- pressure) and draws bolus into esophagus

**POSTIVE pressure is always behind the bolus; NEGATIVE pressure is always in front. Bolus naturally wants to move from place of higher pressure to lower pressure***

**Cranial Nerves Involved in Swallowing**

<table>
<thead>
<tr>
<th>NERVE?</th>
<th>FUNCTION?</th>
<th>What’s affected if it’s impaired?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN V. Trigeminal</td>
<td>Chewing Muscles, Velum, Muscles that power Hyolaryngeal excursion (infrahyoids), Touch, pressure &amp; temp from anterior 2/3 of tongue, Sensory info from face, mouth and mandible</td>
<td>Oral prep phase -Issues chewing -Mechanics of chewing stimulate salivary gland -Won’t feel anything at the front 2/3 of tongue Oral Phase -Velum doesn’t raise up=nasal regurgitation Pharyngeal Phase -impaired hyolaryngeal excursion</td>
</tr>
<tr>
<td><strong>CN. VII Facial</strong></td>
<td>Labial muscles (seal and take a bite)</td>
<td>Oral prep phase</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------</td>
<td>-----------------</td>
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<tr>
<td>Buccal Muscles</td>
<td>Taste from anterior 2/3 of tongue</td>
<td>- Flaccid cheek= residue in lateral sulcus</td>
</tr>
<tr>
<td></td>
<td>2 salivary glands (sublingual &amp; submandibular)</td>
<td>- Poor labial seal=leakage &amp; no intraoral pressure to help drive bolus back</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oral phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Little/no saliva= poor bolus cohesion; dry mouth with lots of residue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No taste to front 2/3 of tongue</td>
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<thead>
<tr>
<th><strong>CN. IX Glossopharyngeal</strong></th>
<th>Helps with Constrictors</th>
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<tbody>
<tr>
<td></td>
<td>All sensation of post. 1/3 of tongue</td>
</tr>
<tr>
<td></td>
<td>Touch &amp; temp in oropharynx</td>
</tr>
<tr>
<td></td>
<td>1 salivary gland (parotid)</td>
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<table>
<thead>
<tr>
<th><strong>CN X. Vagus</strong></th>
<th>Muscles in larynx &amp; pharynx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharyngeal Constrictors</td>
<td>Limited or insufficient pharyngeal constriction</td>
</tr>
<tr>
<td>Intrinsic Laryngeal</td>
<td>Limited or insufficient vf adduction= increased chance of aspiration</td>
</tr>
<tr>
<td>Sensory portion of trachea, pharynx, larynx &amp; esophagus</td>
<td>Impaired sensation to major structures= NO COUGH REFLEX</td>
</tr>
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<thead>
<tr>
<th><strong>CN XI. Accessory (cranial branch)</strong></th>
<th>Depresses velum</th>
</tr>
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<tbody>
<tr>
<td>Innervates sup.</td>
<td>Velum wont depress &amp; make contact with BOT= liquid bolus doesn’t stay in mouth=aspiration on thin liquids</td>
</tr>
<tr>
<td>Pharyngeal constrictor</td>
<td>Impaired pharyngeal constriction</td>
</tr>
<tr>
<td>Helps CX with muscles</td>
<td></td>
</tr>
</tbody>
</table>
CN XII.
Hypoglossal

Extrinsic & Intrinsic lingual muscles
No “stripping action”
Tongue won’t move bolus posteriorly to next phase
Lack of bolus manipulation=sensory info being sent

I. Components of the Swallowing Center
   a. Nucleus Tractus Solitarus
      i. Integrates sensory info on touch, taste and temp
      ii. Receives afferent info from cranial nerves
      iii. Communicates it to Nucleus Ambiguous
   b. Nucleus Ambiguous
      i. Sends efferent info to cranial nerves
      ii. Sends signal

II. Characteristics of Neurologic Injuries
   a. Reduced Sensitivity to aspiration
   b. Fatigue impacts performance

III. Sudden Onset Neurologic Injuries
   i. CVA Hemispheric
      1. Sensory loss in pharynx
      2. Reduced saliva
      3. Reduced pharyngeal contraction
      4. PES dysfunction
      5. Impaired LES relax
   ii. CVA-Brainstem
      1. Severe delay in pharyngeal swallow
      2. Reduced hyolaryngeal, oropharyngeal excursion
      3. Decreased CP opening
   iii. Spinal Cord Injury:
      1. Pharyngeal dysphagia (typically)
         a. Delay in pharyngeal swallow trigger
         b. Reduced laryngeal excursion
         c. Reduced BOT motion
         d. Reduced laryngeal closure
   iv. TBI
      1. Dysphagia occurs due to neurologic damage
2. Physical trauma to head/neck
3. Delay in pharyngeal swallow trigger

IV. Degenerative Conditions

i. Dementia of Alzheimer’s Type
   1. Food agnosia (recognition)
   2. Swallowing & feeding apraxia
   3. Oral prep phase & oral phase
   4. Pharyngeal delay & laryngeal
   5. Reduced BOT

ii. Parkinson’s Disease
   1. Piecemeal deglutition
   2. Buccal retention
   3. Vallecular & pyriform sinus residue
   4. Reduced laryngeal elevation
   5. Penetration/aspiration
   6. PES dysfunction

iii. Polymyelitis: muscular dystrophy

iv. ALS Amyotrophic Lateral Sclerosis
   1. Reduced tongue mobility, lip closure anterior velar bulging, pharyngeal wall contraction
   2. Reduction in laryngeal elevation
   3. Delay in pharyngeal swallow

V. Cerebral Palsy
   a. Oral dysfunction: reflexes
   b. Pharyngeal dysphagia

References:

Missouri: Elsevier.


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