

The Swallowing System

Communication Disorders, Swallowing Disorders, and Speech Therapy - An Introduction

言语治疗概论

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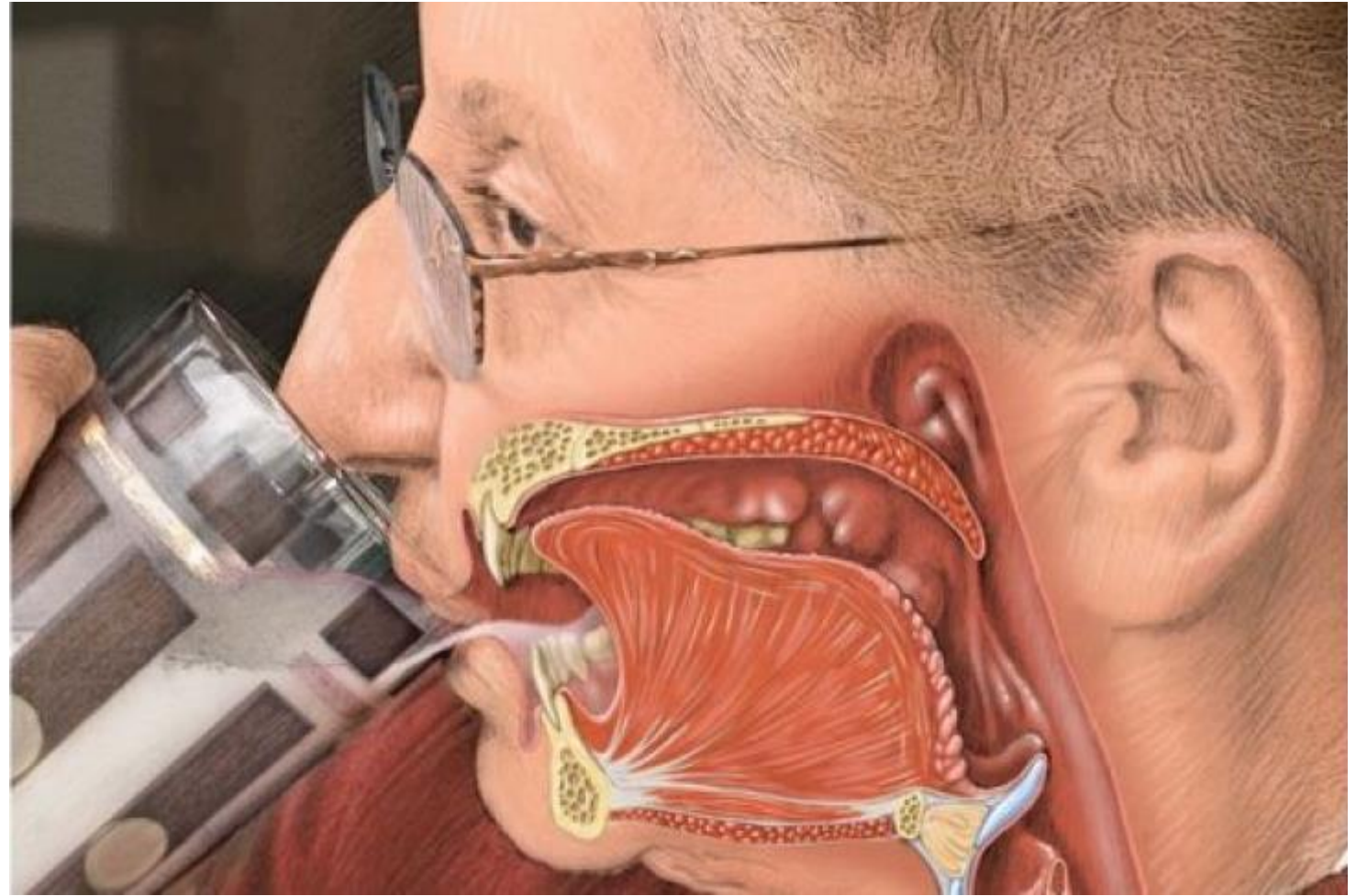
Agenda

- Swallowing / Deglutition
- Anatomy of normal swallow
- Physiology of normal swallow

Swallowing

- Also known as “deglutition”
- Refers to the transport of food from oral cavity to stomach for digestion
- A preliminary process of energy extraction
- Precise and highly synchronized activities are involved
- Swallowing disorder = dysphagia
- Understanding of normal swallow provides foundation for understanding dysphagia

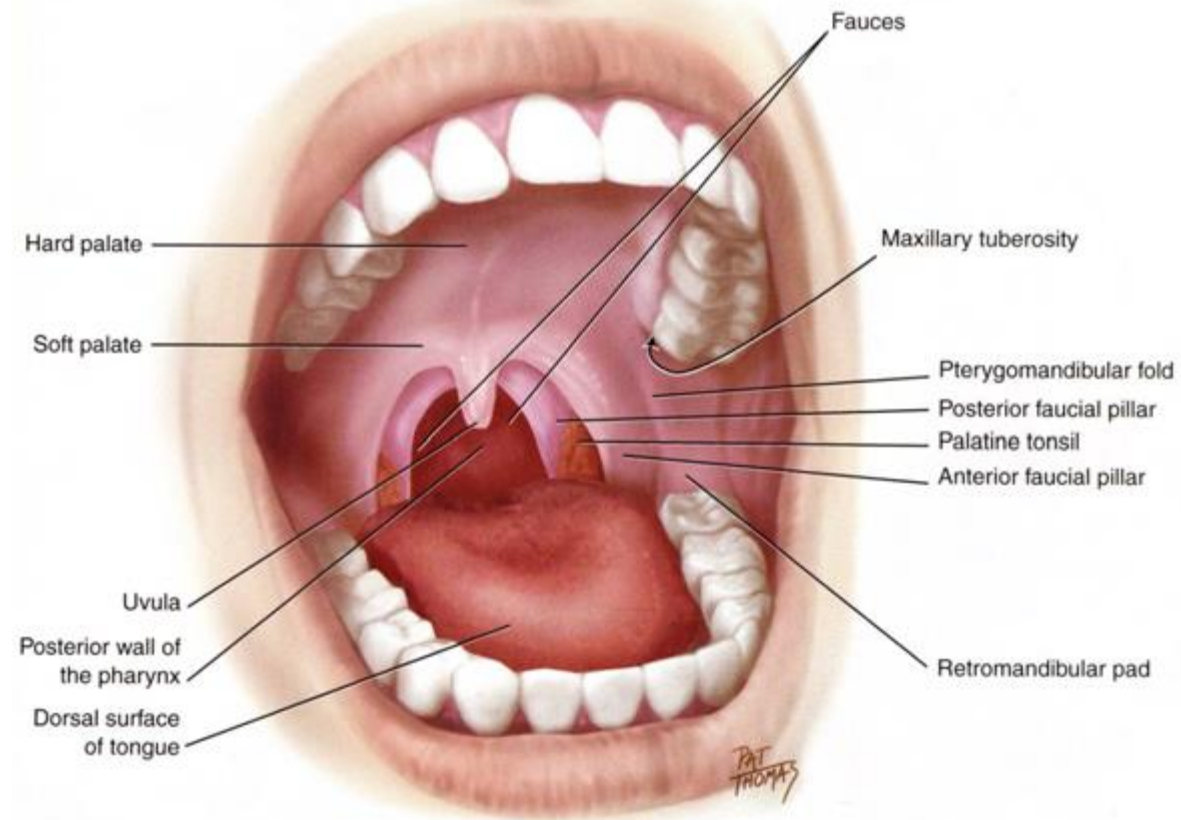
Swallowing



Structures involved in Swallowing

- Shared anatomy with articulatory system
- Parts heavily involved:
 - The oral cavity
 - The pharynx
 - Esophagus

Oral Cavity



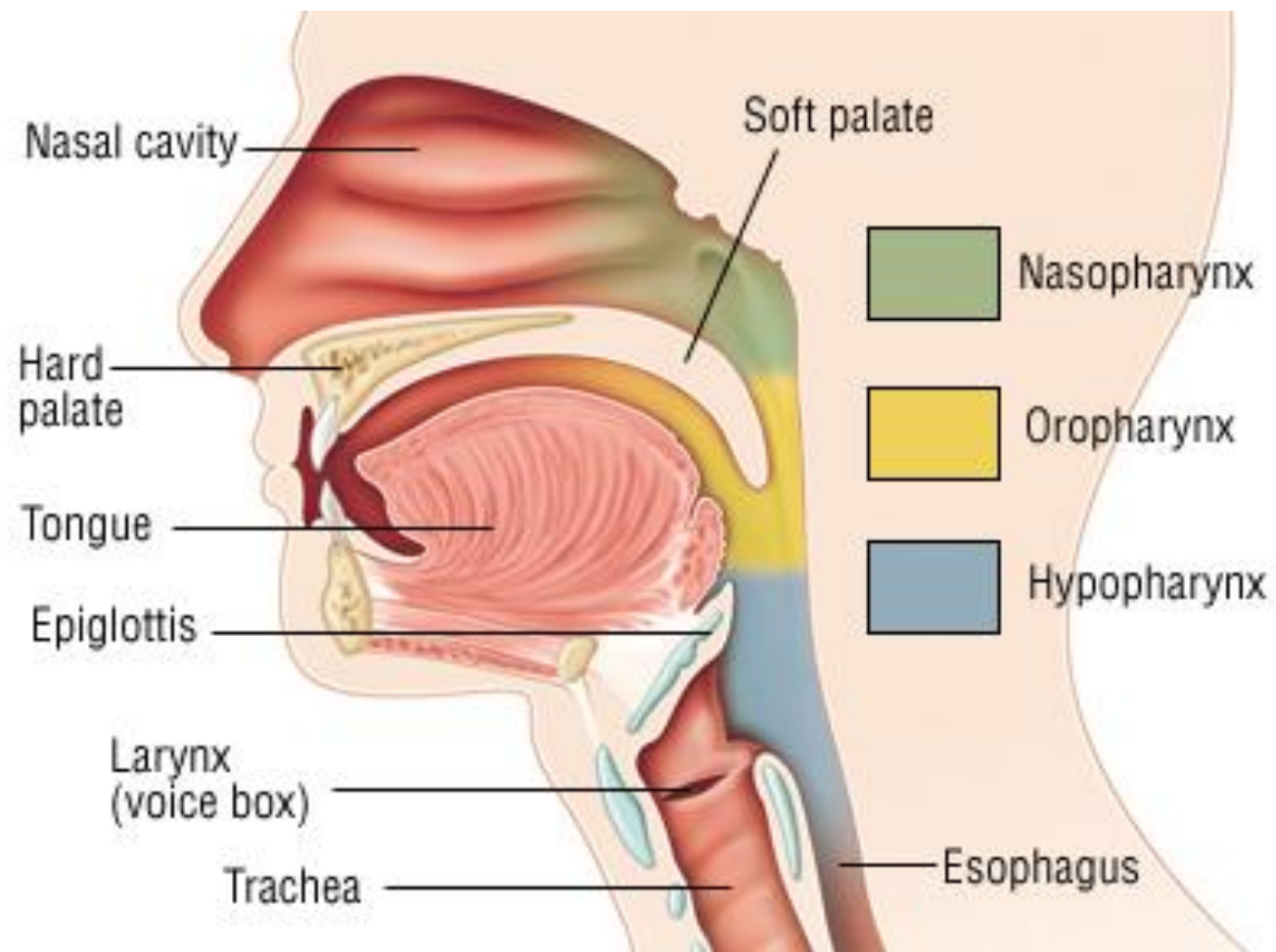
The Pharynx

- External circular layer
 - Superior pharyngeal constrictor
 - Middle pharyngeal constrictor
 - Inferior pharyngeal constrictor
- Internal circular layer
 - Stylopharyngeus m.
 - Salpingopharyngeus m.

The Pharynx

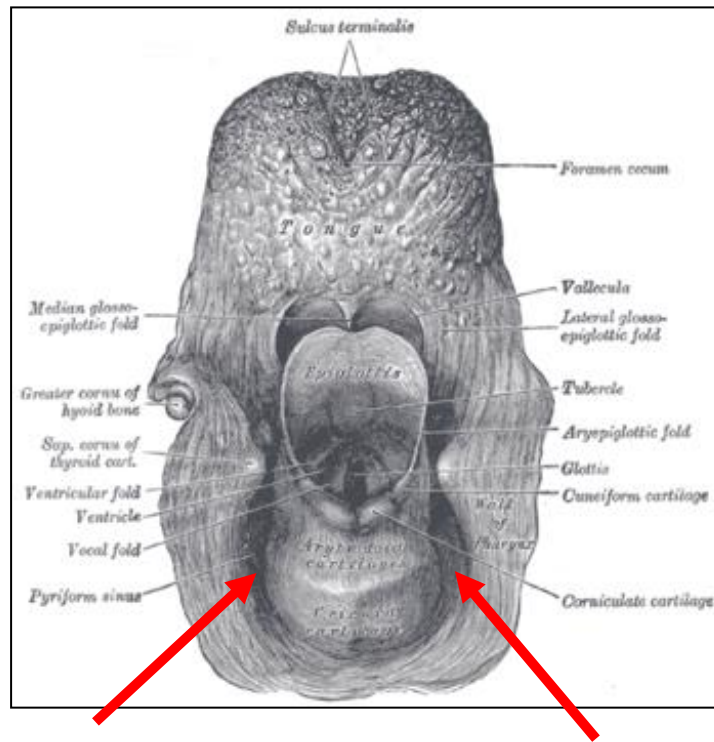
- Synchronized constriction helps move bolus down
- 3 pharyngeal recesses in which food bolus may lodge:
 - Valleculae (x1): the space or depression between the base of tongue and epiglottis
 - Pyriform sinuses (x2): the pouches found beside the larynx
- End at cricopharyngeus (a.k.a. pharyngoesophageal segment, PE segment)

The Pharynx

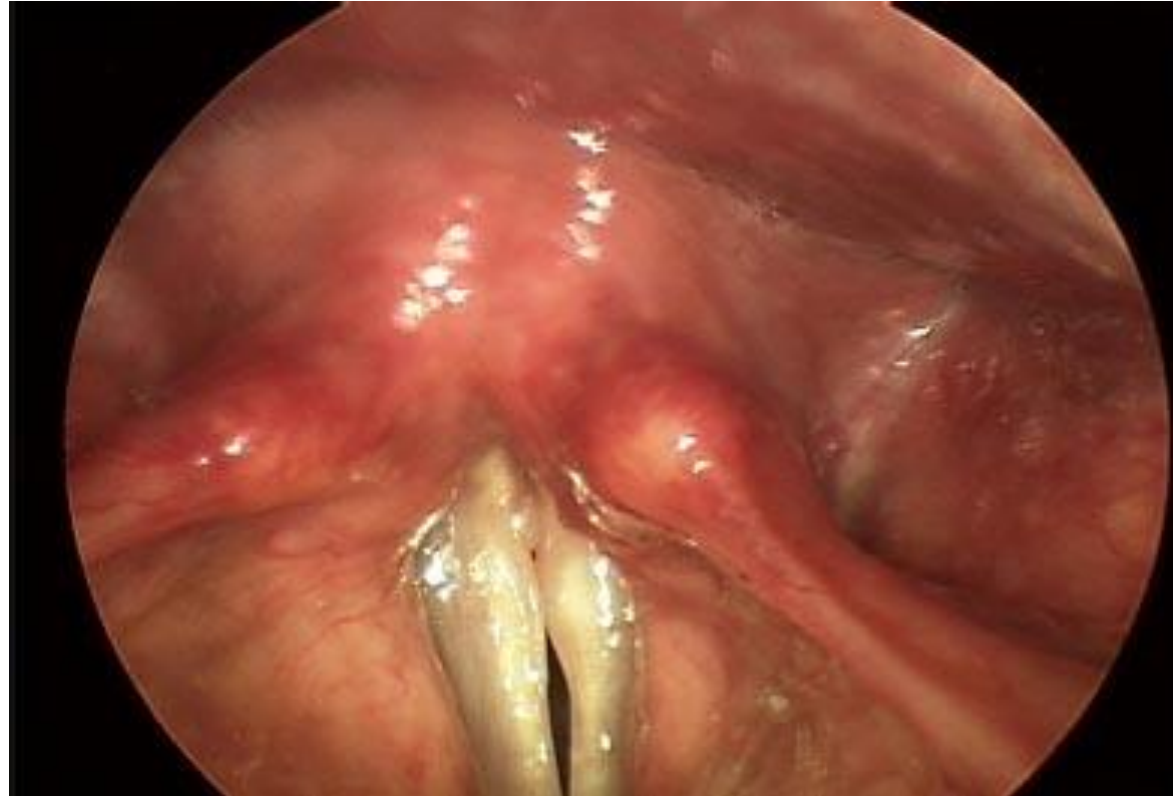


Pyriform Sinus

- The spaces created by the larynx and the pharyngeal constrictors
- Food bolus may pass here before entering esophagus



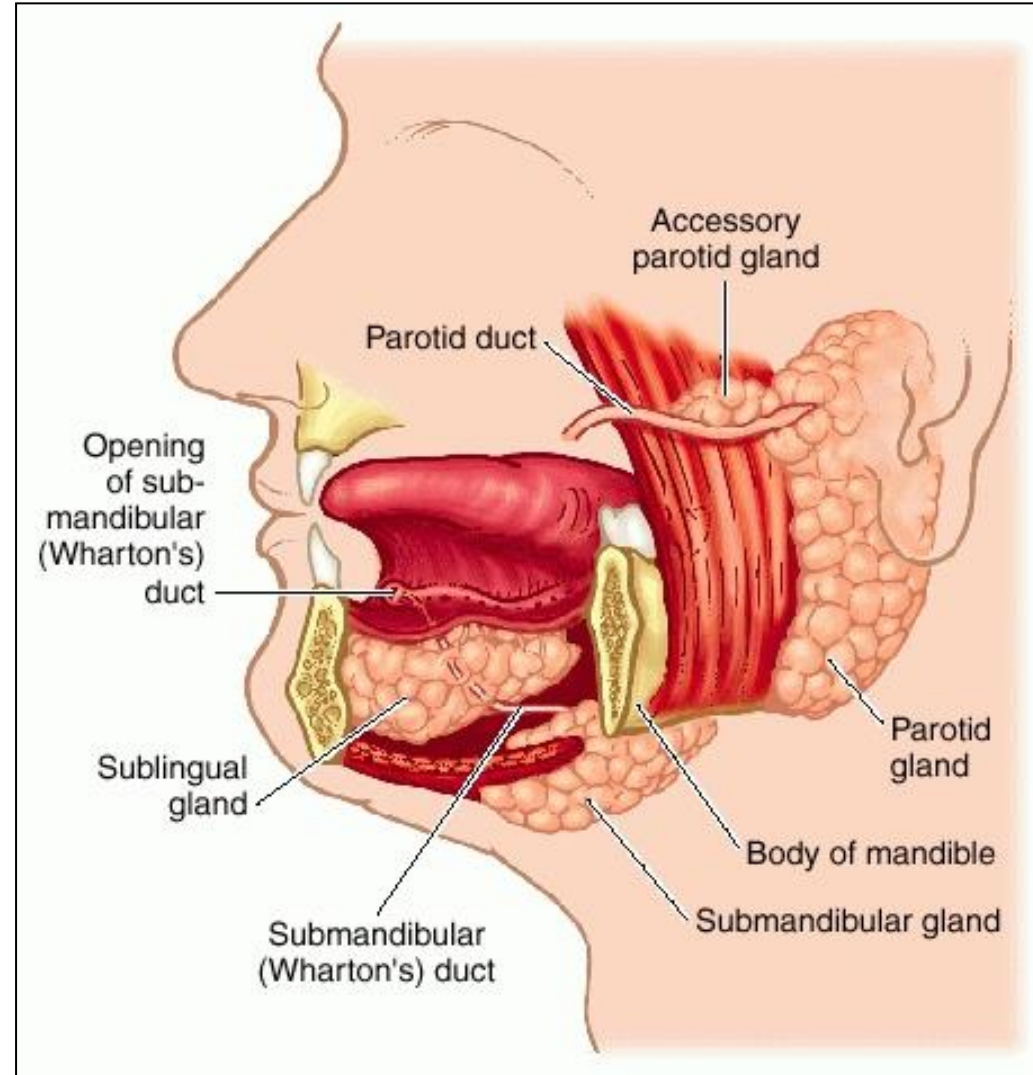
Pyriform Sinus



The Swallow Reflex

- Different from gag reflex; different neurological controls
- Gag reflex
 - True reflex
 - Triggered by extraneous substance touching posterior tongue, pharynx, soft palate
 - Totally controlled by brain stem
- Swallow reflex
 - Pattern-elicited response
 - Partially controlled by brainstem
 - Also takes inputs from cortex, peripheral muscles spindles

Salivary Glands



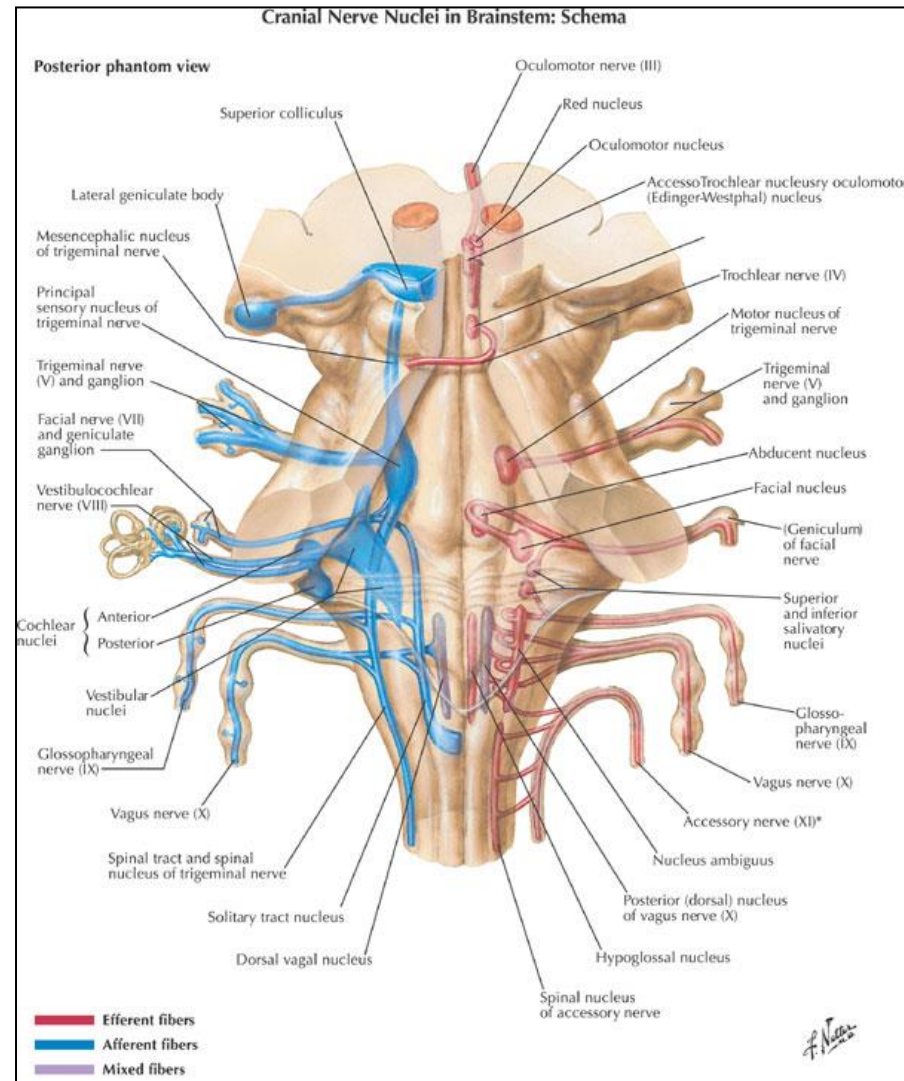
Salivary Glands



Neurological Control of Swallowing

- CN. V (Trigeminal)
- CN. VII (Facial)
- CN. IX (Glossopharyngeal)
- CN. X (Vagus)
- CN. XI (Spinal Accessory)
- CN. XII (Hypoglossal)

Neurological Control of Swallowing



Frequency of Deglutition

- Varies with activity
 - E.g., most frequent when eating
 - E.g., least frequent during sleep
- Average: 580 swallows per day
- Can be up to 20 minutes between swallows (during sleep)

Stages of Normal Swallow

1. Oral preparatory phase
 2. Oral (transport) phase
 3. Pharyngeal phase
 4. Esophageal phase
- Duration and characteristics of each phase depend on:
 - Type of food being swallowed
 - Volume of food being swallowed
 - Voluntary control exerted over it (e.g., swallow maneuver)

Swallowing



Phases of Swallowing



Oral Preparatory Phase



Oral Transport Phase

Phases of Swallowing



Pharyngeal Phase



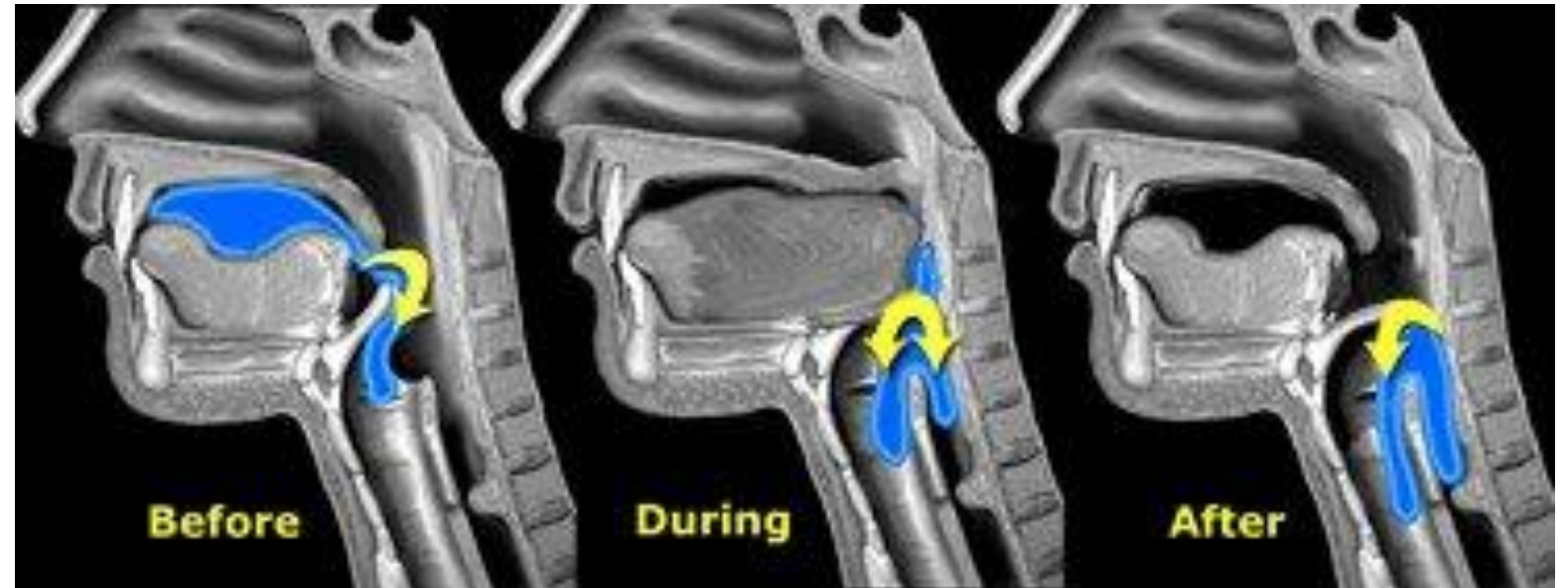
Esophageal Phase

Protective Actions

- Larynx and hyoid bone are upward and forward (~2 cm)
 - To reduce the distance the bolus needs to travel
 - To enlarge pharynx
 - To create a vacuum in the hypopharynx
- True and false vocal folds adduct
- Epiglottis folds down
 - To close off the entrance to airway
 - To divert food bolus into the pyriform sinuses

Dysphagia - Aspiration

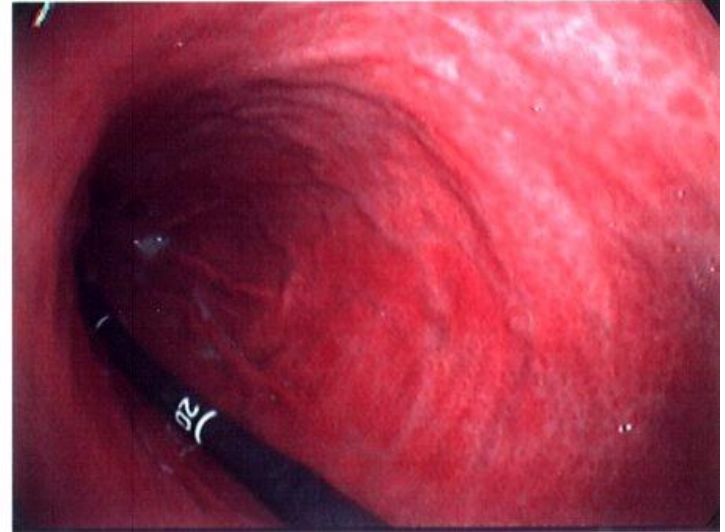
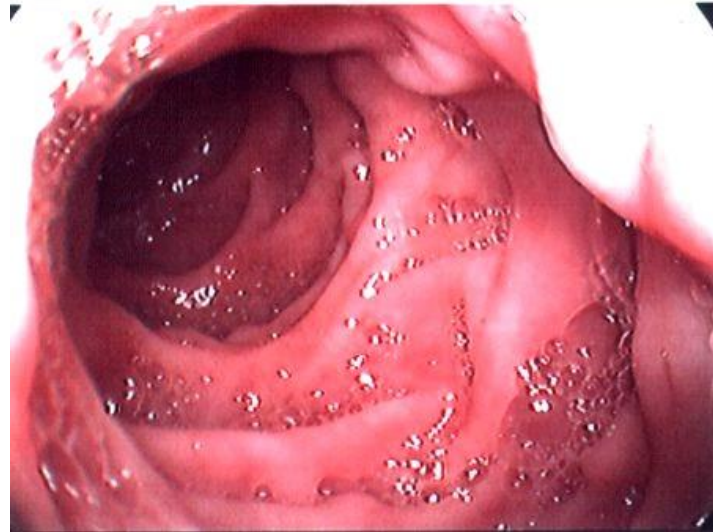
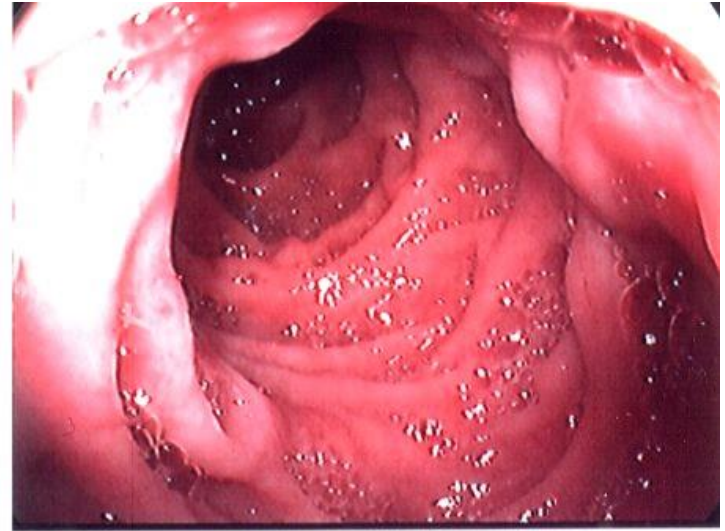
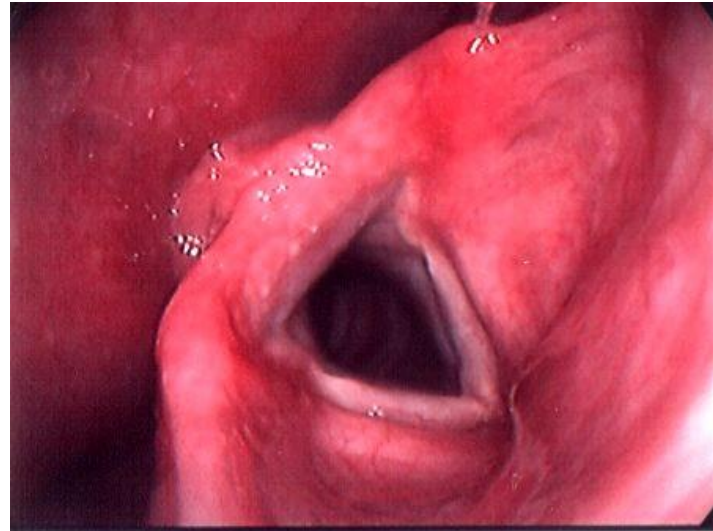
- When food enters the respiratory tract
- Can occur before, during, or after swallow



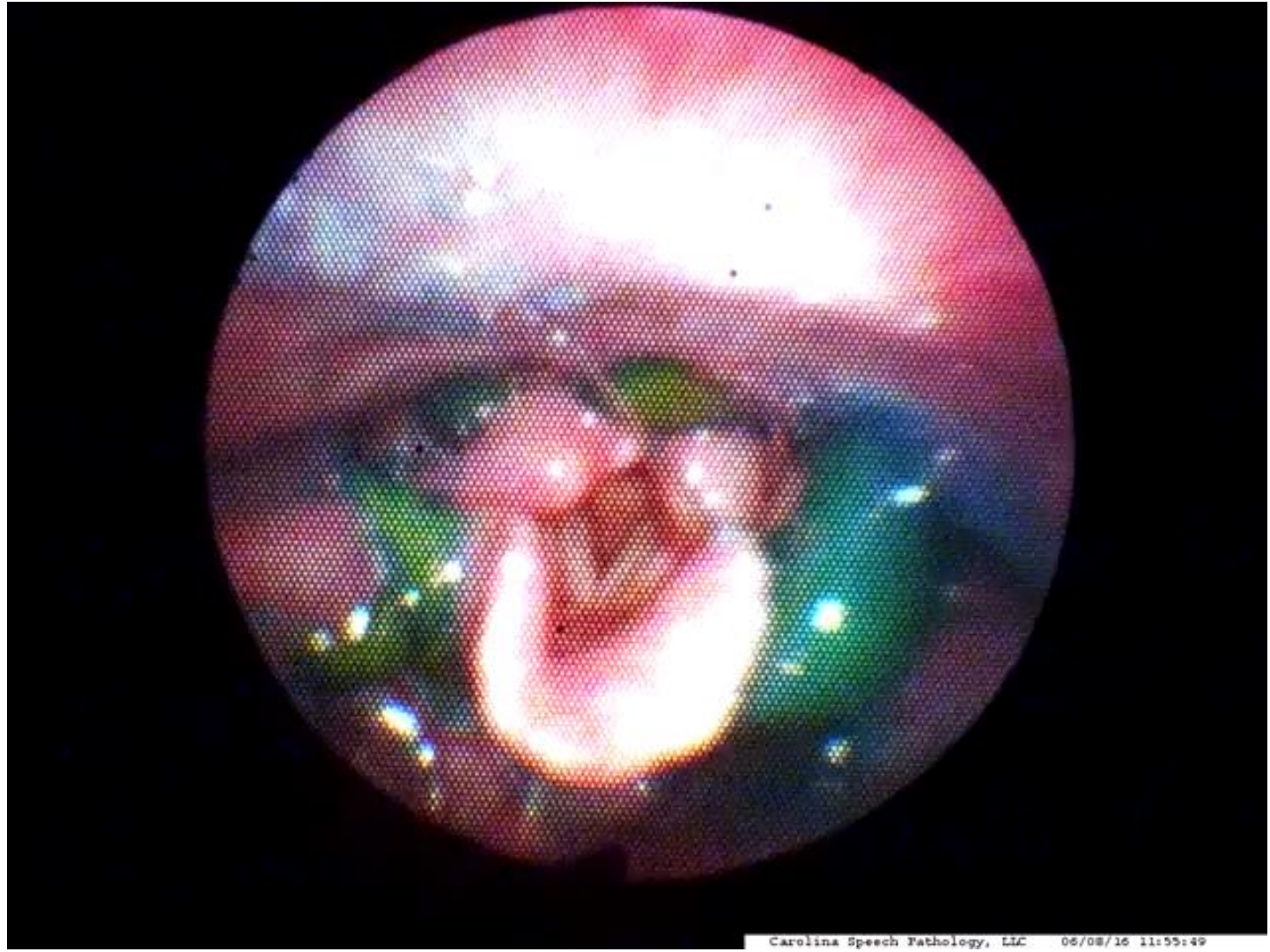
Instrumental Assessment of Swallowing

- Imaging studies
 - Ultrasound
 - Videoendoscopy
 - Videofluoroscopy
 - Scintigraphy
- Non-imaging studies
 - Electroglottography (EGG)
 - Cervical auscultation
 - Pharyngeal manometry

FEES

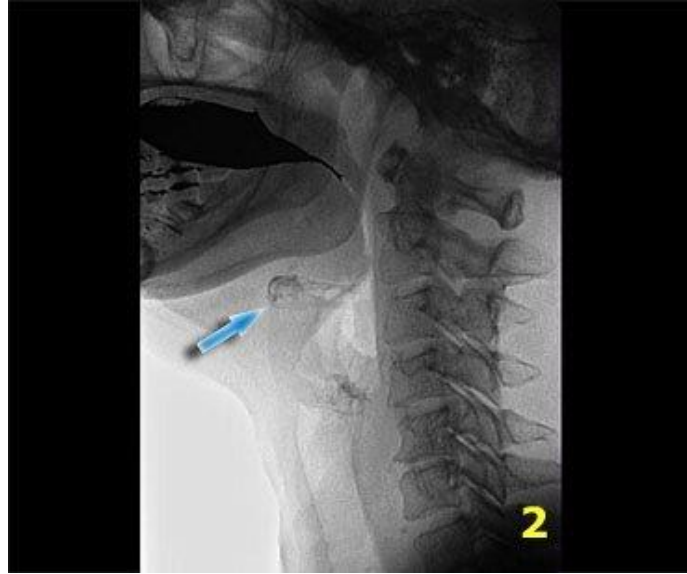
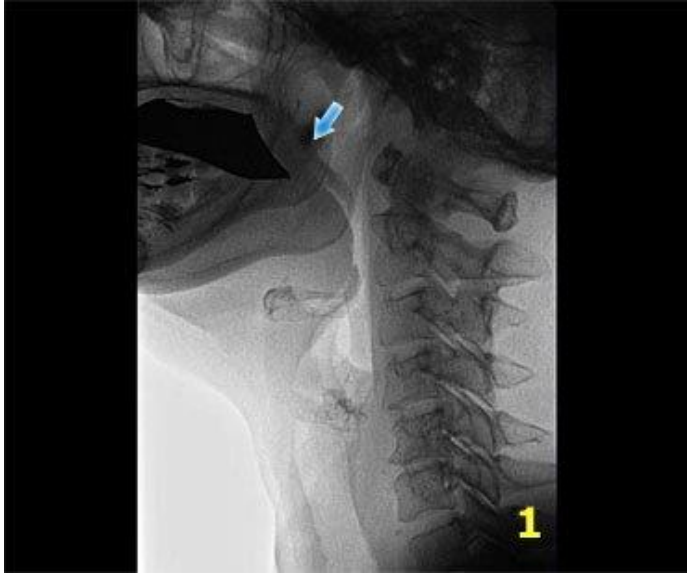


FEES - Aspiration



VFSS

- Most frequently used technique to assess oropharyngeal swallow
- Relatively low dose of radiation (much lower than cinefluoroscopy)
- Provide information on bolus transit times, motility problems, and amount and etiology of aspiration
- Can be lateral or posterior-anterior view
- Can visualize:
 - Oral activity during mastication
 - Oral transport stage
 - Triggering of pharyngeal swallow in relation to position of bolus
 - Motor aspects of pharyngeal swallow, and related structures



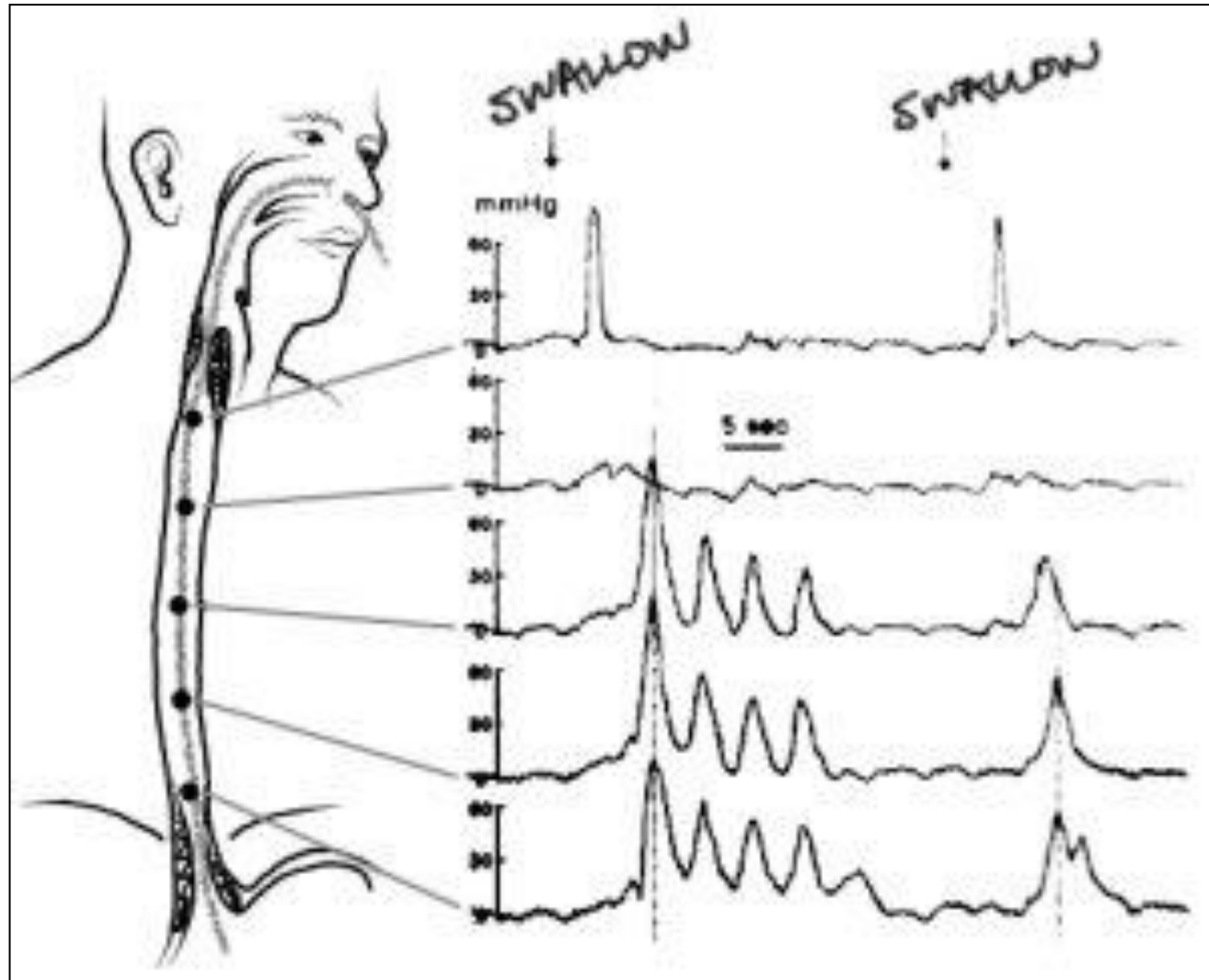
VFSS - Aspiration



VFSS - Alzheimer's Disease



Pharyngeal Manometry



End of Handout