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Identifying Anatomy and Physiology on MBS: Evidence Based Practice for Treatment

Is it Oral, Pharyngeal or Esophageal?

Presenter: Debra Tarakofsky, MS/CCC-SLP
Swallowing Diagnostics, Inc-President
NovaSoutheastern University-Dysphagia Lab Instructor/Developer

- PRESENTER: Debra Tarakofsky, a certified and licensed Speech-Language Pathologist with 20+ years of experience working with the geriatric population, in acute care hospitals, skilled nursing and assisted living facilities with an adult population.
- For 14 years, President and Clinical Administrator of Swallowing Diagnostics, Inc.(SDI), a mobile provider of modified barium swallow studies in Florida. Performed over 20,000 modified barium swallow studies and ASHA certified provider of CEU's.
- I have presented at ASHA, FLASHA, numerous skilled nursing facilities and health maintenance organizations on the topics of dysphagia and modified barium swallow studies.
- Responsibilities include conducting modified barium swallow studies, supervising and training other SLPs, implementing standards of performance, marketing and business development.
- I am adjunct instructor at NovaSoutheastern University, and responsible for the development and ongoing modification of their online modified barium swallow study lab for graduate level students.

Financial Disclosures: Honorarium from Speechpath.com for this presentation

Non Financial Disclosures: I am the owner and a clinician at SDI. We are using videos from patients of SDI which I will refer to throughout this presentation.

LEARNER OUTCOMES

- Participants will be able to state why evidenced-based practice (EBP) is important in dysphagia assessment and treatment.
- Participants will be able to identify anatomical markers on fluoroscopic images.
- Participants will be able to identify normal physiology of the swallow based on anatomical markers.
- Participants will be able to identify normal versus disordered oropharyngeal swallowing under videofluoroscopy
- Participants will be able to identify normal esophageal function vs disordered function under videofluoroscopy.

Evidence-Based Practice (EBP) Defined

- "…the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients…[by] integrating individual clinical expertise with the best available external clinical evidence from systematic research"
  (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71).

Why is EBP so Important?

- Clinicians need to be able to use efficacy and outcome data (American Speech-Language-Hearing Association, 2005b; Dollaghan, 2004)
- Clinicians need to be accountable to clients, families and third-party payers for the services they provide (Apel, & Self, 2003; Justice, & Fey, 2004, September 21; Orange, 2004)
- ASHA Code of Ethics dictates that SLPs and audiologists must provide services that are based on professional and careful decision-making (Apel, & Self, 2003)

ASHA STATES

- When Evaluating Any Treatment Procedure, Product, or Program, Ask Yourself the Following Questions

  (ASHA, 2009)

  - What are the stated uses?
  - To which population does it apply?
  - Are outcomes with supporting data clearly stated?

- "EBP is neither the cure-all nor the fear that is often suggested by its framework. Rather, it is a set of tools that will facilitate improved clinical decision-making, and allow us to be better clinicians, investigators, and educators"
(Dollaghan, 2004, April 13)

A CHALLENGE

- In the featured article *Oropharyngeal Dysphagia in Long Term Care:Misperceptions of Treament Efficacy* from Journal of the American Medical Directors Association (JAMDA) 2008 , clinical neuroscientist Irene Campbell-Taylor states, "there is no evidence to support the suggested need for such management [of swallowing impairment]" and that "the majority of SLPs and other allied health professionals engaged in the management of OPD [oropharyngeal dysphagia] are inadequately trained."

  The attack rallied ASHA and members of Special Interest Division 13, Swallowing and Swallowing Disorders, to counter a sweeping disparagement of the value of dysphagia intervention and the training of SLPs. A total of 14 authors developed and submitted an article, "Oropharyngeal Dysphagia Assessment and Treatment Efficacy: Setting the Record Straight," to *JAMDA*.

Justification for the Use of Modified Barium Swallow Studies

- In the case of pharyngeal phase abnormalities which include such impairments as inadequate airway protection or incomplete and inefficient transport of material through the pharynx …the videofluoroscopy provides a direct opportunity to evaluate the effectiveness of compensatory maneuvers that may reduce the impact of these abnormalities on airway protection …
- The risks of implementing dysphagia interventions without instrumented demonstration of beneficial effect are increasingly recognized in regulatory documents.

Oropharyngeal Dysphagia Assessment and Treatment Efficacy: Setting the record straight in response to Campbell-Taylor (Coyle et al., 2009)

Additional Support

"Why is an instrumental evaluation of swallowing needed?

- "A Bedside Clinical Evaluation is a thorough assessment of oral phase disorders. However for disorders of the pharyngeal phase…" Swigert, N. (2007) accompanying CD-Materials for Education Staff/Physicians
- "the Bedside Clinical Exam is incomplete and serves as a screening…" Swigert, N. (2007) accompanying CD-Materials for Education Staff/Physicians
- The instrumental diagnostic evaluation is crucial in determining which treatment techniques are needed" Swigert, N. (2007) accompanying CD-Materials for Education Staff/Physicians

Additional Support

Groher (1992)

"…become familiar with the clinical pathologic mechanism of certain disease processes … include a thorough understanding of effects on the neuromuscular system, clinical course and expected prognosis. The interaction of these factors should determine the proper approach to treatment" (p.197)

Swigert (2007) stated, "it is crucial to determine what anatomical or physiological impairment is causing the problem(s)" (p82)

Support for MBS

"Dynamic radiographic studies of swallowing, either cine radiographically or videotaped modifications of the barium swallows, are the best procedures available for visualizing the deglutitory muscles during function. Dynamic radiography is required for all cases of dysphagia in which the CED suggests that the problem is directly related to, or complicated by, a cricopharyngeal, esophageal, lower esophageal sphincter, or gastric impairment. Radiographic studies are necessary when the CED fails to determine the cause of dysphagia, the findings are not consistent with a previously diagnosed condition, and when the examination suggests multiple factors are contributing to the dysphagia. Radiography should be used in cases of unexplained cases of aspiration pneumonia, and it may be useful to assist in determining the effectiveness of compensations in preventing aspiration."
Groher, Michael, Dysphagia: Diagnosis and Management, second edition 1992, pg.161

ANATOMICAL SITES

ANATOMICAL SITES

LIPS

- The orbicularis oris
  - Major muscle that circles the opening of the mouth
  - functions as a sphincter to close it
  - anterior boundary of the oral cavity
  - The inner surface of each lip is connected in the middle to the corresponding gum by a fold of mucous membrane, the **frenulum**—the upper being the larger.
- Other muscles that control the lips
  - Labial muscles:
    - levator labii superioris, depressor anguli oris, and risorius.
- Frenulum: a fold of mucous membrane that connects in the middle to the corresponding gum –the upper being the larger.

- German, R., & Palmer, J. (2006).
- Massy, B. (2006)

Muscle Fibers of the Orbicularis Oris

- Retrieved from http://www.bartleby.com/107/242.html

Retrieved from: http://www.yorku.ca/earmstro/journey/images/facial.gif

ANATOMICAL SITES

- **Tongue:** Controlled by two muscle groups
  - Extrinsic muscles: attach the tongue to external points
  - Intrinsic muscles: run vertically, transversely, and longitudinally inside the tongue, allowing it great range of movement.
  - Covered by a mucous membrane that extends from the hyoid bone at the back of the mouth upward and forward toward the lips.
  - Upper surface of the tongue-covered with small projections called papillae, which give it a rough texture & assist the senses of touch, taste, and smell

German, R. & Palmer, J. (2006)

Tongue

- The **extrinsic muscles**: Primary actions are to pull the tongue forward, backward, upward and downward
  - Genioglossus.
  - Hyoglossus.
  - Chondroglossus.
  - Styloglossus.
  - Glossopalatinus
- The **intrinsic muscles**: Primary actions are to shape the tongue during articulation and deglutition
  - Longitudinalis superior.
  - Transversus.
  - Longitudinalis inferior.
  - Verticalis.

Tongue tip, mid, posterior

- *Tongue Tip:* Picks up the bolus to bring it onto the lingual surface to initiate the swallow. As the oral stage is initiated, the tongue tip and sides contact the alveolar ridge.
- *Mid Tongue:* Sequentially elevates from front to back propelling the bolus posteriorly. Pressure is applied at the bolus tail.
- *Back of Tongue:* The back of the tongue begins at the circumvallate papillae & extends to the front of the soft palate. As the bolus and tongue motion approach the anterior faucial arches and base of the tongue, the pharyngeal swallow should be triggered
- *Oral tongue pressure increases as bolus viscosity increases*
- Logeman, J. 1993. (p. 9).

ANATOMICAL SITES

- Circumvallate Papillae:
  - Back of the tongue begins at the circumvallate papillae and extends to the front of the soft palate
  - Usually numbering between eight and 14
    - Located at the back of the tongue
    - Divided by the median sulcus
    - Lie on both halves

Papillae:

Retrieved from: https://figures.boundless.com/19577/full/figure-36-03-03.jpe

ANATOMICAL SITES

- **Velum(Soft Palate):** Elevation and retraction of the velum to the posterior pharyngeal wall prevents the bolus from entering the nasal cavity.
  - A movable fold, suspended from the posterior border of the hard palate.
  - Consists of a fold of mucous membrane enclosing muscular fibers, an aponeurosis, vessels, nerves, adenoid tissue, and mucous glands.
  - Velum position at rest: anterior surface is concave, continuous with the roof of the mouth, and marked by a median raphé. Its posterior surface is convex, and continuous with the mucous membrane covering the floor of the nasal cavities.
  - Its upper border is attached to the posterior margin of the hard palate, and its sides are blended with the pharynx. Its lower border is free. Its lower portion, which hangs like a curtain between the mouth and pharynx, is termed the **palatine velum.**
  - The upper portion of the superior pharyngeal constrictor contracts to meet the velum and close the nasal cavity and maintain pressure generation.
  - The soft palate elevation is maintained until the bolus tail exits the hypopharynx, after which the soft palate usually returns to a rest position

ANATOMICAL SITES

- Muscles of Mastication:
  - The Temporalis, Masseter, and Pterygoideus
    - Masseter elevates the mandible.
    - The Pterygoids assist in opening the mouth, & mandibular protrusion
      - They also assist in side to side movement during chewing.
    - Temporalis muscle is responsible for retraction of the mandible

Bartleby.com. (2014)

ANATOMICAL SITES

- **Base of the Tongue:** Extends from the valleculae to the circumvallate papillae (approximately at the tip of the uvula). Posterior movement to contact the pharyngeal wall propels the bolus through the pharynx. The back of the tongue is considered the major pressure-generating force to propel the bolus through the pharynx. Posterior movement covers approximately 2/3 of the distance to the posterior pharyngeal wall.

ANATOMICAL SITES

- **Hyoid Bone:**
  - Appearance usually is oval or rounded shape
  - In the lateral view greater horns project posteriorly
  - Elevates and moves anteriorly
  - Lifts approximately 2 cm in normal adults
  - Action of the suprahyoids elevates the hyoid
  - Action of the infrahyoids depresses the hyoid

ANATOMICAL SITES

- **Epiglottis:** projects upward behind the root of the tongue, in front of the entrance to the larynx. The lateral folds are partly attached to the wall of the pharynx. The lower part of the anterior surface lies behind the hyoid bone. It extends inferiorly to the thyroid notch and attaches via a ligament to the thyroid cartilage.
  - Backward-tilting base of the epiglottis facilitates closure of the airway entrance as it approximates the anterior-tilting arytenoid cartilages.
  - The top 1/3 of the epiglottis is folded down horizontally by the upward and forward motion of the larynx and hyoid.
  - If incomplete, penetration will occur.
  - This can occur before or during the onset of the swallow
    - (Logemann, J. 1993 p.10, 11)

ANATOMICAL SITES

- **Valleculae:** Located immediately behind the epiglottis.
  - It is the spaces that are formed between the epiglottis and the base of tongue
  - The hyoepigottic ligament divides the valleculae
  - In the normal swallow, as the bolus reaches the valleculae, it divides fairly evenly
  - In approximately 20% of normal swallows, the bolus divides unilaterally.
    - Logemann, J. (1986)

ANATOMICAL SITES

- **Pharyngeal Wall:**
  - As the bolus tail approaches the top of the tongue base, contraction of the pharyngeal walls (anterior movement of the posterior pharyngeal wall and medial movement of the lateral pharyngeal walls) begins at the oropharynx,
  - The pharyngeal walls and velum act together to close off the nasopharynx
  - The tongue base moves posteriorly to meet the pharyngeal walls
  - Contraction progresses superiorly to inferiorly via the upper pharyngeal, mid pharyngeal and lower pharyngeal constrictors
  - This clearing wave cleans any residual bolus from the pharyngeal walls.
  - Anterior bulging covers 1/3 the distance to the base of tongue.
    - Logemann, J. (1986) (pp. 12 &13)

ANATOMICAL SITES

- **Pyriform Sinus:** Formed by the pharyngeal walls and aryepiglottic folds.
  - The bolus passes through the valleculae, down the lateral channels of the pharynx, through the pyriform sinuses and into the esophagus.

ANATOMICAL SITES

- **Laryngeal Vestibule:**
  - The portion of the larynx above the vocal folds. A space formed by the epiglottis anteriorly, the aryepiglottic folds laterally, and the arytenoid cartilages posteriorly.
  - Wide and triangular in shape, containing the false vocal folds
    - Anterior border: the epiglottis
    - Posterior Border: the arytenoid cartilages, the corniculate cartilages, and the interarytenoid notch
    - Lateral Border: Aryepiglottic Folds

ANATOMICAL SITES

- **Vocal Folds:** Enclose two strong bands, named the **vocal ligaments.** Each ligament consists of a band of yellow elastic tissue, attached in front to the angle of the thyroid cartilage, and behind to the vocal process of the arytenoids.
  - Onset of VF adduction occurs prior to the onset of hyoid bone movement, base of tongue movement and initiation of peristalsis in the nasopharynx. Murray, 2006, p. 31)
- **False vocal folds** (ventricular folds): Two thick folds of mucous membrane, each enclosing a narrow band of fibrous tissue, the **ventricular ligament,** which is attached in front to the angle of the thyroid cartilage immediately below the attachment of the epiglottis, and behind to the antero-lateral surface of the arytenoid cartilage, a short distance above the vocal process.
  - Approximation of the true vocal folds precedes false vocal fold approximation and approximation of the arytenoids to the base of the epiglottis. (Murray, 2006, p. 26)

ANATOMICAL SITES

- **Trachea**
  - Anterior to the esophagus.
  - Cartilaginous and membranous anterior: two-thirds cartilaginous, with the posterior being deficient where the tube is fibrous tissue and muscular fibers.
  - Eventually divides into two bronchi, one for each lung.
  - The **cartilages** of the trachea vary from sixteen to twenty in number
  - In the right bronchus the cartilages vary from six to eight and in the left vary from nine to twelve
  - Highly elastic, but may become calcified in advanced life.
    - The ***first cartilage*** is broader than the rest, connected by the cricotracheal ligament with the lower border of the cricoid cartilage.
    - The ***last cartilage*** is thick and broad in the middle.

IDENTIFICATION OF ANATOMICAL MARKERS ON MODIFIED BARIUM SWALLOW STUDY IMAGES

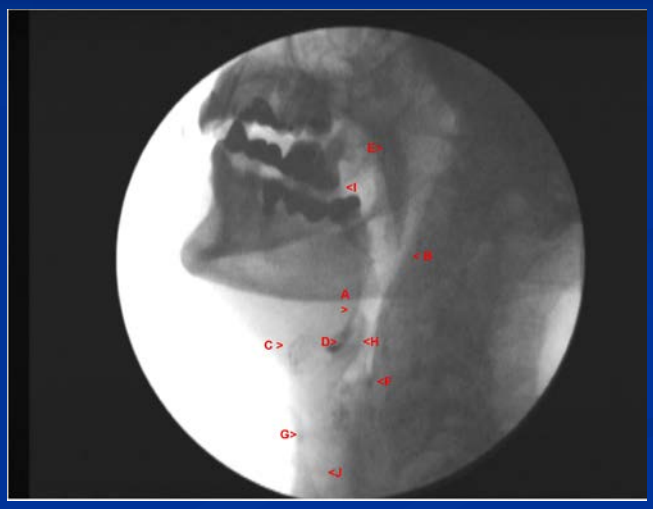

IMAGE 1

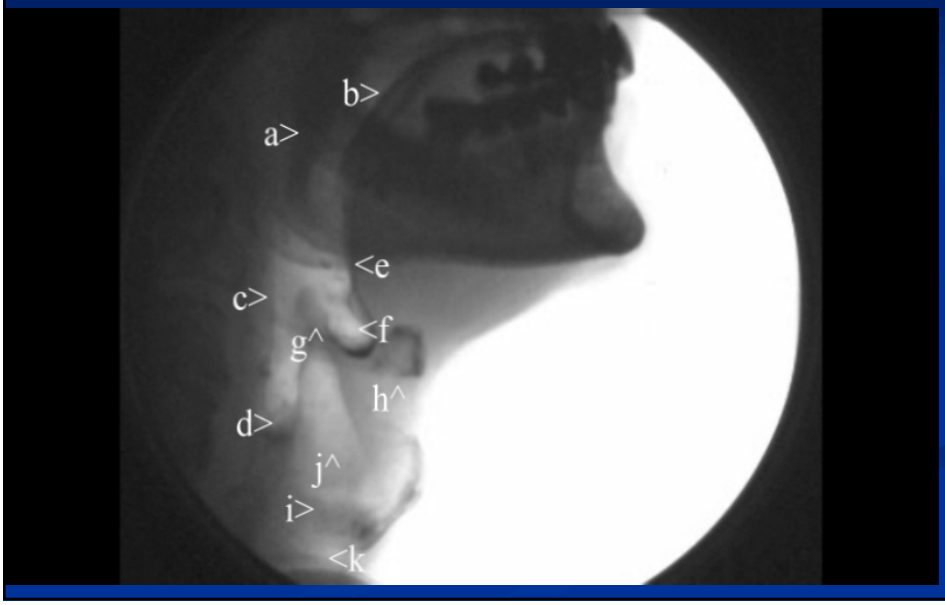

IMAGE 2

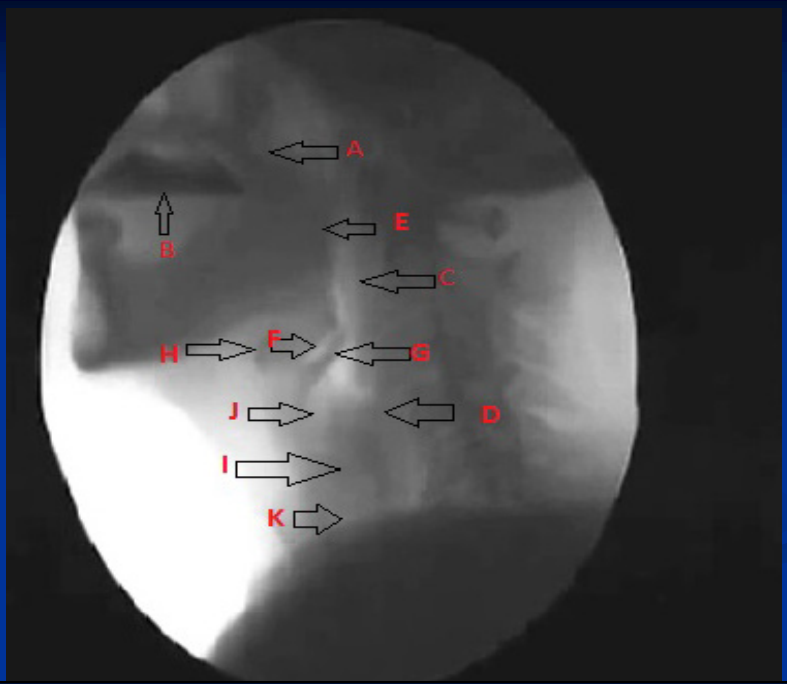

IMAGE 3

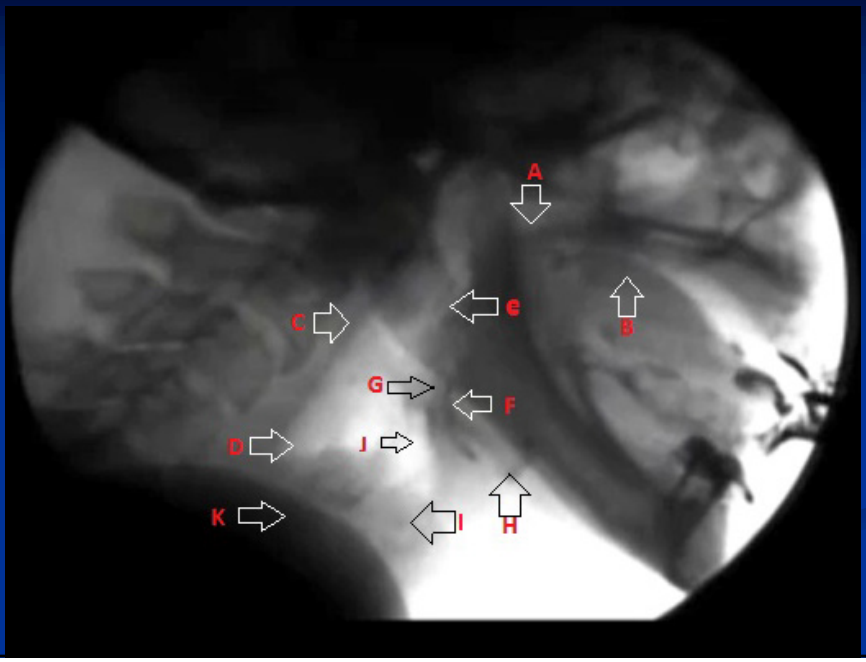

IMAGE 4

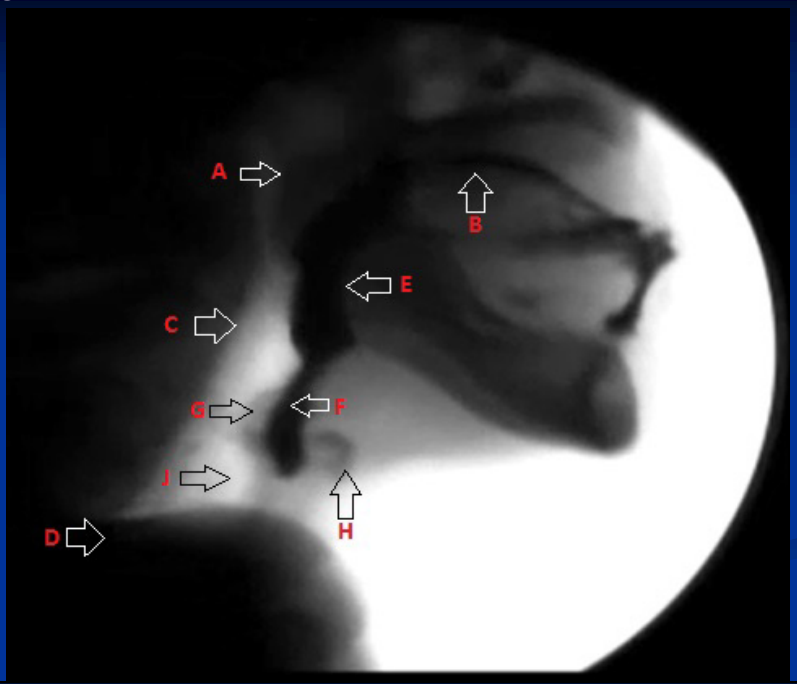

IMAGE 5

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IMAGE 6

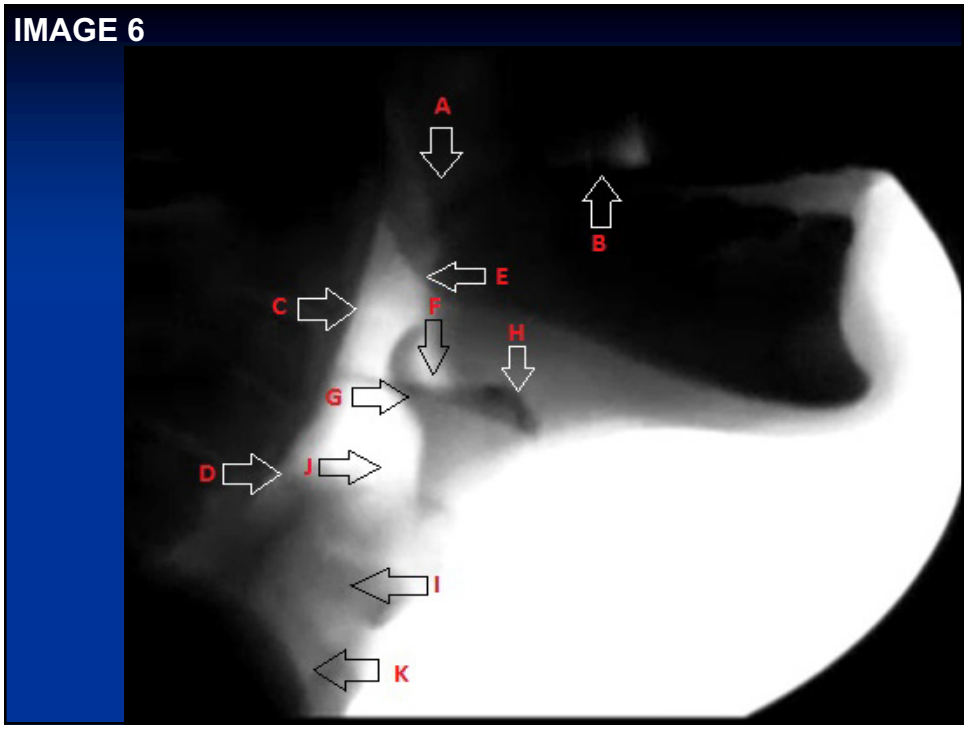


IMAGE 7

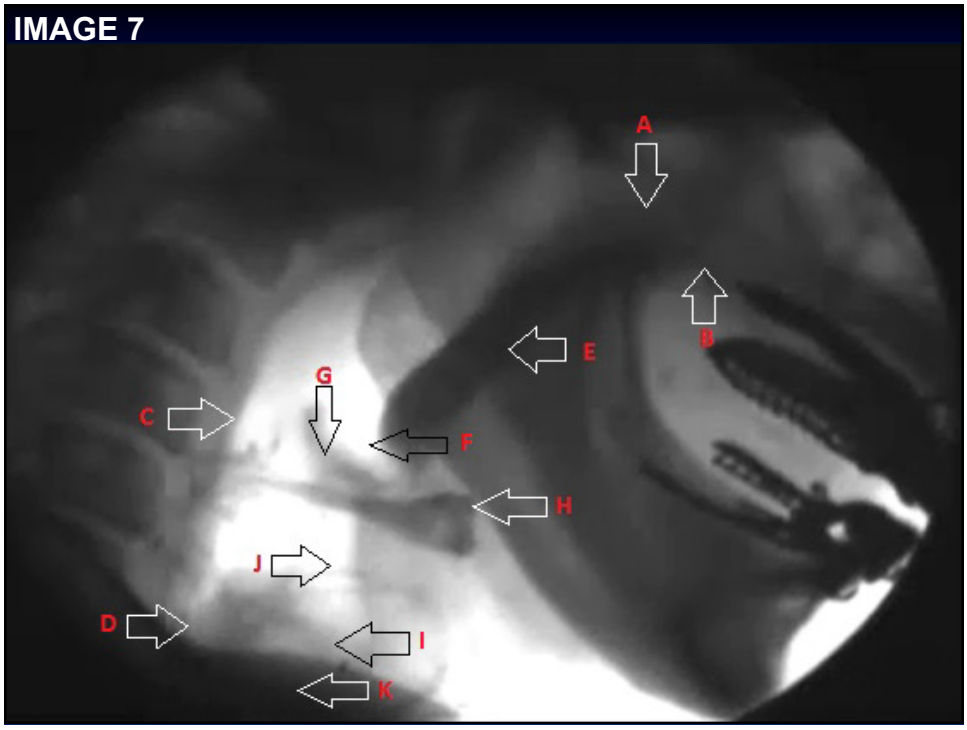


IMAGE 8

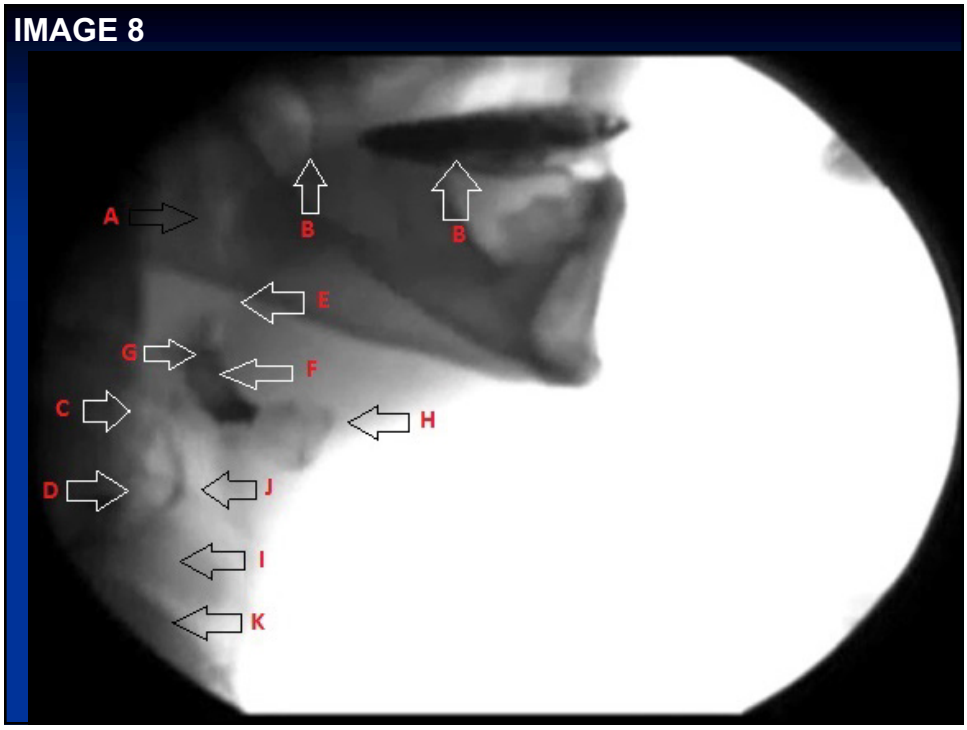


IMAGE 9

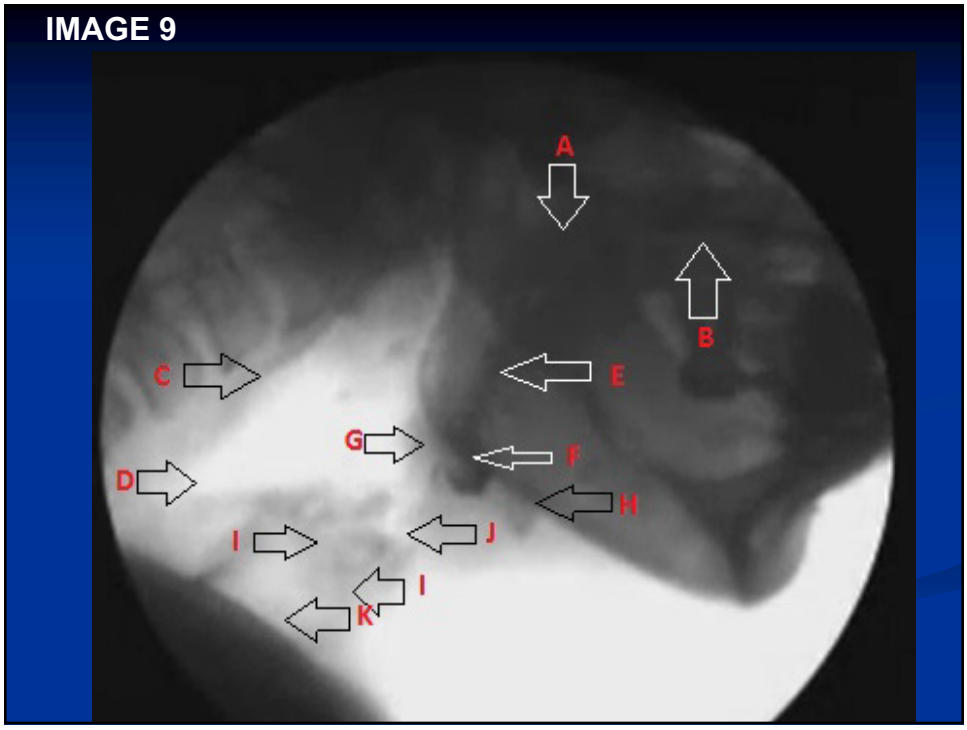
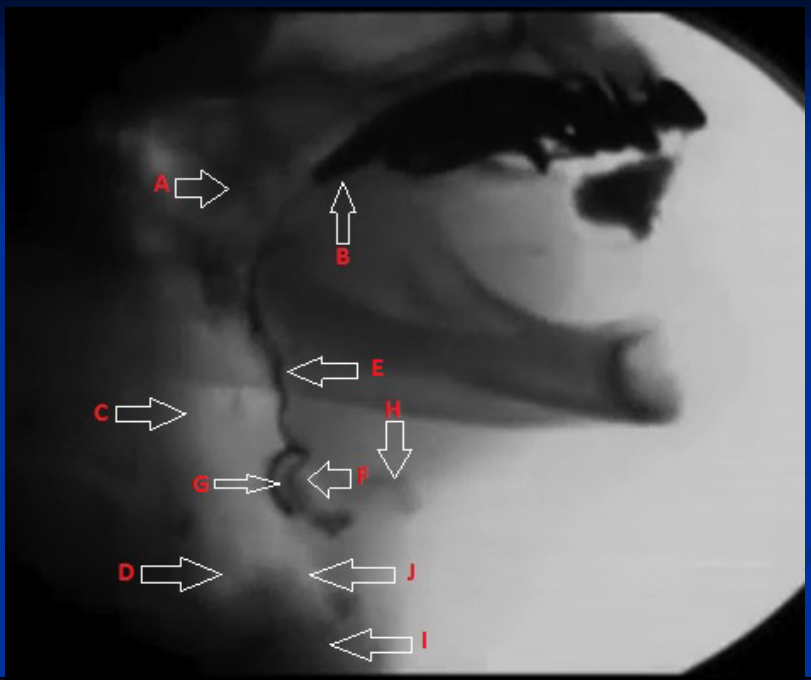


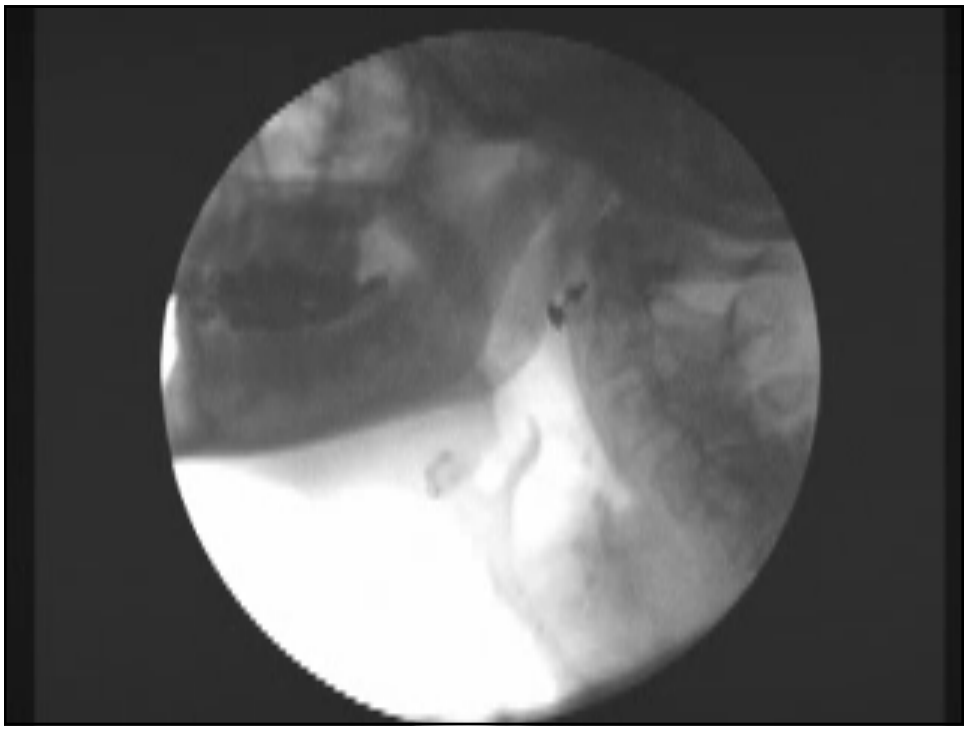
IMAGE 10

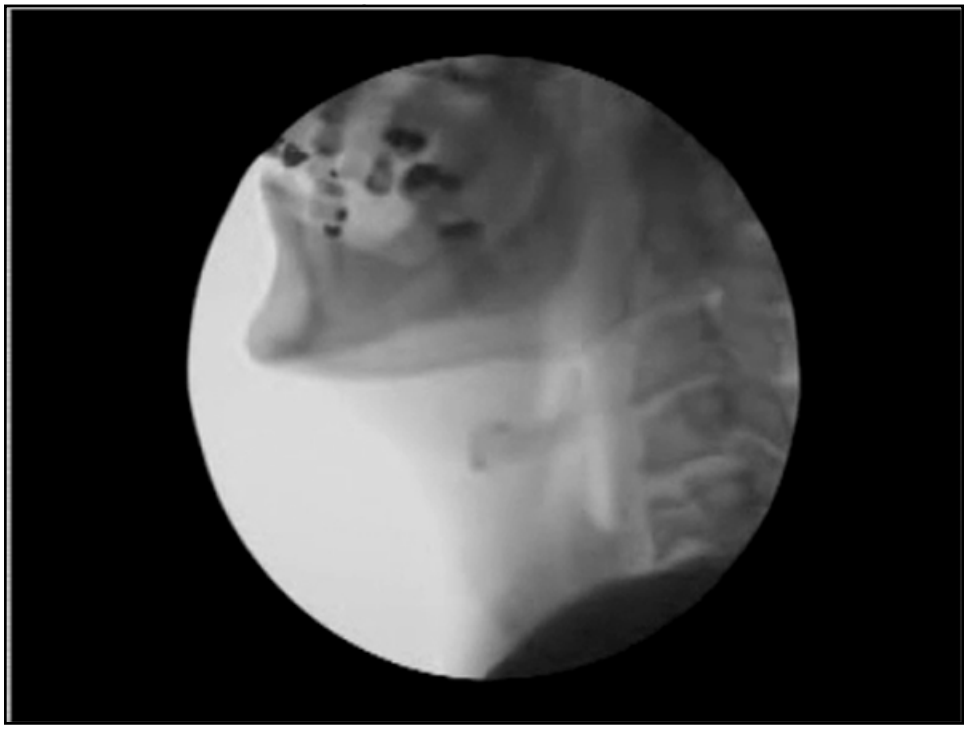


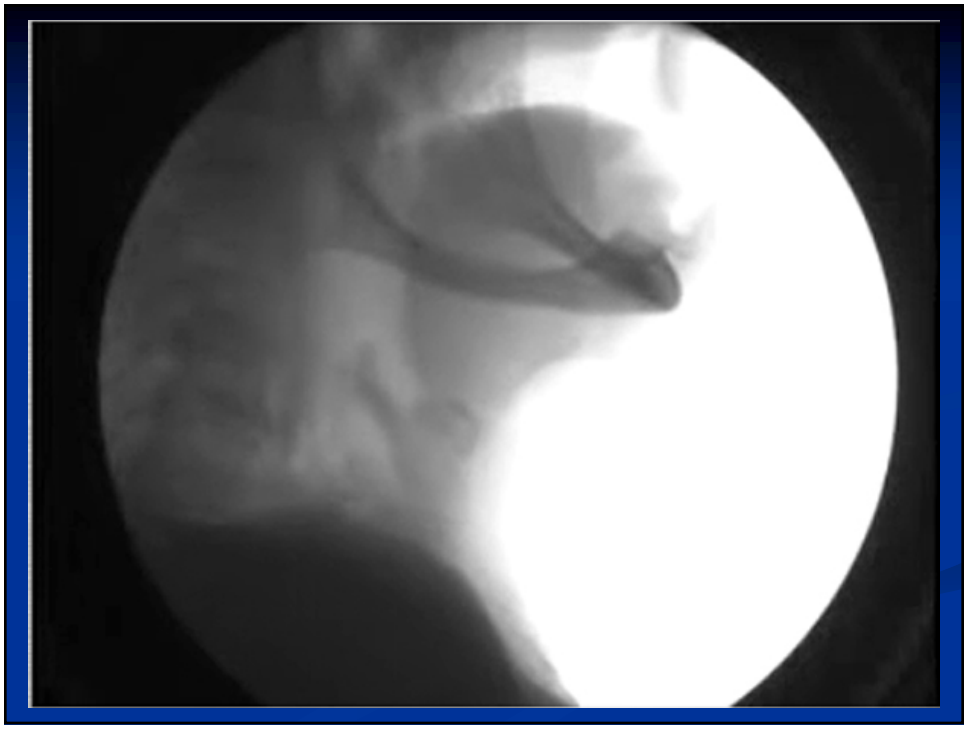
Anatomy of the Larynx:

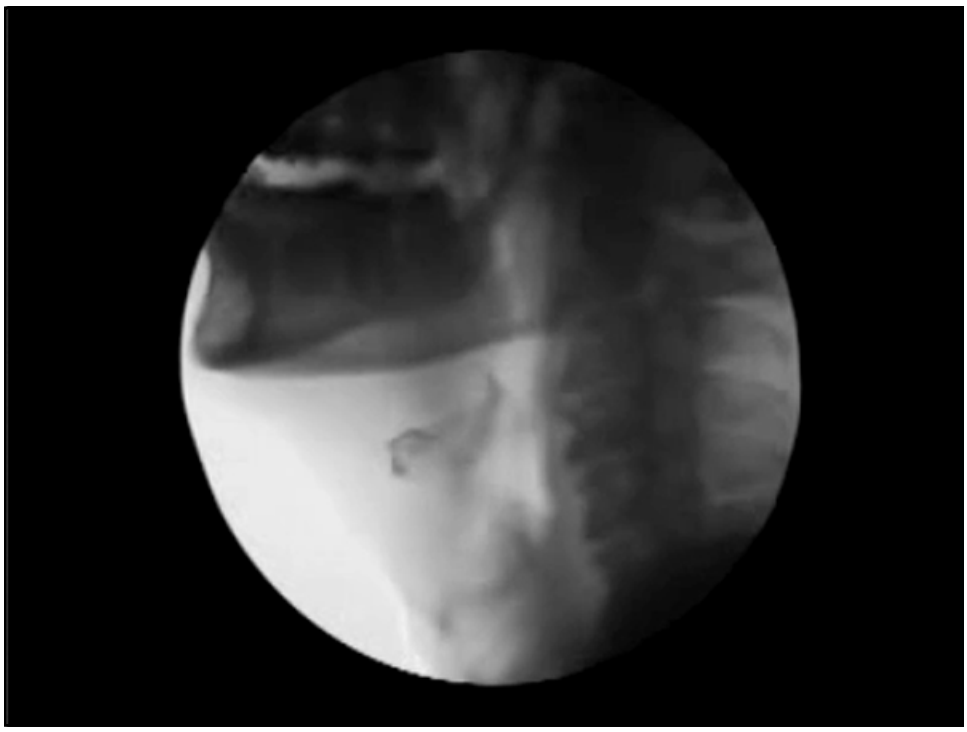
- Retrieved from: http://nathanclarkecommunication.wikispaces.com/file/view/Anatomy-of-the-larynx.jpg/151326099/Anatomy-of-the-larynx.jpg

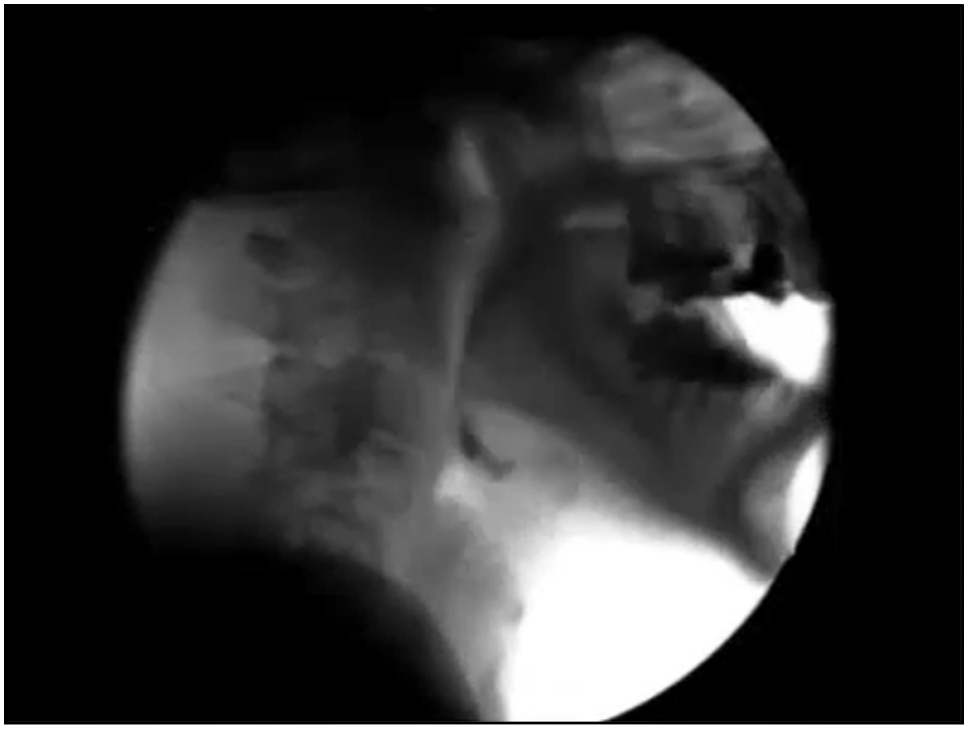
Identification of Anatomy-Unlabeled

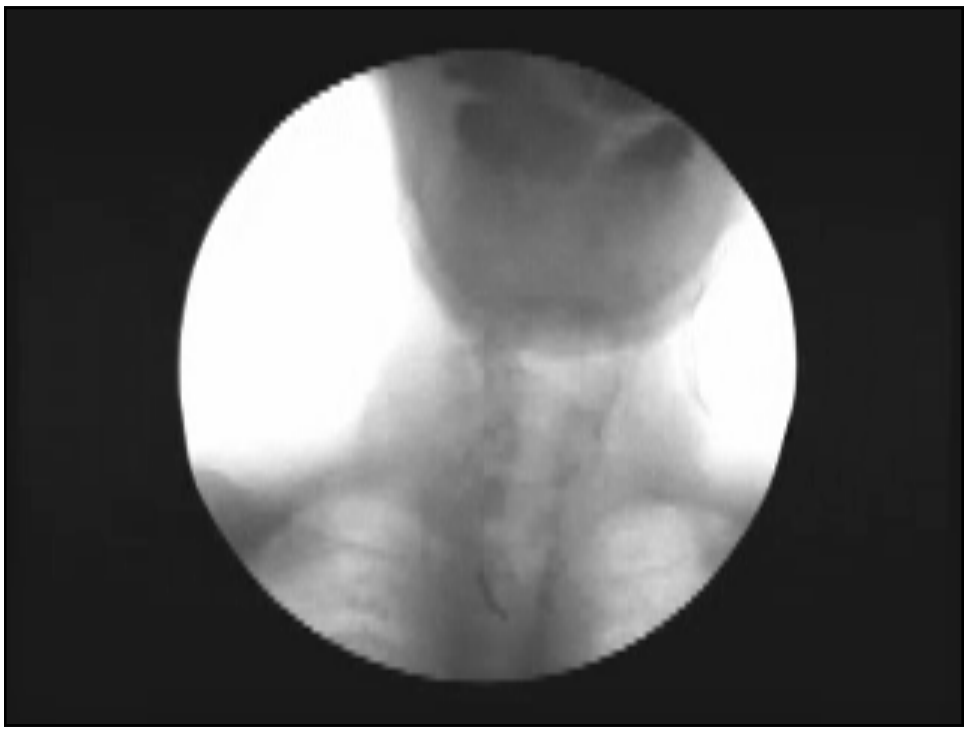












THE NORMAL SWALLOW

- **Normal Swallow:**
  - *Oral Prepatory Phase*- Lips, tongue, mandible, dentition, soft palate and muscles of the buccal cavity grind and position the food. The tongue arranges the bolus and moves it posteriorly and laterally, for mastication. At this point the reduction phase takes over and the food is chewed, ground and mixed with saliva to form a bolus.
  - *Oral Phase (transit)*- Lingual to palatal and alveolar ridge contact controls the bolus along with posterior tongue to velar contact. This retains the bolus in the oral cavity. The velum then elevates as the lips and buccal muscles contract to build pressure and reduce the volume of the oral cavity. The posterior tongue relaxes, and the anterior and middle portions elevate and contact the hard palate, propelling the bolus to the pharynx.
  - *Pharyngeal Phase-* As the tongue elevates and velopharyngeal closure begins, this triggers the upward and forward motion of the hyolaryngeal mechanism. This initiation of movement is judged as the onset of the swallow. Upper esophageal sphincter (UES) relaxation commences and the hyo-laryngeal elevation and excursion increase the opening of the UES. This activity is considered involuntary.
  - *Esophageal Phase-* The primary function of the esophageal body is passage of material from the pharynx to the stomach. With the sequential contraction of the esophagus and relaxation of the lower esophageal sphincter, the bolus is propelled through the esophagus by contraction above and relaxation below the bolus. The bolus passes from the proximal to the distal esophagus and into the stomach.

Murray, T. (2006) pp. 22-24.

The Normal Swallow-Slow Motion

VIDEO 1

The Normal Swallow

VIDEO 2

The Normal Swallow

Video 3

NORMAL ESOPHAGUS

Video 4

NORMAL ESOPHAGUS

VIDEO 5

THE AGING SWALLOW

- As adults approach 60 and 70 yrs of age and beyond:
  - When bolus retrieval occurs (e.g., from a cup), the bolus often pools on the floor of the oral cavity, where it is retrieved by the tongue tip
  - The oral stage is slightly longer
  - Onset of the swallow is slightly later
  - The larynx lowers slightly approaching the level of the 7th cervical vertebra
  - Arthritic changes in the cervical vertebra may impinge on the pharyngeal wall
  - A small amount of residue may be seen in the valleculae and pyriform sinuses
  - Esophageal transit and clearance are slower and less efficient

AGING SWALLOW-Oropharyngeal

Video6 -AGING SWALLOW 1

AGING SWALLOW-Oropharyngeal

Video7 -AGING SWALLOW 2

Aging Swallow-Esophageal

Video8 –

AGING SWALLOW ESOPHAGUS

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Course Exam

Have your Preview Exam ready (or some other means of recording your answers) so that you can enter those answers into our online system after this course is done

Exam: Normal, Aging or Disordered Swallow

Course Exam Question 1 - VIDEO 1

Exam: Normal, Aging or Disordered Swallow

Course Exam Question 2
-VIDEO 2

Exam: Normal, Aging or Disordered Swallow

Course Exam Question 3
-VIDEO 3

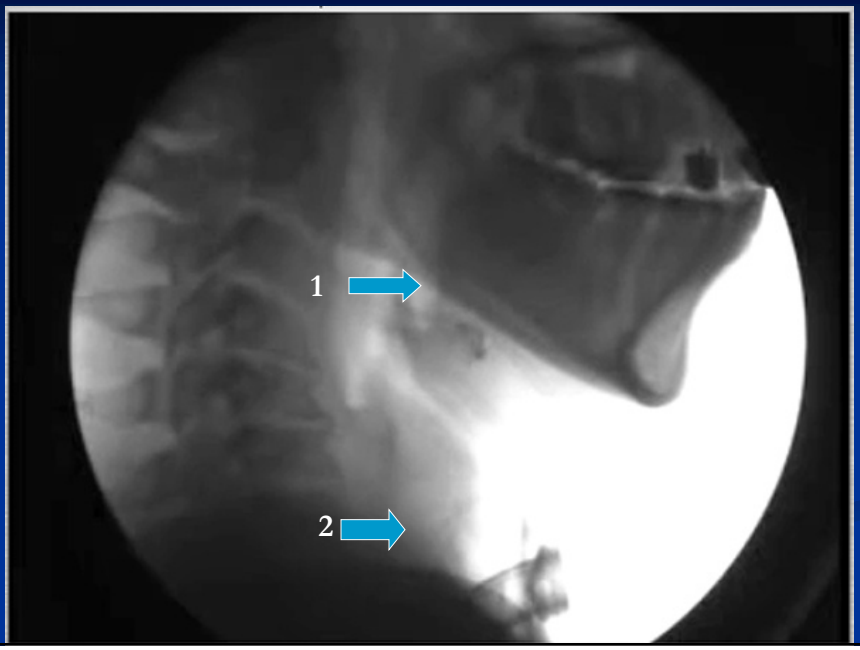
Exam: Normal, Aging or Disordered Swallow

Course Exam Question 4
-VIDEO 4

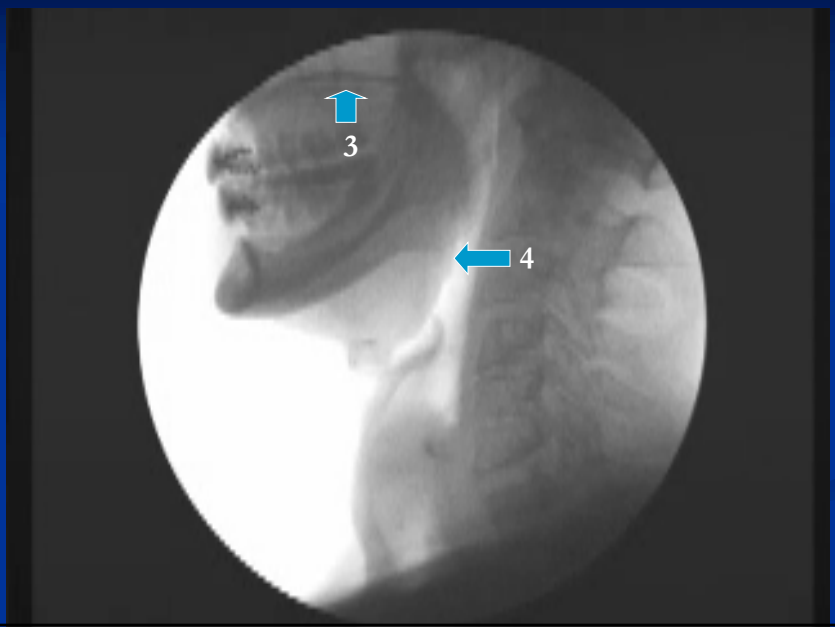
Exam: Normal, Aging or Disordered Swallow

Course Exam Question 5
-VIDEO 5

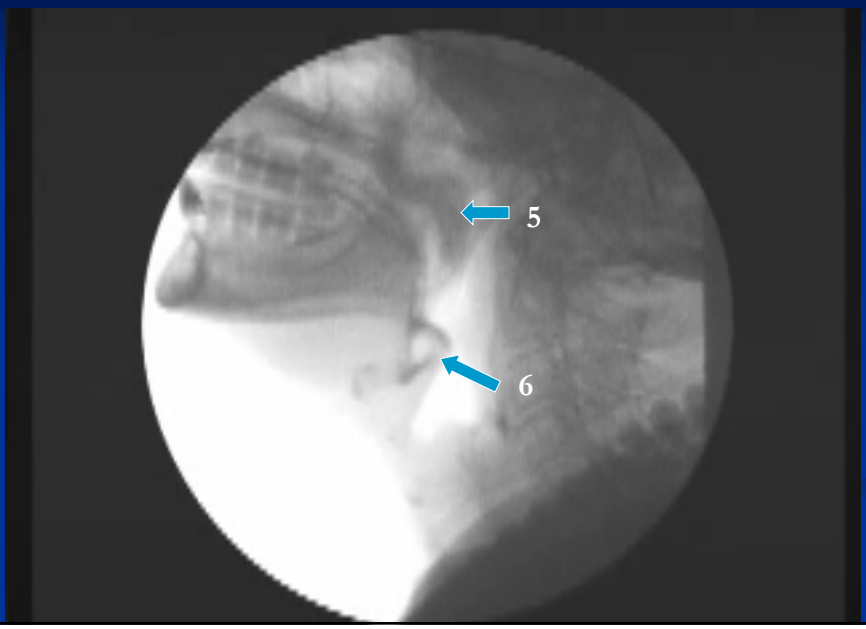
EXAM Qs 6 & 7 -IDENTIFICATION OF ANATOMICAL MARKERS



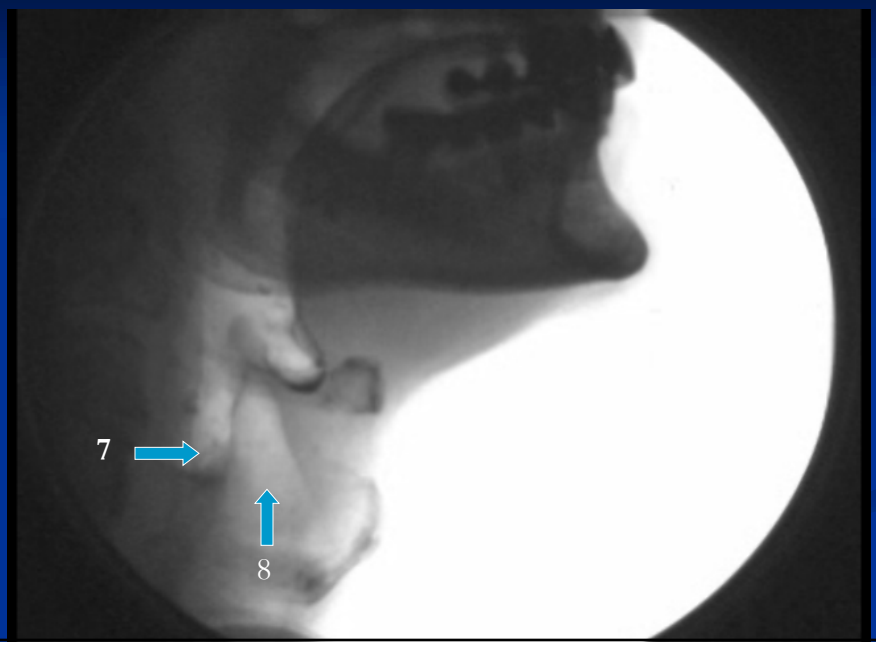
EXAM Qs 8 & 9-IDENTIFICATION OF ANATOMICAL MARKERS

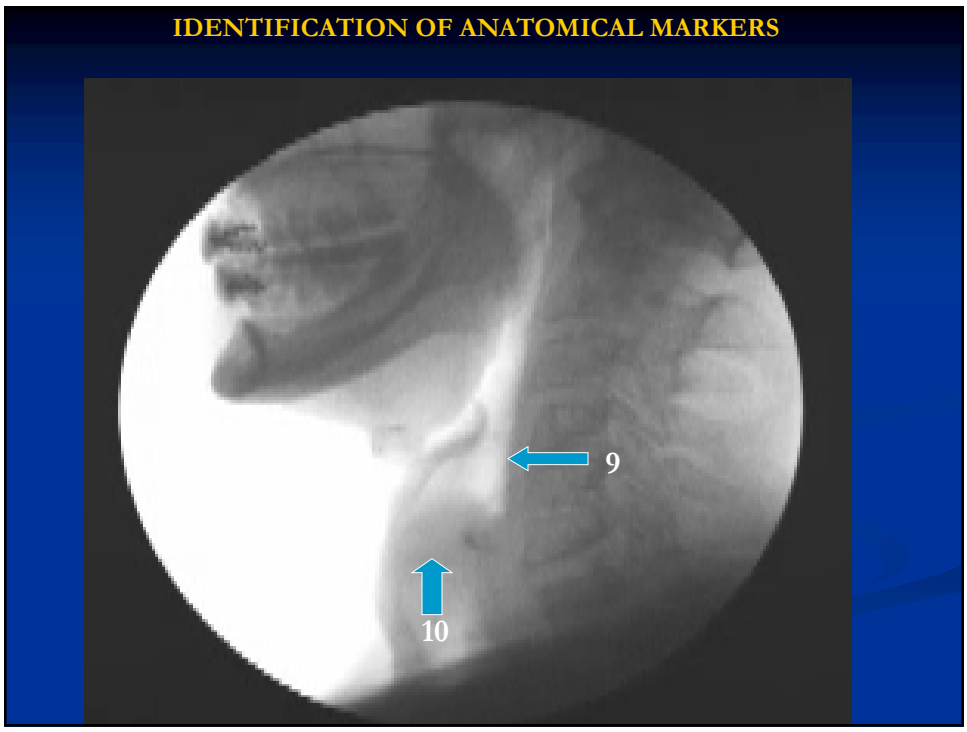


EXAM Q 10 -IDENTIFICATION OF ANATOMICAL MARKER



IDENTIFICATION OF ANATOMICAL MARKERS




IDENTIFICATION OF ANATOMICAL MARKERS
9
10