I CAN’T SWALLOW:
DYSPHAGIA AND ITS
RADIOLOGICAL STUDY

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Outline:

• Introduction to Patient
• Overview of Dysphagia
• Anatomy of Swallowing
• Phases of Swallowing
• Radiologic Evaluation of Dysphagia
  • ACR criteria
  • Barium Swallow
  • Modified Barium Swallow
• Back to our patient
• Conclusion
Intro to our Patient:

- **CC:** Difficulty swallowing
- **HPI:** Elderly patient who was in usual state of health until experienced progressive dysphagia 2 months prior to presentation at ED. First had trouble swallowing solids; currently can only swallow sips of liquids. Patient has immediate sense of holdup after swallowing. Needs to swallow multiple times to clear fluid. Reports no pain and no hx of stroke or neck radiation. Along with difficulty swallowing, patient has had R earache and hoarseness. Has seen many doctors in the past 2 months but none have been able to improve her condition.

Patient is desperate and has not eaten solid food in weeks!
Overview: Dysphagia

• From Greek word “dys” (with difficulty) and “phagia” to eat.

• Prevalence (Cook and Kahrilas, 1999):
  • 16-22% in individuals older than 50
  • 20-40% in patients with head injuries, CVA, and PD

• Complications: dehydration, malnutrition, aspiration, pneumonia, choking, and death.

*Dysphagia merits a work-up and should not be attributed to normal aging.*
The Anatomy: Lateral
More Anatomy: Coronal

Netter, Frank H., MD, 2011.
Swallowing can be divided in four stages: Oral preparatory, Oral propulsive, Pharyngeal, and Esophageal stages.

We will discuss each stage in the following slides.
Oral Preparatory Phase

- Liquid is held in anterior part of floor of mouth.
- Oral cavity is sealed posteriorly by contact between the soft palate and the tongue.
Oral Propulsive Phase

- Tongue tip rises and touches the ridge of hard palate.
- Back of oral cavity opens as posterior tongue drops.
- Tongue to palate contact expands from anterior to posterior, pushing bolus back along palate and into pharynx.
Pharyngeal Phase

Two important parts:
1. Propulsion of food through pharynx and upper esophageal sphincter
2. Airway protection
Food goes down the esophagus with help of peristalsis and gravity.
Now that we know the anatomy and stages of swallowing, we are ready to consider the differential diagnosis for dysphagia.
But before showing you the next slide, which is busy, recall that there are two types of dysphagia:

Oropharyngeal and Esophageal

And HISTORY is KEY for differentiating between the two.
Etiology of Dysphagia

**Approach to the Patient with Dysphagia**

- Dysphagia localized to neck, nasal regurgitation, aspiration, associated ENT symptoms
  - Oropharyngeal dysphagia
    - Structural
      - Zenker's diverticulum
      - Nodplasm
      - Cervical web
      - Oropharyngeal bar
      - Osteophytes
      - Congenital abnormalities
      - Post head and neck surgery
      - Chemotherapy mucositis
      - Radiation
      - Corrosive injury
      - Infection
    - Propulsive
      - Cerebral vascular accident
      - Parkinson's
      - Amyotrophic lateral sclerosis
      - Brainstem tumor
      - Guillain-Barré
      - Huntington's chorea
      - Post-polio syndrome
      - Multiple sclerosis
      - Cerebral palsy
    - Neurogenic
    - Myogenic
- Dysphagia localized to chest or neck, food impaction
  - Esophageal dysphagia
    - Solid and liquid dysphagia
      - Propulsive
      - Myogenic
        - GERD with weak peristalsis
        - Achalasia (primary and secondary)
        - Diffuse esophageal spasm
        - Scleroderma
      - Neurogenic
        - Myasthenia gravis
        - Polymyositis
        - Mixed connective tissue disorders
        - Oculopharyngeal muscular dystrophy
        - Paraneoplastic syndrome
        - Myotonic dystrophy
        - Sarcoidosis
    - Solid dysphagia
      - Structural
      - Odynophagia
        - Pill esophagitis
        - Infectious esophagitis
        - Caustic injury
        - Chemotherapy mucositis
        - Sclerotherapy
        - Crohn's disease
        - Behcet's syndrome
        - Bullous pemphigoid
        - Lichen planus

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Differential Diagnosis for Dysphagia

Put simply, when working up a patient with dysphagia, look out for **functional** or **structural** deficits in oral cavity, pharynx, larynx, esophagus, and sphincters.

**Structural**: Watch out for intrinsic and extrinsic structural causes

**Functional/Propulsive**: Can be problem with nerve, NMJ or muscle.
Zooming in on oropharyngeal dysphagia, let’s discuss what radiological studies can help us characterize its etiology.
### ACR Appropriateness Criteria

**Variant 2:** Unexplained oropharyngeal dysphagia.

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
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<tbody>
<tr>
<td>X-ray pharynx dynamic and static imaging</td>
<td>8</td>
<td>Both pharyngeal and esophageal examinations needed, since patient may have referred dysphagia.</td>
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**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level

In the next slides we will try to understand what this means....
Esophagram

- **Esophagram** is a fancy name for **barium swallow**. It can be single or double contrast study. Evaluates hypopharynx and esophagus.
- **Indications**: Dysphagia, odynophagia, evaluation of chest pain unrelated to heart or lungs, symptomatic GERD, evaluation of esophageal leak
- **Contraindications**: If suspect esophageal perforation or aspiration, use water soluble contrast. Do not perform in pregnant women.
- **Patient Prep**: NPO after midnight
- **Length of procedure**: 20 min
**X-Ray Biphasic Esophagram**

- **Procedure**: Swallow liquid barium (+/-) effervescent crystals and take x-rays in different views (upright and supine positions).
- **Three phases**: mucosal relief (A), full column images (B) and air contrast (C).

But why not just get an endoscopy?

Good question. In fact, endoscopies have replaced esophagrams in many aspects of medical care. But our beloved barium swallow is still better at detecting abnormalities in peristalsis, fistulas and diverticula compared to endoscopy.
Esophagrams help us look at the esophagus and its contours. But this only tells us about the last stage of swallowing. So how do we study the first three stages of swallowing radiologically?
Modified Barium Swallow

• A videofluoroscopic examination of oral cavity, pharynx, and cervical esophagus and used to assess swallowing function.
• As shown in table below, give patients liquids and solids of different consistencies and assess swallowing fluoroscopically.

Risk of developing aspiration pneumonia is directly related to degree of swallowing dysfunction on modified barium study (Pikus et al)

<table>
<thead>
<tr>
<th>Table 1. Food categories</th>
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<tbody>
<tr>
<td>Category</td>
</tr>
<tr>
<td>Thin liquids</td>
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<tr>
<td></td>
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<tr>
<td>Thick liquids</td>
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<tr>
<td>Ultra-thick liquids</td>
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<td>Formable (type A) solids</td>
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<td>Particulate (type B) solids</td>
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In the next slides we will see four examples of abnormal modified barium swallow studies.
Companion Patient #1: Abnormal Barium Swallow

Bolus in Nasopharynx

Companion Patient #2: Abnormal Barium Swallow

Aspiration

Companion Patient #3: Abnormal Barium Swallow

Pharyngeal Stasis

Companion Patient #4: Abnormal Barium Swallow

Cricopharyngeal Bar

When you don’t know why your patient has oropharyngeal dysphagia, you want to study function of oropharynx and esophagus via fluoroscopy. Plus examine oropharynx and esophagus with double contrast and static images.

### Variant 2: Unexplained oropharyngeal dysphagia

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*Relative Radiation Level*
Now back to our patient…

Do you remember the first thing we do when a patient presents with dysphagia?
Questions to ask patients with dysphagia

- Do you have problems initiating a swallow or do you feel food getting stuck a few seconds after swallowing? (Helps distinguish oropharyngeal from esophageal dysphagia.)
- Do you cough or choke or is food coming back through your nose after swallowing? (Coughing, choking, or nasal regurgitation suggests aspiration and oropharyngeal dysphagia.)
- Do you have problem swallowing solids, liquids, or both? (Liquids not solids suggests a motility disorder; solids progressing to liquids suggests a benign or malignant obstruction.)
- How long have you had problems swallowing and have your symptoms progressed, remained stable, or are they intermittent? (Rapidly progressive dysphagia is concerning for malignancy.)
- Could you point to where you feel food is getting stuck? (Ability to localize source of dysphagia is unreliable; best with oropharyngeal dysphagia.)
- Do you have other symptoms such as loss of appetite, weight loss, nausea, vomiting, regurgitation of food particles, heartburn, vomiting fresh or old blood, pain during swallowing, or chest pain?
- Do you have medical problems such as diabetes mellitus, scleroderma, Sjögren syndrome, overlap syndrome, AIDS, neuromuscular disorders (stroke, Parkinson, myasthenia gravis, muscular dystrophy, multiple sclerosis), cancer, Chagas’ disease or others?
- Have you had surgery on your larynx, esophagus, stomach, or spine?
- Have you received radiation therapy in the past?
- What medications are you using now (ask specifically about potassium chloride, alendronate, ferrous sulfate, quinidine, ascorbic acid, tetracycline, aspirin and NSAIDs)? (Pill esophagitis can cause dysphagia.)

Our Patient:
- Right after swallow
- Coughs and regurgitates food
- Both
- Progressed
- Points to neck
- No loss of appetite, nausea, heartburn or blood. Reports weight loss.
- None
- None
- None
- Just takes levothyroxine

Fass, 2013.
Our Patient: H&P Continued

- PMH: hypothyroidism, familial tremor, hip fracture, migraines, Medications: levothyroxine and ibuprofen PRN
- Allergies: none
- SH: Patient is retired and lives independently. Completes all ADLs unassisted. Has never smoked, does not drink and has no hx of illicit drug use.
- FH: No hx of cancer or cardiovascular complications
- Physical Exam: Patient is in NAD. Has supple neck and no nuchal rigidity. No palpable thyroid nodules. Normal cardiac, pulmonary, and abdominal exam. All CN intact.
Since our patient had what was thought to be oropharyngeal dysphagia, a modified barium swallow was ordered. A neck CT was also ordered to better visualize surrounding tissues.
Our Patient: Modified Barium Swallow Study

Showed regurgitation into nasopharynx and mild aspiration.

Modified Barium Swallow, lateral view
Our Patient: Left Neck Mass on CT

“4.6 cm mass adjacent to or arising from the left lobe of the thyroid. Further characterization with ultrasound can be considered, but ultimately biopsy would be required for definitive diagnosis. No cervical lymphadenopathy.”
Our patient: FNA Results

FNA biopsy showed **anaplastic thyroid carcinoma**

Unfortunately prognosis for this is dismal, with median survival ranging from 3 to 7 months (Tuttle and Sherman).

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At the time of presentation, patient had not made any decisions regarding future medical care.
But why did our patient complain of hoarseness?
The recurrent laryngeal nerve!
And is her original presentation with ear pain at all related to her neck mass?
Arnold’s Nerve
Vagus nerve has sensory branch to external ear canal. Thus, her earache could be an example of referred pain.
In summary, we studied:

- Definition, differential dx, and types of dysphagia
- Importance of history in building differential and deciding which radiological tests to order
- Indications, procedure, and benefits of Barium Swallow and Modified Barium Swallow
- Examples of abnormal Modified Barium Swallow studies
- Case of patient with progressive dysphagia and neck mass
References

• Dodds, Wylie et al. Physiology and radiology of the normal oral and pharyngeal phases of swallowing. AJR; 1990; 154: 953-963.
• Lembo, Anthony. Diagnosis and treatment of oropharyngeal dysphagia. In: Up to Date, Grover Ed.
• Netter, Frank H., MD - Atlas of Human Anatomy, Saunders, an imprint of Elsevier Inc. 2011: 1-152
With special thanks to:

Dr. Kate Troy, Dr. Gillian Lieberman, Phillip Purvis, Michael Larson, and Claire Odom.

For your time, patience, and insight.