Feeding and swallowing disorders in infants

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Disclosure

I have no relevant financial relationships to this activity.
Learning Objectives

1) Define infant dysphagia, chronic aspiration and laryngeal penetration.

2) Discuss the differential diagnosis of dysphagia in children including chronic aspiration, GERD and eosinophilic esophagitis.

3) Explore different treatment modalities of feeding disorders and proper utilization of diagnostic tools.
1. 14-month old boy, past medical history remarkable for prematurity (ex 24-weeker) presents with recurrent vomiting episodes, worsening after meals.

2. 19-month old baby girl with no remarkable past medical history presents with feeding intolerance of solid foods (tolerating well liquids).

3. 3-month old baby boy with trisomy 21 presents with chronic cough, back arching and vomiting during meals.

4. 1-month old baby boy presents with acute onset of cyanosis and lack of response, resolved within 3 minutes.

5. 7-month old baby girl, history of prematurity, g-tube fed, NPO, vomits after meals.
Introduction

Oropharyngeal dysphagia is defined as difficulty or improper swallowing of oral solids, liquids or both. It can lead to oropharyngeal aspiration.
Common GI causes of dysphagia

Chronic aspiration

GERD

Eosinophilic esophagitis
Phases of swallowing

1. Oral preparatory phase
2. Oral transit phase
3. Pharyngeal phase
4. Esophageal phase
**Introduction**

**Aspiration** occurs when pharyngeal secretions, food material or gastric contents enter the larynx and trachea, below the vocal cords, and can descent into the lungs.

**Laryngeal penetration** occurs when the foreign material only enters the laryngeal vestibule but does not descend below the vocal cords.
Risk factors for chronic aspiration

1. Neurologic impairment
2. Anatomical anomalies
3. Pulmonary disease
4. GI disorders
5. Others
GERD?

Reflux burden does not predict number of total admissions, even after adjusting for aspiration.

Duncan DR. *J Pediatr Gastroenterol Nutr* 2016
Aspiration - consequences

Airway injury due to acute aspiration appears very quickly. Aspirated gastric content appears within 12-18 seconds. Extensive atelectasis appears within 3 minutes. Acute pneumonia may occur within hours, and granulomatous changes appear within 48 hours.
Diagnosis for chronic aspiration

1. Clinical history
2. Physical exam
3. Imaging
4. Feeding evaluation
5. MBS
6. FEES
7. Radionucleotide salivary exam
8. Triple scope
Clinical manifestations

- Fussiness with meals
- Noisy breathing after meals
- Turning head away from bottle
- Arching during feeds
- Coughing during and after meals
- Clinically improved with thicker consistencies
MBS findings

Fig. 1. VFSS outcomes. (A) Tracheobronchial aspiration in a 2-year-old male. (B) Laryngeal penetration in a 6-month-old female. (C) Neither aspiration nor penetration in a 5-year-old female.

Endoscopy versus MBS

- Randomized prospective study of 126 adult patients with dysphagia, randomly assigned to either endoscopy or MBS.
- Clinical decision based on results.
- Monitored for 1 year for any development of pneumonia.

➔ Similar rates of pneumonia between the groups. Both diagnostic tests are equal.

Treatment

- Feeding modifications
- Feeding therapy?
- Gastrostomy? Nissen fundoplication?
Thickeners

Starch based thickeners:

Gum-based thickeners:

Xanthan gum:

Carbo gum

Infant cereal:

Food pureed (fruits, vegetables, yogurt):
NEC and commercial thickeners

• 3 cases of NEC reported in preterm infants receiving SimplyThick

• The concern is that feeding premature infants with xanthan gum-based thickener not only stimulates the immature gut by increase in water, sugars, SCFA and bile acids in the distal small intestine and colon, but also may directly activate gut lymphocytes and macrophages to trigger an excessive inflammatory cascade

Prognosis

- Prognosis is variable and depends on underlying factors, cause and duration of aspiration and amount and nature of aspirate.

- Also depends in utilization of diet modifications, feeding tubes and surgical interventions.

- Better lung function prior to the insult is associated with better outcome.

- Poor cognitive function is associated with worse outcome.
Common GI causes of dysphagia

Chronic aspiration

GERD

Eosinophilic esophagitis
Pediatric GERD

- GER – passage of gastric content into the esophagus with or without regurgitation/vomiting

- GERD – when the reflux leads to troublesome symptoms and/or complications.

Differentiating the two in infants is challenging: excessive crying, back arching, regurgitating, irritability

Sherman et al. evidence based consensus on the definition of GERD in the pediatric population Arch Pediatr 2010.
# Table 1. Symptoms and signs that may be associated with gastroesophageal reflux disease in infants and children 0 to 18 years old

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>General</td>
</tr>
<tr>
<td>Discomfort/irritability*</td>
<td>Dental erosion</td>
</tr>
<tr>
<td>Failure to Thrive</td>
<td>Anemia</td>
</tr>
<tr>
<td>Feeding refusal</td>
<td></td>
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<tr>
<td>Dystonic neck posturing</td>
<td></td>
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<tr>
<td>(Sandifer syndrome)</td>
<td></td>
</tr>
<tr>
<td><strong>Gastrointestinal</strong></td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>Recurrent regurgitation with/</td>
<td>Esophagitis</td>
</tr>
<tr>
<td>without vomiting in the older</td>
<td>Esophageal stricture</td>
</tr>
<tr>
<td>child</td>
<td>Barrett esophagus</td>
</tr>
<tr>
<td>Heartburn/chest pain†</td>
<td></td>
</tr>
<tr>
<td>Epigastric pain†</td>
<td></td>
</tr>
<tr>
<td>Hematemesis</td>
<td></td>
</tr>
<tr>
<td>Dysphagia/odynophagia</td>
<td></td>
</tr>
<tr>
<td><strong>Airway</strong></td>
<td>Airway</td>
</tr>
<tr>
<td>Wheezing</td>
<td>Apnea spells</td>
</tr>
<tr>
<td>Stridor</td>
<td>Asthma</td>
</tr>
<tr>
<td>Cough</td>
<td>Recurrent pneumonia</td>
</tr>
<tr>
<td>Hoarseness</td>
<td>associated with aspiration</td>
</tr>
<tr>
<td></td>
<td>Recurrent otitis media</td>
</tr>
<tr>
<td>Symptoms and signs</td>
<td>Remarks</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>Weight loss</td>
<td>Suggesting a variety of conditions, including systemic infections</td>
</tr>
<tr>
<td>Lethargy</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td></td>
</tr>
<tr>
<td>Excessive irritability/pain</td>
<td>May suggest urinary tract infection, especially in infants and young children</td>
</tr>
<tr>
<td>Dysuria</td>
<td></td>
</tr>
<tr>
<td>Onset of regurgitation/vomiting &gt;6 months or increasing/persisting &gt;12–18 months of age</td>
<td>Late onset as well as symptoms increasing or persisting after infancy, based on natural course of the disease, may indicate a diagnosis other than GERD</td>
</tr>
<tr>
<td><strong>Neurological</strong></td>
<td></td>
</tr>
<tr>
<td>Bulging fontanel/rapidly increasing head circumference</td>
<td>May suggest raised intracranial pressure for example due to meningitis, brain tumor or hydrocephalus</td>
</tr>
<tr>
<td>Seizures</td>
<td></td>
</tr>
<tr>
<td>Macro/microcephaly</td>
<td></td>
</tr>
<tr>
<td><strong>Gastrointestinal</strong></td>
<td></td>
</tr>
<tr>
<td>Persistent forceful vomiting</td>
<td>Indicative of hypertrophic pyloric stenosis (infants up to 2 months old)</td>
</tr>
<tr>
<td>Nocturnal vomiting</td>
<td>May suggest increased intracranial pressure</td>
</tr>
<tr>
<td>Bilious vomiting</td>
<td>Regarded as symptom of intestinal obstruction. Possible causes include Hirschsprung disease, intestinal atresia or mid-gut volvulus or intussusception</td>
</tr>
<tr>
<td>Hematemesis</td>
<td>Suggests a potentially serious bleed from the esophagus, stomach or upper gut, possibly GERD-associated, occurring from acid-peptic disease*, Mallory-Weiss tear† or reflux-esophagitis.</td>
</tr>
<tr>
<td>Chronic diarrhea</td>
<td>May suggest food protein-induced gastroenteropathy‡</td>
</tr>
<tr>
<td>Rectal bleeding</td>
<td>Indicative of multiple conditions, including bacterial gastroenteritis, inflammatory bowel disease, as well as acute surgical conditions and food protein-induced gastroenteropathy rectal bleeding‡ (bleeding caused by proctocolitis)</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>Indicative of obstruction, dysmotility, or anatomic abnormalities</td>
</tr>
</tbody>
</table>
Pediatric GERD

- History and physical examination are sufficient to establish a diagnosis of uncomplicated infantile reflux.

- Note: fussiness, crying and back arching with or without spitting up on an otherwise thriving infant (with no “red flags”) → no need for diagnostic testing and therapies (despite an intense pressure by families).

- EGD: usually in older infants that have persistent symptoms on PPI or inability to wean off PPI

- PH/impedance esophageal monitoring: persistent symptoms, no erosions on EGD
Treatment of pediatric GERD – step 1&2

• Use of thickeners may slightly improve the occurrence or regurgitation/vomiting symptoms.

• Feeding modifications, while no sufficient evidence exist to advocate their use, should be considered prior to using more costly and risky interventions.

• Hydrolyzed formulas and amino acid based formulas are not part of GERD treatment. However as GERD and CMP allergy have clinical similarity, consider a trial of those formulas as a step 2.

• For each intervention we need a minimum of 2 weeks to assess for clinical improvement.
Not part of GERD treatment:

1. Positioning therapy (left side, head elevation) – unclear if this improves reflux symptoms.
2. Probiotics
3. Massage therapy
4. Parental tobacco avoidance
5. Complementary therapy
6. Dietary supplementation

What about medical treatment?
Common GI causes of dysphagia

Chronic aspiration

GERD

Eosinophilic esophagitis
Eosinophilic esophagitis

- Characterized by significant eosinophilic infiltrate in the esophagus
- Etiology is an increased immunological response to allergen exposure
- Strong link to those with atopy
Eosinophilic esophagitis
Eosinophilic esophagitis - diagnosis

- Symptoms of esophageal inflammation: pain, heartburn, emesis, food impaction, dysphagia

- Requirement of biopsy showing >15 eos/hpf

- Exclusion of other disorders with similar clinical presentation
Eosinophilic esophagitis

- Clinical symptoms – age variability
  - Infants and toddlers: food refusal, vomiting, pain/discomfort when eating
  - School age: chronic abdominal pain and vomiting
  - Adolescence: reflux, dysphagia, recurrent food impaction
Eosinophilic esophagitis - treatment

- Topical steroids
- Elimination diet (milk, soy, wheat, eggs, peanut, shellfish)
- Biological agents
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