Eosinophilic Esophagitis Diagnosis & Management

2nd Edition
Core Slide Set
Disclosures

Educational support for the *Eosinophilic Esophagitis Diagnosis and Management* slide set was provided by Abbott Nutrition.

**NASPGHAN FOUNDATION** and **NASPGHAN** do not endorse any commercial product. Any products named in this slide set are presented as part of the scientific evidence being cited and are used only to illustrate teaching points. The opinions expressed in the educational activity are those of the faculty. Please refer to the official prescribing information for each product for discussion of approved indications, contraindications, and warnings. Audience members are required to critically evaluate any product that they will use in clinical care.
Presenter Disclosure

• Put your disclosure here
Learning Objectives

Upon completion of this activity, participants should be better able to:

• To define Eosinophilic Esophagitis (EoE) and present the updated 2011 diagnostic guidelines.

• To understand the epidemiology, pathophysiology and genetics of EoE.

• To identify the clinical symptoms, allergic manifestations, endoscopic and histologic features of EoE.

• To list and define the treatments of EoE which include dietary restriction, pharmacologic therapy and esophageal dilation.

• To understand how to manage patients with EoE.

• To provide information regarding ongoing and future research on EoE.
Background & Natural History
Natural History Adults

• There is still an incomplete understanding of the natural history of EoE

• Long term associated morbidity has now been reported to include the formation of esophageal strictures; either short or long segments of the esophagus, which is the result of chronic esophageal inflammation and remodeling resulting in fibrosis of the esophagus
Definition
Normal eosinophil values, per high power field (hpf):

- Esophagus (0)
- Gastric antrum (2-10)
- Duodenum (10-20)
- Colon (15-30)

Average accepted values

Esophageal Eosinophilia

Differential Diagnosis

• Eosinophilic Esophagitis
• Gastroesophageal Reflux Disease
• PPI-responsive esophageal eosinophilia
• Celiac Disease
• Eosinophilic gastroenteritis
• Crohn’s Disease
• Hypereosinophilic syndrome
• Achalasia
• Vasculitis, pemphigus, connective tissue disease
• Infection
• GVHD
Panel of 33 physicians (6 months)

Conceptual Definition

“Eosinophilic esophagitis represents a chronic, immune/antigen mediated, esophageal disease characterized clinically by symptoms related to esophageal dysfunction and histologically by eosinophil-predominant inflammation”

Pediatric and adult EoE likely the same disease

Diagnostic Guideline

• EoE is a clinico-pathologic disease
• Clinically characterized by esophageal dysfunction
• Pathologically 1 or more biopsies show eosinophil predominant inflammation (15+ eosinophils in peak hpf)
• Isolated to esophagus (need for other GI biopsies)
• Other causes need to be excluded
  - Distinguish between “EoE” and “esophageal eosinophilia”
  - “PPI responsive esophageal eosinophilia”
• EoE diagnosis made by clinicians
• Rarely < 15 eos/hpf (if other path features are present)
PPI-Responsive Esophageal Eosinophilia
PPI-Responsive Esophageal Eosinophilia

• PPI-REE currently considered to be “distinct” from EoE

• Etiology
  – Gastroesophageal reflux responsive to acid suppression
  – Possible anti-inflammatory effect of PPI
  – Subset of EoE
  – Combination of GERD and EoE

• Important to make distinction

• Further research needed
Epidemiology of Eosinophilic Esophagitis
## Age of Onset of EoE

<table>
<thead>
<tr>
<th>Mean age (N=30)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>At first diagnosis</td>
<td>33</td>
</tr>
<tr>
<td>At first manifestation</td>
<td>29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean age (N=31)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>At first diagnosis</td>
<td>34</td>
</tr>
<tr>
<td>Years “incorrect diagnosis”</td>
<td>7</td>
</tr>
</tbody>
</table>

# Frequency of EoE in a Single County

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>22</td>
<td>24</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>Incidence*†</td>
<td>0.909</td>
<td>0.991</td>
<td>1.033</td>
<td>1.281</td>
</tr>
<tr>
<td>Prevalence*</td>
<td>0.991</td>
<td>1.983</td>
<td>3.016</td>
<td>4.296</td>
</tr>
</tbody>
</table>

‡ Hamilton County, OH  
* per 10,000 population age 0-19 years  
† Chi-square test for trend NS

**Potential Pathophysiology of EoE**

- Intraluminal allergen exposure
  - Predominately food antigens
- Mucosal production of eosinophilic chemoattractants
- Influx of eosinophils
- Release of inflammatory mediators
- Esophageal dysfunction

Cells Related to EoE

• Esophageal eosinophils
• An expansion of Th2 cells are found
• Both Th2 cells and eosinophils play a critical role in the pathogenesis of EoE
• Other cells
  – Esophageal mast cells
  – Esophageal basophils
Genetics
Gene Expression Profile of EoE

EoE patients have a unique gene expression profile

230 Genes Downregulated

344 Genes Upregulated

EoE - Genetics

- Increased incidence in siblings and 1st degree relatives
- Identified gene locus at chromosome 5q22
- TSLP gene (Thymic Stromal Lymphopoietin Protein)

Fibrosis
Esophageal Fibrosis

• Occurs in adults
• Occurs in animal model
  – In response to allergen challenge
• Occurs in pediatric patients
  – With dysphagia
  – With strictures and EoE

EoE as a Progressive Disease

Predicted probability of developing fibrostenosis

- Predicted probability
- Upper 95% CI
- Lower 95% CI

OR = 2.1 (1.7-2.7) per 10 year increase for developing a fibrostenotic EoE phenotype

Pediatric Clinical Symptoms
Clinical Features

- Male predominance (about 3:1)
- Multiple reports of familial clustering (within and across generations)
- Association with food allergy and atopy
- Chronic condition in adults and children

Furuta et al. Gastroenterology. 2007; 133:1342-1363.
Feeding Disorder: 13%
Vomiting: 26%
Abdominal Pain: 26%
Dysphagia: 27%
Food Impaction: 7%
Clinical Symptoms - Pain

- Present in 5-68% of children
- Frequent, but not universal complaint
- May be chest pain or abdominal pain (epigastric or generalized)
- GERD-like symptoms in 5-82% of children
- Odynophagia is not typical
- May be responsive to acid suppression therapy
Clinical Symptoms - Vomiting

- Present in 8-100% of children with EoE
- Not clinically distinguishable from other causes of vomiting
- Symptom frequently misclassified as GERD and there is often a delay in diagnosis
- Typically true vomiting over effortless regurgitation
- Chronic, episodic and unpredictable
- May not occur immediately after food ingestion
Clinical Symptoms - Dysphagia

• The most common symptom of EoE in adults

• In children, dysphagia manifests in several ways:
  – Choking, gagging, food refusal
  – The sensation of food sticking or going down slowly
  – Food impaction

• Often occurs even in the absence of esophageal stricture or small caliber esophagus
EoE and Atopy
Prevalence of Atopic Disease in EoE

- Asthma, allergic rhinitis, atopic dermatitis and IgE mediated food allergies are common and increasing in the general population.
- Patients with eosinophilic gastrointestinal disorders have a higher prevalence of all atopic disorders.
- Studies report between 50% to 93% of EoE patients have some type of atopic disorder.
  - Rise in EoE mirrors rise in atopy.
  - Atopy much more common in patients with EoE.
# Incidence of Atopic Symptoms

<table>
<thead>
<tr>
<th>Feature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhinoconjunctivitis</td>
<td>57.4</td>
</tr>
<tr>
<td>Wheezing</td>
<td>36.8</td>
</tr>
<tr>
<td>Food allergy*</td>
<td>46</td>
</tr>
<tr>
<td>Family history atopy</td>
<td>73.5</td>
</tr>
<tr>
<td>Family history EoE</td>
<td>6.8</td>
</tr>
</tbody>
</table>

* H/O positive skin-prick, RAST, or clinical response

Association with Environmental Allergies
20 year old female, history of multi-sensitization to aeroallergens. Symptoms of allergy and EoE peaked during pollen season.

Radiologic Findings
Esophageal Rings
Small Caliber Esophagus
Endoscopic Findings
Esophageal Furrowing
White Plaques
Esophageal Rings
Esophageal Fragility
Histology of EoE
EoE Histology
EoE Histology
Histology of EoE

Eosinophilia is often patchy

Multiple biopsies are necessary

EoE currently determined by the number of eosinophils in most affected field
Number of Biopsies to Diagnose Pediatric EoE

Complications
Distal Esophageal Stricture
Small Caliber Esophagus
Pill Impaction
Treatment with PPIs
Rationale for PPI Therapy

- GERD causes eosinophilia
  - Usually less than 7 eosinophils/hpf but can be greater
- GERD and EoE co-exist but are unrelated
  - 20% to 40% of adults have GERD
- EoE contributes to or causes GERD
  - Eosinophil secretory products alter esophageal motility, permeability, and fibrosis causing secondary GERD
- GERD contributes to or causes EoE
  - Increased esophageal permeability results in exposure of deep epithelial layers to antigens
- A trial of proton pump inhibitors (PPI’s), even when diagnosis of EoE appears clear-cut, is always recommended

Eosinophils Respond to PPI’s Adolescents/Young Adults

<table>
<thead>
<tr>
<th></th>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)/sex</td>
<td>14/M</td>
<td>25/M</td>
<td>13/F</td>
</tr>
<tr>
<td>Presentation</td>
<td>Pain</td>
<td>Food impaction</td>
<td>Dysphagia</td>
</tr>
<tr>
<td>Environmental Allergies</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Treatment</td>
<td>Omeprazole 10 mg BID</td>
<td>Omeprazole 20 mg BID</td>
<td>Omeprazole 20 mg QD</td>
</tr>
<tr>
<td>Eosinophils/hpf</td>
<td>Before treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>21</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>After treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

PPI Therapy and EoE

• Acid suppression with PPI’s
  – Important for making the diagnosis of EoE
  – Useful for treating symptoms associated with EoE that may be due to secondary GERD
  – Possible primary therapy for esophageal eosinophilia not related to acid suppression but instead to another, as yet identified, PPI related response
  – Proton pump inhibitor therapy alone, is insufficient for the treatment of EoE
Dilation
Savary Esophageal Dilators
Laceration After Dilation in EoE

Esophageal Dilation in EoE

- Dilation does not address the underlying disease process
- Relapse is common after dilation although prolonged remission can occur
- Significant risk of long mucosal lacerations and pain
- Esophageal perforation risk is low but consequences can be substantial
- Pharmacologic and dietary therapy is effective at relieving symptoms and treating strictures
- Whenever possible, pharmacologic or dietary therapy should be attempted prior to esophageal dilation

Furuta et al. Gastroenterology. 2007; 133:1342-63.
Steroid Treatment in Pediatrics
Oral Steroid Studies


1 mg/kg BID; max 30 mg BID

Eos/hpf

<table>
<thead>
<tr>
<th>Study</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liacouras (n=20)</td>
<td>34.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Schaefer (n=40)</td>
<td>29</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Topical Steroids (*Swallowed Fluticasone*)

- **Konikoff** (n=18): Design: RCT, Max Dose: 880 mcg/day
- **Noel** (n=20): Design: Retrospec, Max Dose: 1320 mcg/day
- **Teitelbaum** (n=13): Design: Prospec, Max Dose: 880 mcg/day
- **Schaefer** (n=40): Design: RCT, Max Dose: 1760 mcg/day

*Post treatment data on 16 patients.*

Liquid Budesonide

- 20 children with EoE (baseline: 87 eos/hpf)
- Prescribed liquid budesonide (1-2 mg once daily) mixed with a sucralose (Splenda®) paste
  - 16 responders (< 8 eos/hpf);
  - 3 partial responders (8-23 eos/hpf);
  - 1 non-responder (no change in eos) after 3-4 months of treatment;
  - No significant adverse effects; esophageal *Candidiasis* in one patient

Randomized, Double-Blind Placebo Controlled Trial Budesonide (BEE Trial)

36 Adults with EoE
Placebo or budesonide 1 mg BID x 15 days

Eosinophils per hpf

Before treatment

After treatment

Budesonide

Placebo

Guidelines for Corticosteroids in EoE

- Systemic and topical corticosteroids effectively resolve the acute clinico-pathological features of EoE.

- When discontinued, the disease generally recurs.

- Systemic corticosteroids may be utilized in emergent cases such as dysphagia requiring hospitalization, dehydration due to swallowing difficulties and weight loss, etc.
  - Because of the potential for significant toxicity their long-term use is not recommended.

- Topical corticosteroids are effective in inducing a remission of EoE when utilized in high doses (pediatrics & adults).
  - The incidence of long term side effects with this form of administration has not been formally studied but currently it is well tolerated (fungal infections).

- Topical corticosteroids are used for maintenance of EoE but have not been well studied.

Furuta et al. Gastroenterology. 2007; 133:1342-63.
Dietary Treatment in Pediatrics
History of Diet and EoE

- In 1995: “Eosinophilic esophagitis attributed to gastroesophageal reflux: improvement with an amino acid-based formula”
  - 10 patients with refractory reflux symptoms
  - 6 had received anti-reflux surgery without resolution
  - All with markedly elevated esophageal eosinophils
- Patients given a trial of an “elemental diet”
  - Amino acid based formula
  - Minimized any risk of food allergy

Diet and Eosinophilic Esophagitis

• After elemental diet:
  – Symptom resolution in 8 patients, improvement in 2
  – Improvement occurred within 3 weeks
  – Biopsies improved as well

• Symptoms returned after food was reintroduced

• Conclusions:
  – EoE is an allergic phenomenon
  – EoE improves with food elimination

![Graph showing maximum intraepithelial esophageal eosinophil counts before and after dietary trials.](image)
Dietary Management
Amino Acid–Based Formula

- 172 Patients (128 nasogastric tube, 32 oral, 4 failed, 8 noncompliant)
  - 160 patients completed therapy
- Patients evaluated 4-6 weeks after instituting diet

<table>
<thead>
<tr>
<th>160 Patients</th>
<th>Pre-diet</th>
<th>Post-diet</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eosinophils per hpf</td>
<td>38.7 ± 10.3</td>
<td>1.1 ± 0.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>30</td>
<td>1</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>GERD symptoms</td>
<td>134</td>
<td>3</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

EoE – Elemental Diet

Before

After
Types of Dietary Therapy for EoE

• Total Elimination Diet
  – Amino-Acid based formula

• Selective Diet
  – Empiric Diet
  – Directed (Targeted) Diet
Advantages of Elemental Diet

• When administered correctly:
  – > 95% demonstrate clinical and histologic response
  – Allows systematic re-introduction of foods

• Can lead to prolonged remission clinically and histologically without the need for medications

• Causative foods may be able to be reintroduced successfully later (tolerance)
Obstacles to Elemental Diet

• Elemental formula is unpalatable
• Commonly needs nasogastric or gastrostomy tube to administer
• Nutritional status must be monitored closely
• Elemental formulas are expensive
  – Variable insurance coverage
  – Usually significant out of pocket expense
• Quality of Life issues
Selective Elimination Diet

- Removal of a limited number of foods
- 2 types of dietary restriction
  - Empiric (based on history of the most likely foods)
    - “The usual suspects”
    - Milk, soy, egg, peanut, wheat, fish, meats
  - Directed (based on allergy testing or clinical symptoms)
    - Clinical history
    - Allergy testing (skin prick tests, atopy patch tests)
Empiric Elimination Diet

• Six food elimination diet (SFED)
• 60 EoE patients – retrospective review
  – 35 given diet without milk, soy, wheat, egg, peanut, nut and fish
  – 25 given amino acid formula
• Biopsies done at start compared with 6 weeks of diet therapy
• Improvement in restricted group 75% while amino acid group 90%

Empiric Diet Elimination

- Easy, do not need testing
- Few studies in the literature
- May not eliminate all foods necessary to induce remission
- May eliminate foods that are not necessary to be eliminated
- May prolong the process of food elimination and re-introduction
Directed Diet Elimination

• Elimination by history/symptoms (or guessing) is challenging
  – Reactions may be delayed several days after exposure
  – Reactions may persist several days after exposure
  – More than one food may be causing reaction
• Elimination based on diagnostic testing is inaccurate
Methods of Direct Allergy Testing for EoE

Bifurcated Needle

Milk — Soy — Corn — Beef — Chicken — Wheat — Potato — Egg — Oat — Rice — Saline —
Response of 3 Types of Dietary Restriction

<table>
<thead>
<tr>
<th>Method</th>
<th>% of Patients Clinically and Histologically Significantly Improved</th>
<th># of Esophageal Eosinophils Still Present After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary Restriction (Empiric - Kagalwalla)</td>
<td>74%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Dietary Restriction (Directed - Spergel)</td>
<td>77%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Dietary Elimination (Liacouras)</td>
<td>95%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

# Diet Choice

## TABLE V. Comparison of food prick skin testing and atopy patch testing precision in patients with eosinophilic esophagitis

<table>
<thead>
<tr>
<th>Approach</th>
<th>Definition</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental</td>
<td>Diet exclusively consisting of amino acid–based formula</td>
<td>• Hypoallergenic</td>
<td>• Taste (may require feeding tube)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nutritionally comprehensive</td>
<td>• Expense</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduces symptoms and eosinophil counts</td>
<td>• Age appropriateness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Excludes all food</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• May have adverse impact on quality of life</td>
</tr>
<tr>
<td>Empiric diet</td>
<td>Diet that eliminates the major food allergens from the diet (typically milk, egg, wheat, soy, peanut/tree nut, and fish/shellfish, though variants exist)</td>
<td>• Allergy testing not required</td>
<td>• Some avoidance may be unnecessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Studied across all ages</td>
<td>• Only four foods may be necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduces symptoms and eosinophil counts</td>
<td>• Expense</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• May be nutritionally incomplete</td>
</tr>
<tr>
<td>Targeted diet</td>
<td>Diet that eliminates foods on the basis of allergy skin testing (skin prick test and/or atopy patch test)</td>
<td>• Most specific therapy</td>
<td>• Testing precision and technique is inconsistent across centers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Can preserve diet</td>
<td>• Milk testing precision very poor when negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Established sensitivity, specificity, and NLR/PLR to assist with add-back</td>
<td>• Empiric milk elimination as an addition greatly improves response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduces symptoms and eosinophil counts</td>
<td>• Some avoidance may be unnecessary (sensitization without clinical allergy)</td>
</tr>
</tbody>
</table>

Foods Causing EoE

• Foods found in single elimination or reintroduction with positive biopsies
  – Milk > Egg, Soy > Corn, Wheat, Beef > Chicken > Peanuts, Rice, Potato > Oat, Barley, Turkey, and Pea

• Most EoE patients, average 4 to 5 foods

• Up to 25% have severe food allergies - unable to tolerate ANY food without symptoms and histologic changes
# Food Reintroduction

*After Normal Biopsy*

## Reintroduction Strategy

<table>
<thead>
<tr>
<th>Reintroduction Strategy</th>
<th>Pediatric</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested order</td>
<td>Fish/shellfish</td>
<td>Fish/shellfish</td>
</tr>
<tr>
<td></td>
<td>Peanut/tree nut</td>
<td>Egg</td>
</tr>
<tr>
<td></td>
<td>Soy</td>
<td>Peanut/tree nut</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>Soy</td>
</tr>
<tr>
<td></td>
<td>Egg</td>
<td>Milk</td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>Wheat</td>
</tr>
</tbody>
</table>
Role of Dietician in EoE

• Assessment of nutritional status
• Determination of dietary adequacy
• Working within dietary restrictions to provide balanced, acceptable diet
• Education of patient & family
• Identification /assessment of barriers to effective nutritional therapy
Guidelines for Dietary Therapy in EoE

• Dietary therapy (AA formula, SFED, directed diet) should be considered and discussed in all patients with a diagnosis of EoE

• The use of dietary therapy may lead to a complete or near-complete resolution of both the clinical and histologic abnormalities.

• Dietary therapy may reverse esophageal fibrosis.

• Consultation with a registered dietician is strongly recommended to ensure proper calories and micronutrients.

Furuta et al. Gastroenterology. 2007; 133:1342-63.
Biologic Treatment
Anti-Interleukin 5

• IL-5 is the predominant cytokine mediating eosinophil function; eosinophil lifeline

• Pediatric and Adult trials –

• Eos counts reduced in most; complete histologic resolution in only a small #. No change in symptoms in adults.

Anti-IL5 on Esophageal Eosinophils

Anti-IL5 - Current Studies

• Mepolizumab
  – Utilized 3 different doses of anti-IL5 via 4 week infusions
  – Significantly reduced esophageal eosinophilic inflammation
  – Symptom improvement difficult to assess

• Reslizumab
  – Placebo controlled trial
  – Anti-IL5 significantly reduced esophageal eosinophils
  – Symptom improvement similar between placebo and anti-IL5

Assa’ad et.al. Gastroenterol. 2011;141:1593-1604
Treatment

- EoE has become a significant component of most practices in both pediatric and adult gastroenterology.
- Centers for the care of patients with EoE have been developed to coordinate multiple health care providers including allergy/immunology, gastroenterology, and nutrition.
A trial of PPI therapy is required for patients with presumed eosinophilic esophagitis, even if the diagnosis seems clear-cut.

Proposed Endpoints for Treatment of Eosinophilic Esophagitis

Symptomatic Remission

Histological Remission

Endoscopic Remission

Rings

Furrows

Exudates

Endoscopic photos from Dr. Ikuo Hirano
Suggested Algorithm for Management of Eosinophilic Esophagitis

**Suspected EoE**
- PPI 8 wks, Ongoing or Intermittent Symptoms
  - EGD with Bx
    - 0-4 Eos/hpf
      - GERD or PPI Responsive Eosinophilia (PPIREE)
    - 5-14 Eos/hpf
      - GERD, PPIREE or Indeterminate EoE
        - Symptoms +/- Pathology (? Non-adherence)
          - Elemental Diet
            Systemic Steroid
            Esophageal Dilation
            High Dose Topical Steroid (?)
            Biologic Therapy (?)
        - Symptomatic Stricture with Histologic Remission
          - Esophageal Dilation
    - >15 Eos/hpf
      - Topical Steroid or Dietary Therapy

**Follow up**
- Symptomatic Stricture with Histologic Remission
  - Consider Maintenance Therapy
The Next Frontiers

- Steroid formulations with greater viscosity and/or esophageal tissue adherence; other delivery methods
- Antibodies targeting IL-13 and eotaxin
- Prostaglandin D2 inhibitor – ‘CRTH2’
- ? co-therapy with PPI – augment CRTH2; block eotaxin-3 release
- Other mechanisms of PPI effects
- FDA approval of drugs currently used or under study
EoE - Future Testing Methods

- Esophageal biomarkers
- Serum biomarkers
- Esophageal String Test
  - Capsule filled with a 90 cm string, swallowed with string to remain in place (taped to face) for a period of time
  - String removed and proximal secretions evaluated for biomarkers of disease

Advocacy Groups
Advocacy Groups

• American Partnership for Eosinophilic Disorders
  – www.apfed.org

• Campaign Urging Research for Eosinophilic Disorders
  – www.curedfoundation.org

• Food Allergy Network
  – www.foodallergy.org
TIGER
Conclusions

- EoE is a clinico-pathologic disorder diagnosed by clinicians
- EoE can occur “at any age”
- Pediatric and Adult EoE are likely the same disease
- Incidence and prevalence continue to increase
- Important that you make the distinction between
  - Eosinophilic Esophagitis
  - Esophageal Eosinophilia
  - “PPI-responsive” esophageal eosinophilia
- “Stay tuned”
  - Expect changes to occur within the guidelines as therapy, research and interest continues