The Unified Airway: Allergic Rhinitis and Asthma

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Disclosure of Financial Relationships

- None
Objectives

At the conclusion of this lecture, the participant should be able to:

• Recognize the similar pathophysiologic features of allergy and asthma

• Understand the epidemiologic relationship of asthma and rhinitis

• Describe the “Unified Airway” and possible mechanisms.
Allergy testing and history confirm the diagnosis of allergic rhinitis in your patient. They deny having a history of asthma and are not on asthma medication. Which would you do to evaluate for asthma?

• Maybe nothing, unless they volunteered asthma symptoms
• Ask about asthma symptoms, listen for wheezing
• Ask, Listen, send for Spirometry
“One Airway, One Disease”

• Asthma and allergic rhinitis increasingly viewed as a continuum of disease involving one common airway
  – Allergic rhinitis in patients with less severe disease
  – Asthma in patients with more severe disease

• Concept of “one airway, one disease” gaining greater acceptance

Asthma and Rhinitis

- Epidemiological, pathophysiologica, and clinical studies suggest a relationship between rhinitis and asthma

- Upper and lower airways may be influenced by a common inflammatory process that is sustained and amplified by interconnected mechanisms

- “When considering a diagnosis of rhinitis or asthma, an evaluation of both the lower and upper airways should be made”
Links Among Asthma, Allergic Rhinitis, Sinusitis, and Otitis Media
What percentage of Allergic rhinitis patients have asthma?

- 7%
- 14%
- 28%
- 56%
What percentage of asthmatic patients have rhinitis?

- 10%
- 20%
- 40%
- 80%
Inconvenient truth (for ENT’s avoiding asthma)

Epidemiology

- Allergic rhinitis 15-40% of population
- Asthma 7% of population
- 50-100% of patients with asthma have AR
- 20-40% of patients with AR have asthma

On average, 3 children in a classroom of 30 are likely to have asthma.*

Epidemiologic Links

- Olmstead County, Minnesota Asthma Cohort
- 1245 subjects with Asthma
- 52% had documented AR
- 6% non-allergic rhinitis

- Yearly medical care charges were 46% higher for concomitant asthma and rhinitis

Tucson Study: Methods

• 1,655 subjects recruited
• 182 subjects without asthma at enrollment were assessed and had new diagnosis of asthma after age 20
• 2,177 controls without asthma during 20-year study period

Tucson Study: Results

- Subjects with rhinitis 3 times more likely to have asthma
- Increased duration of rhinitis associated with increased prevalence of asthma
- Increased severity of rhinitis associated with increased risk of developing asthma
- Risk of asthma enhanced if history of rhinitis + sinusitis

**Conclusion:** Allergic or non-allergic rhinitis is an independent risk factor for adult onset asthma

Epidemiology

European Community Respiratory Health Survey

• 9730 French subjects from 3 sites returned questionnaire

• 28-34% self-reported nasal allergies

• 7-9% self-reported asthma ever, 2-4% current asthma

• Nasal allergies 6 to 8x more common in asthmatics
Epidemiology

11,540 subjects from Finnish Twin Cohort Study

• Health questionnaire 1975, 1981, 1990

• 64% of men and 73% of women with asthma had “hay fever”

• Men, hay fever in 1975 → 4x risk of asthma 1990
• Women, hay fever 1975 → 6x risk of asthma 1990

• Hay fever nearly always diagnosed before asthma

Epidemiologic Link Between Asthma and Allergic Rhinitis: Copenhagen Allergy Study

Odds Ratio (95% CI) for Developing Allergic Asthma

<table>
<thead>
<tr>
<th>Allergic Rhinitis at Baseline</th>
<th>To Pollens</th>
<th>To Animals</th>
<th>To Mites</th>
</tr>
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<tbody>
<tr>
<td>To pollens</td>
<td>8.2 (3.6-18.5)</td>
<td></td>
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<tr>
<td>To animals</td>
<td></td>
<td>18.9 (4.8-73.9)</td>
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<tr>
<td>To mites</td>
<td></td>
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<td>46.5 (10.8-199.9)</td>
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734 = n 8 year f/u

Allergic Rhinitis and Developing New Asthma

N = 1836 college freshmen

% of Patients with New Asthma at 23-Year Follow-up
(10.5% vs. 3.6%)

*P < 0.002, allergic rhinitis vs no allergic rhinitis

Allergic Rhinitis (n=162)

No Allergic Rhinitis (n=528)

What best explains the observed associations of asthma and rhinitis?

• A naso-bronchial reflex makes the nose and lung behave similarly
• Aspiration of nasal secretions that contain inflammatory mediators
• Nasal obstruction causes inhalation of unfiltered air
• Inflammatory cells and mediators are systemically propagated
Links between Asthma and Rhinitis

• Nasal and bronchial mucosa are similar
• Inflammation in rhinitis and asthma are similar
• Asthma and rhinitis have same triggers
• Rhinitis → non-specific bronchial hyperreactivity
• Inflammation of the nose → worse asthma
Proposed Links: Upper and Lower Airways

Aspiration of inflammatory material into lower airways (postnasal drip)

Activation of nasobronchial reflexes

Systemic propagation of nasal inflammation

Bypassing the nose: breathing poorly conditioned air

Blaiss MS. Allergy Asthma Proc. 2002;23:223-227
Corren J. J Allergy Clin Immunol. 1997(suppl);99:S781-S786
Effect of Nasal Obstruction on Asthma

% of Baseline FEV₁

FEV₁ = forced expiratory volume in 1 second

Baseline

After Exercise

Nasal breathing

Mouth breathing

Upper and Lower Airway Link

- Patients with AR but no asthma have increased airway responsiveness

- Nasal airway challenge increases BHR in AR patients

Spector and Tan. Ann Allergy 2000;85:87
“Minimal Persistent Inflammation”

Mucosal inflammation persists when patient is asymptomatic:
- Allergic Rhinitis
- Chronic Rhinosinusitis
- Asthma
The “Tip” of the Iceberg

Airway inflammation

Airflow obstruction

Bronchial hyperresponsiveness

Airway inflammation

Pathogenesis of Asthma

- Asthma is primarily an *inflammatory* disease

- Bronchospasm occurs as a result of acute inflammatory stimuli
The Upper-Lower Airway Link

Common pathophysiologic mechanisms

– Vasodilation
– Vascular permeability
– Mucus production
– Leukocyte infiltration
– Multiple inflammatory components

Meltzer. Ann Allergy 2000;84:176
Which cell type is crucial in both asthmatic and rhinitis inflammation?

- Neutrophil
- Monocyte
- Fibroblast
- Eosinophil
Inflammatory Mechanisms

• Asthma, allergic rhinitis, and chronic rhinosinusitis are inflammatory processes

• Mast cells and eosinophils are major effector cells
  – Eosinophils are hallmark of both asthma, allergic rhinitis

• Similar inflammatory mediators contribute to inflammation in both upper and lower airways
  – Histamine, leukotrienes, cytokines, etc.

• Both local and systemic inflammatory processes involved

Asthma Triggers

- Allergies
- Infections
- Nonspecific irritants such as tobacco smoke, air pollution, chemicals
- Physical exercise
- Emotional stress
- Esophageal reflux

NIH 2007 Asthma guidelines
Treatment of Allergic Rhinitis May Improve Asthma

• Treatment of allergic rhinitis with intranasal corticosteroids reduces asthma symptoms and bronchial hyperreactivity for some patients

• Treatment of seasonal allergic rhinitis with antihistamines improves asthma symptoms for some patients

• Current antihistamines are not contraindicated for asthma patients

Five year follow-up on the PAT study: specific immunotherapy and long-term prevention of asthma in children

• Randomized, open SCIT trial for prevention of asthma in children with timothy grass or birch allergy

• Actively treated children: ↓ asthma after a 3 year course of SCIT as evaluated by clinical symptoms, visual analog scale, and methacholine bronchial provocation testing

Asthma Evaluation:

- History
- Chest Examination
- Spirometry
  - Pre/Post Bronchodilator
  - If medically necessary
Conclusion

• Asthma and rhinitis often co-exist
• AR associated with, and risk factor for, asthma
• Rhinitis and asthma have same triggers
• Rhinitis often precedes development of asthma
• Patients with AR should be evaluated for asthma and vice versa
• Prevention or early treatment of AR
  – May prevent occurrence of asthma
  – May limit severity of bronchial symptoms

Should patients with allergic rhinitis be evaluated for asthma?

- Yes, always
- Sometimes
- No, we’re Otolaryngologists
True or False?: Rhinitis and asthma have the same environmental triggers.

• True
• False
Thank you