The Use of FeNO in Pediatric Asthma

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Lecture Objectives
1. Describe the current approach for using FeNO in managing asthma.
2. Indicate where FeNO serves as a template for further biomarker development.
3. Identify opportunities to advance asthma care through an application of biomarkers in selecting and monitoring asthma treatment for children.

AACAII/AAAAAI Statement
• The AACAII and AAAAI recognize that the measurement of inflammation, using FeNO, is a paradigm change in the diagnosis and management of asthma.
• It provides a perspective otherwise unavailable to the clinician.
• Rather than focusing solely on the assessment of symptoms and lung function, FeNO allows for the identification of inflammation and the need for appropriate therapy to prevent the symptoms and airflow obstruction that are the end results of the inflammatory process.

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Exhaled Nitric Oxide
• Easy to use and reproducible
• Validated in measurement and application
• Good measure of ICS effect
• Good predictor of ICS response in children
• Can be useful in reducing ICS dose once control is established
• Limited effect on improving asthma control when added to a guidelines approach.
• Could be useful in anticipating exacerbations.

Clinical phenotypes of asthma

FEV₁ Response ≥ 7.5%: Odds Ratio

<table>
<thead>
<tr>
<th>Baseline Characteristic (Categorical)</th>
<th>FP</th>
<th>Mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV₁ &lt; 90% predicted (pre-BID)</td>
<td>4.19*</td>
<td>1.78</td>
</tr>
<tr>
<td>FEV₁/FVC &lt; 0.80 (pre-BID)</td>
<td>4.29**</td>
<td>2.40*</td>
</tr>
<tr>
<td>Methacholine BTPS &lt; 5 mg/mL</td>
<td>2.82*</td>
<td>1.17</td>
</tr>
<tr>
<td>eNO &gt; 25 ppb</td>
<td>2.70*</td>
<td>2.03</td>
</tr>
<tr>
<td>TEC &gt; 300 cells/mm³</td>
<td>2.34*</td>
<td>1.62</td>
</tr>
<tr>
<td>Serum ECP &gt; 15 μg/L</td>
<td>2.78**</td>
<td>1.18</td>
</tr>
<tr>
<td>AEC &gt; 200 cells/μL</td>
<td>3.88**</td>
<td>3.96</td>
</tr>
<tr>
<td>LRT &gt; 100 pg/mL</td>
<td>3.03</td>
<td>3.23*</td>
</tr>
<tr>
<td>Female</td>
<td>1.14</td>
<td>2.30</td>
</tr>
<tr>
<td>Minority</td>
<td>0.84</td>
<td>1.98</td>
</tr>
<tr>
<td>Age &gt; 10 years</td>
<td>0.64</td>
<td>2.50*</td>
</tr>
</tbody>
</table>

*p ≤ 0.05, **p ≤ 0.05

Levels of Clinical Assessment

- Symptoms – always accessible
  - Exacerbations
  - Night time symptoms
  - Day time symptoms
  - Exercise-induced
- Medication use (rescue and long-term controllers) – always accessible
- Pulmonary function – limited application
- Biomarkers? Occasionally available

Risk Factors for Asthma Exacerbations

- Season
- Poorly controlled asthma
- Treatment (ICS, ICS/LABA, LTRA)
- Pulmonary function
- Biomarkers?

Exacerbations

<table>
<thead>
<tr>
<th>Outcomes (% with ≥1)</th>
<th>eNO Group</th>
<th>Reference Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone bursts</td>
<td>32%</td>
<td>42%</td>
<td>0.02</td>
</tr>
<tr>
<td>Unscheduled visits ¹</td>
<td>21%</td>
<td>23%</td>
<td>NS</td>
</tr>
<tr>
<td>Hospitalizations ¹</td>
<td>3%</td>
<td>4%</td>
<td>NS</td>
</tr>
</tbody>
</table>

¹ Self-reported, based on two-month recall


ICS Dose Prescribed

FeNO as a Prompt for Further Assessment

- ICS Adherence?
- ICS Inhalation delivery technique?
- Allergen exposure?
- Inadequate dose?
- ICS dose adjustment – prevention?
- Low pulmonary function?
- Steroid resistance?