UNDERSTANDING ASTHMA

Definition

Asthma is a chronic inflammatory respiratory disease that is characterized by total or partial obstruction of the airways that may be reversed with treatment.\(^1\)

The condition is called non-allergic asthma when symptoms are experienced but there is no demonstrable allergic cause. Asthma is more commonly experienced when an individual comes into contact with an allergen that he/she is sensitized to; this is called allergic asthma.

Allergic asthma accounts for 9 out of 10 of all cases\(^2\) and typically develops in childhood. Approximately 8-in-10 children with asthma also have other allergic conditions such as nasal allergies or eczema.\(^3\) Allergic asthma often goes into remission in early adulthood but, in some cases, asthma reappears later.

Non-allergic asthma represents about 1-in-10 of all cases.\(^2\) It usually develops after the age of 30 and is not typically associated with allergies. Women are more frequently affected and many cases seem to follow a respiratory tract infection. The condition can be difficult to treat and symptoms are often chronic and year-round.

Diagnosis

The following approaches are used to diagnose asthma:

- Analysis of medical history
- Physical examination
- Measurement of allergic status and airway responsiveness and markers of airway inflammation
- Spirometry / peak flow measurements
  
  Spirometry is the measurement of the volume and flow of air that can be inhaled and exhaled by a patient; peak flow measurements assess an individual’s maximum ability to expel air from the lungs.

While measurement of airway function is easy for adults, most new cases of asthma are diagnosed in young children who are unable to perform spirometry. Diagnosis in children is based largely on clinical judgment and an assessment of symptoms, as well as clinical findings. A good method for confirming the diagnosis of asthma in children is to trial treatment with a short-acting bronchodilator (medication that widens the constricted airways) and inhaled glucocorticosteroids to see if a marked clinical improvement is demonstrated as this may indicate that the child is experiencing asthma.

Differential diagnosis

A careful history and physical examination, together with the demonstration of reversible and variable airflow obstruction (spirometry), will in most instances confirm the diagnosis of asthma. However, there are many alternative diagnoses that need to be considered.

A healthcare professional (HCP) taking a medical history should check whether the patient is using any known bronchoconstrictors (substances that cause narrowing of the airways, e.g., certain anti-inflammatory agents or beta-blockers).
Other forms of obstructive lung diseases, such as COPD (Chronic obstructive pulmonary disease), have similar symptoms to asthma but correlate more with exposure to cigarette smoke, older patients, less symptom reversibility after administration of a bronchodilator and corticosteroid, and decreased likelihood of a family history of allergy in comparison to individuals with asthma.3

Gastroesophageal reflux disorder can cause a chronic cough and chest discomfort which mimics asthma and may need to be ruled out. Less commonly, vocal cord dysfunction causes episodic spasms of the vocal cords which resemble severe asthma attacks.4

A majority of children with asthma have an identifiable allergy trigger and are often affected by more than one. In a 2004 US study of 368 children aged 3 to 5 years, more than 7-in-10 had positive test results for more than one allergen, and more than 3-in-10 had positive test results for more than three allergens.5 The majority of these triggers can often be identified from the history; for instance, asthmatics with hayfever or pollen allergy will have seasonal symptoms, those with allergies to pets may experience an abatement of symptoms when away from home, and those with occupational asthma may improve during leave from work. Occasionally, allergy tests are warranted and, if positive, may help in identifying avoidable symptom triggers.

What happens in the airways?

Asthma causes a narrowing of the airways, which interferes with the normal movement of air in and out of the lungs (see figure 1). Asthma involves only the bronchial tubes and does not affect the air sacs (alveoli) or the lung tissue. The narrowing that occurs in asthma is caused by three major factors: inflammation, bronchospasm and hyperreactivity.

• **Inflammation**
  The first and most important factor causing narrowing of the bronchial tubes is inflammation.2 The bronchial tubes become red, irritated, and swollen. The inflammation occurs in response to an allergen or irritant (such as pollen, tobacco smoke, certain chemicals or a respiratory virus) and results from the action of chemical mediators (histamine, leukotrienes and others). The inflamed tissues produce an excess amount of sticky mucus that can clump together and form "plugs" that can clog the smaller airways. Tissue damage may also occur with damaged cells being shed into the airways, thereby contributing to the narrowing.

• **Bronchospasm**
  In response to chemical mediators and nerves in the bronchial tubes, the muscles around the bronchial tubes may tighten during an attack of asthma. This muscle constriction of the airways is called bronchospasm and causes the airway to narrow further.

• **Hyperreactivity (hypersensitivity)**
  In patients with asthma, the chronically inflamed and constricted airways become highly sensitive, or reactive, to triggers such as allergens, irritants, and infections. Exposure to these triggers may result in more inflammation and narrowing.

The combination of these three factors results in difficulty with breathing out, or exhaling. As a result, the air needs to be forcefully exhaled to overcome the narrowing, thereby causing the typical wheezing sound. People with asthma also frequently cough in an attempt to expel the thick mucus plugs. Reducing the flow of air may result in less oxygen passing into the bloodstream and if very severe, carbon dioxide may dangerously accumulate in the blood.2
The importance of inflammation

Asthma is a disease that varies within and among patients but inflammation of the airways is a persistent feature, even in patients with mild asthma.6

Inflammation is a normal response of the body to injury or infection whereby blood flow increases to the affected site as part of the healing process. Usually, when the healing is complete, the inflammation subsides.

The central issue in asthma, however, is that the inflammation does not resolve completely on its own. In the short term, this results in recurrent attacks of asthma. In the long term, it may lead to permanent thickening of the bronchial walls, called airway "remodelling." If this occurs, the narrowing of the bronchial tubes may become irreversible and poorly responsive to medications. Therefore, the goals of asthma treatment are:

• In the short term, to control airway inflammation in order to reduce the reactivity of the airways
• In the long term, to prevent airway remodelling2

The effectiveness of asthma treatment is partly limited by the patient’s adherence to therapy. As such, increasing patient understanding of the disease and of the role of anti-inflammatory medication may play an important role in improving patient outcomes.6

REFERENCES
5. Vargas PA. Characteristics of children with asthma who are enrolled in a Head Start program. Journal of Allergy and Clinical Immunology 2004; 114: 499 – 504

---

Figure 1. Bronchiole cross-section in a normal and asthmatic individual

<table>
<thead>
<tr>
<th>Normal bronchiole</th>
<th>Asthmatic bronchiole</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Normal bronchiole" /></td>
<td><img src="image2" alt="Asthmatic bronchiole" /></td>
</tr>
</tbody>
</table>

© 2008, UCB Pharma, S.A. All rights reserved