

Recognition of the Asthmatic Component of Respiratory Failure*

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Definitions. In this discussion we shall understand each other better if we define two important terms first. They are "respiratory failure" and "asthma." It is not too difficult to define respiratory failure. Asthma is much more of a problem. The word has been used since the time of Hippocrates; yet contemporary authors do not agree on what it means.

Respiratory Failure. The "50-50 rule" is easy to remember and very satisfactory. Respiratory failure is present when the arterial blood P_{O_2} is less than 50 mm Hg, or the P_{CO_2} is greater than 50 mm Hg.

Asthma. We shall consider definitions from two recent books and from the American Thoracic Society. Bates, Macklem, and Christie (1) insist that asthma "denotes a condition of usually intermittent episodes of bronchospasm, with symptom free periods, in a subject with a history or a family history of an allergic condition." They also recognize that some patients with chronic bronchitis develop such severe bronchospasm during exacerbations of infection that their symptoms appear similar to spasmodic asthma. This definition is too restrictive. Also, if we consider only patients with evidence of allergy or infection we shall seldom have a problem of recognizing asthma, and such patients rarely develop severe respiratory failure.

Dr. Swineford (4) has a very simple definition: "Asthma is a complex pulmonary syndrome characterized by wheezing." Many of us find this definition too broad in that it includes conditions with fixed or localized airway obstruction unresponsive to any treatment.

The American Thoracic Society's (2) definition has been widely accepted. "Asthma is a disease characterized by an increased responsiveness of the trachea and bronchi to various stimuli and manifested by a widespread narrowing of the airways that changes in severity either spontaneously or as a result of therapy." This is a more satisfactory definition because it recognizes that the difficulty is due to a generalized airway obstruction that may respond to treatment.

We cannot insist on strict adherence to any definition because we are considering the asthmatic component in respiratory failure. Few patients with pure asthma will develop dangerous respiratory failure. We are chiefly concerned with individuals who have one of the acute or chronic lung diseases but who also have an element of generalized reversible bronchial constriction. When there is an asthmatic component, if it is recognized early, treatment should prevent the development of respiratory failure. If it is recognized at any time, treatment should prevent the death of the patient.

Causes of Respiratory Failure. There are a number of diseases that may cause respiratory failure and may also be confused with or complicated by asthma. The common ones are: chronic bronchitis and emphysema, pulmonary fibrosis, pneumonia, infectious bronchitis, pulmonary edema, pulmonary embolism, carcinoma or other lung tumor, and foreign body in the bronchus. Whenever a physician is dealing with patients manifesting any of these conditions he should think of and look for evidences of asthma.

Recognition of Asthma. An asthmatic component is usually easily recognized if considered. The history, physical examination, chest roent-

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genogram, blood and sputum examination for eosinophils (3), and pulmonary function studies may be helpful.

The history is important. A story of hay fever, a family history of allergic disease, seasonal symptoms and previous relief from the use of epinephrine, isoproterenol, xanthine, or steroids suggest asthma.

The physical examination is often not helpful since wheezing is common in so many patients with airway obstruction. However, pale, moist, swollen nasal membranes and inspiratory wheezing suggest asthma.

Likewise, the chest roentgenogram is often not helpful. However, if the lungs look almost normal, the heart is of normal size and shape, and the signs of heart failure are missing, asthma becomes an important consideration.

The sputum and blood examination is of critical importance. Blood eosinophilia suggests asthma. Sputum eosinophilia is the single most important sign of asthma and is a strong indication that steroid treatment will lead to improvement. For proper study the sputum should be fresh. The physician should separate out strands of thick mucus or a bronchial cast, spread the material on a slide, and stain it with Hansel stain¹. Even small clumps in which most of the cells are eosinophils are significant. The higher the percentage of eosinophils the more likely that asthma is contributing to the symptoms.

In the presence of respiratory failure it is usually not possible to do ventilatory tests or diffusion studies. If there is a record of a recent good CO diffusion or a good response to isoproterenol, asthma deserves serious consideration. Blood gas measurements are essential for the proper management of any patient with respiratory failure.

Treatment. If respiratory failure is of short duration and if there is an asthmatic component treatment with isoproterenol by nebulizer, subcutaneous epinephrine or IV, aminophylline may be effective. All of these drugs may contribute to ventricular irregularity and should be used cautiously in patients with coronary artery disease.

In most patients steroids will be needed and effective. Prednisolone or prednisone is commonly used. If a patient with respiratory failure has used steroids in the past, if there is convincing evidence that asthma is present, if he is obese, if the asthma began in middle life or later, or if the arterial blood P_{O_2} is falling or the P_{CO_2} is rising in spite of treatment, steroid treatment should be started promptly and used aggressively (5). The ideal dose is not known. Fifty to 100 mg of prednisone or prednisolone every two hours until improvement begins is a reasonable dose. In respiratory failure due to asthma the presence of tuberculosis or other infection, diabetes, heart failure, or hypertension do not contraindicate the use of steroids. Other forms of treatment such as the use of assisted ventilation, antibiotics, or treatment of heart failure should be used as needed.

Summary. Respiratory failure from various causes is occasionally associated with or confused with asthma. Therefore, asthma should be considered and looked for in all patients with respiratory failure. Sputum eosinophilia when present is the most important indication that asthma may be important. Steroids used early and aggressively are usually indicated and effective.

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