PATTERNS OF AIRFLOW IN UPPER AIRWAYS OBSTRUCTION

D. EMPEY The forced expiratory volume in one second (FEV₁) and peak expiratory flow rate (PEFR) were measured in normal subjects both with and without resistances in the form of orifices of decreasing diameter.

The ratio \( \frac{\text{FEV}_1 \text{ as } \% \text{ of predicted normal}}{\text{PEFR as } \% \text{ of predicted normal}} \) was calculated and found to be approximately 1:10 without added resistance. The addition of increasing resistances led to a rise in this ratio, e.g., 1:60 with an orifice 8 mm in diameter and 3:10 with an orifice 4 mm in diameter. Groups of patients were then studied. These included 24 patients with obstruction of the upper airways (tracheal stenosis, bilateral vocal cord paresis, etc.); 42 patients with lower airways obstruction (asthma and bronchitis); and 19 with fibrosing alveolitis.

It was found that the ratio \( \frac{\text{FEV}_1 \text{ predicted } \%}{\text{PEFR predicted } \%} \) exceeded 1:60 only in those cases with obstruction of the upper airways (above the carina). Those patients with the highest ratios had the most severe degrees of obstruction. Some patients were also investigated by more complex techniques such as flow-volume curves and derived flow rates. Consideration of these, and further studies, provide an explanation for the alteration in \( \frac{\text{FEV}_1 \text{ predicted } \%}{\text{PEFR predicted } \%} \) ratio and a theoretical justification for its use. The measurement of this ratio by means of simple standard equipment appears to be useful in the diagnosis and assessment of upper airways obstruction.

LUNG FIBROSIS INankylosing Spondylitis

D. DAVIES In recent years it has become recognized that some patients with ankylosing spondylitis develop progressive upper lobe fibrosis, often with cavitation. The condition can easily be mistaken for tuberculosis. It usually develops several years after the onset of joint symptoms and begins as unilateral or bilateral apical consolidation and fibrosis. The rate of progression is variable and it may extend to involve the upper half of both lungs. The cavities frequently become colonized by \textit{Aspergillus fumigatus} with the formation of fungus balls. This occurs more commonly than in most tuberculosis cavities.

The condition is illustrated by a selection from 11 cases recognized in recent years.

There is no evidence that bacterial infection or radiotherapy are causal factors. There are good reasons for accepting this as another extra-articular manifestation of ankylosing spondylitis.

INCLINED FRONTAL PLANE TOMOGRAPHY

M. MEREDITH BROWN In several hundred patients frontal plane tomograms have been made with a Cervid-Philips radiotome with which both the patient and the film are rotated so that the plane of the tomograms is parallel to that of the trachea and main bronchi.

In the normal patient, the trachea, main bronchi, and principal branches are shown on a single cut, including the angle of the carina and the thickness of the right wall of the trachea. Narrowing or distortion of these air passages can be demonstrated more accurately than by other radiographic methods, except perhaps bronchography. Lesions of the smaller bronchi, such as the middle lobe bronchus or the segmental branches, cannot be demonstrated as they do not lie in the plane of the tomograms. Vascular abnormalities can sometimes be recognized, and the technique is particularly valuable in demonstrating enlarged lymph nodes.

In clinical practice these tomograms have been found useful in demonstrating lesions of the trachea and main bronchi; in confirming suspected lymph node enlargement of hilar and paratracheal groups; and in helping to elucidate the hilar structures in patients with bronchial neoplasms. In this way the technique is an aid to diagnosis and to the planning of treatment. The accuracy is such that negative findings can be confidently accepted.

BRONCHODILATATION

Pharmacology of the Bronchi

G. STERLING Recent research into the pharmacology of the contraction of bronchial smooth muscle has emphasized both neural and humoral factors.

Of the former there is now no doubt that the cholinergic parasympathetic system causes bronchoconstriction and that atropine may be of diagnostic and therapeutic value in bronchial asthma. Current research is concentrated more on the role of the adrenergic system: partly on the question of whether alpha-adrenergic receptors, which appear to cause bronchoconstriction when stimulated, are likely to be important clinically; partly on the effects of beta-adrenoceptor blockade in asthma and the possibility of catecholamine metabolites causing beta-blockade.

With regard to humoral factors, interest has been concentrated on the mode of action of disodium cromoglicate in alleviating allergen and exercise-induced asthma and in reducing the hyperreactivity to histamine shown by asthmatic subjects. Recent evidence suggests that disodium cromoglicate in vivo may have an antihistaminic action as well as preventing the breakdown of mast cells, though this observation needs to be confirmed. Of the potential humoral mediators of bronchoconstriction and bronchodilatation the prostaglandins have been investigated most intensively recently, following the discovery that they occur naturally in the human lung and have potent constrictor and dilator effects on the bronchus.

Side Effects of Beta-adrenergic Receptor Stimulant Bronchodilator Drugs

J. W. PATERSON The side effects of this group of drugs may be divided into three classes:

1. Expected: These are side effects which may be predicted from a knowledge of the pharmacology of the drug. Thus stimulation of beta-receptors in sites
other than bronchial smooth muscle results in effects such as cardiac stimulation. Side effects of this type have been reduced by the introduction of so-called 'selective' beta-stimulant drugs. Selectivity can be achieved by altering the mode of administration, and this is referred to as 'therapeutic selectivity'.

2. 'Semi'-expected: These are side effects which may not be immediately obvious from a consideration of pharmacology, such as effects on oxygen tension and the development of tolerance to beta-stimulants.

3. Unexpected: These will include all the rare reactions that may occur with any drug, such as bone marrow damage, etc., but with beta-stimulant bronchodilator drugs particular interest is focussed on the possible toxic effects of the fluorocarbons used as propellant gases in aerosols.

Prostaglandins and Bronchial Smooth Muscle

M. F. Cuthbert Prostaglandins are naturally occurring fatty acids which are widely distributed in human tissues; prostaglandins E2 (PGE2) and F2a (PGF2a) have been isolated from the lungs and bronchi. Among their many physiological properties prostaglandins have powerful effects on bronchial smooth muscle, those of the E series causing bronchodilatation while those of the F series cause bronchoconstriction.

Prostaglandin E1 and isoprenaline have similar bronchodilator effects in anaesthetised guinea-pigs when given intravenously, but when given by aerosol PGE1 is 10 to 100 times more active than isoprenaline. The high activity and lack of cardiovascular effects when prostaglandins are given by aerosol may be related to their rapid metabolism within the lung.

Isolated human bronchial muscle is contracted by PGF2a and relaxed by PGE2. Aerosols of prostaglandins E1 and E2 have no effect in normal volunteers but in asthmatic subjects inhalation of 55 μg PGE1 and PGE2 has a bronchodilator effect, as measured by changes in ECV, of similar degree and duration to that of 550 μg isoprenaline. These results have recently been confirmed in studies in which inhalation of PGE1 and PGE2 caused a marked decrease in airways resistance and an increase in specific conductance in asthmatics. Inhalation of the natural E prostaglandins, however, can be associated with irritation of the upper respiratory tract.

The current use of intravenous prostaglandins in the induction of labour and therapeutic abortion may lead to an increase in airways resistance. In normal women this is not sufficient to cause symptoms but may represent a hazard in asthmatics.

The possibility of the therapeutic use of prostaglandins and prostaglandin antagonists in reversible obstructive airways disease will be considered in the light of speculations concerning the relationship of the prostaglandins to the function of bronchial smooth muscle.

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