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Proceedings of the Thoracic Society

The Summer Meeting of the Thoracic Society was held in the New Buildings of University College at Belfield, Stillorgan, in County Dublin, on 7 and 8 July 1967. There were 15 short papers and two symposia. Summaries follow.

ALLERGIC ALVEOLITIS IN A MALT-WORKER

H. F. V. RIDDLE and I. W. B. GRANT reported that a malt-worker in Kirkcaldy, Scotland, had developed an illness with clinical, radiological, and pathophysiological features similar to those of farmer's lung. Mycological investigation showed that the germinating barley in the maltings was heavily infected with *Aspergillus clavatus*, a common soil fungus. The same organism was isolated from a mask worn by the patient and also from a specimen of sputum obtained three weeks after he had stopped work. Precipitating and complement-fixing antibodies against *A. clavatus* were detected in the patient's serum, but a histamine release test on human lung sensitized by the same specimen of serum and challenged by an extract of *A. clavatus* was negative, suggesting that reaginic antibodies were not concerned in the pulmonary hypersensitivity. There was no immediate or late reaction to a prick test. The inhalation of *A. clavatus* spores produced after six hours a sharp rise in temperature and a fall in the forced vital capacity, forced expiratory volume, and carbon monoxide extraction. These findings, together with the results of other investigations designed to exclude the participation of other antigens, suggested that the pulmonary changes in this case resulted from a precipitin-mediated hypersensitivity reaction to *A. clavatus*. The results of a clinical, radiological, and immunological survey of the other workers in the maltings are also described, as are the factors responsible for infection of the germinating barley by *A. clavatus*.

The generic term 'allergic alveolitis' is suggested for the group of disorders, of which the condition described in this paper may be a further example, in which the inhalation of organic antigens of various types produces a diffuse abnormality of the peripheral gas-exchange tissues of the lungs, associated with the presence of specific antibodies in the serum.

SOLDERING FLUX ASTHMA

G. STERLING (introduced by J. BATTEN) said that two patients had been seen who complained of wheezing dyspnoea after using a soldering flux recently developed for jointing aluminium cables. Serial measurement of the forced expiratory volume and peak expiratory flow rate confirmed the occurrence of severe airway obstruction a few hours after inhalation of the fumes of the whole flux or of an organic amine, amino-ethylethanolamine, which was one of its main constituents. There were no physical or radiographic signs to suggest pulmonary infiltration of the kind seen in farmer's lung, and the reason for the delayed onset of the bronchoconstriction is obscure.

A CONTROLLED TRIAL OF ANTITUBERCULOUS CHEMOTHERAPY IN THE EARLY COMPLICATED PNEUMOCONIOSIS OF COAL-WORKERS

J. D. BALL and J. C. GILSON described a trial carried out in an attempt to throw further light on the hypothesis that tuberculous infection is responsible for the development of complicated on a background of simple pneumoconiosis. One hundred and eighty-two working coal-miners under 50 years of age with massive shadows, whose total diameter was 8 cm. or less, and all sputum negative for acid-fast bacilli, were divided into three groups. One group was treated for three months in hospital with streptomycin, isoniazid, and P.A.S. and then continued on isoniazid and P.A.S. for nine months after discharge; the second group was given only hospital rest and placebo tablets; the third group continued at work throughout the year and had no treatment. A comparison of the chest radiographs before and after three years' observation showed no significant effects of the chemotherapy or the hospital rest. Several disadvantages, *e.g.*, drug side-effects, were noted. It was concluded that the trial gave no support to the tuberculous hypothesis of complicated pneumoconiosis.

• PULMONARY EMBOLISM

EXPERIMENTAL OBSERVATIONS

R. MARSHALL said that experimental pulmonary embolization had been carried out in dogs to determine the relative importance of mechanical and reflex effects of the emboli and the recovery of function after massive or recurrent smaller embolization. Massive embolization with thrombi caused very little systemic disturbance and there was considerable recovery of lung function after one to two weeks.

Small blood-clot emboli may cause some reflex effects, but death after repeated embolization was produced by the large volume of clot blocking the circulation. No significant bronchoconstriction was found during this type of embolization and there was no evidence that serotonin plays an important role in the response to embolization.

Pathology

M. S. Dunnill said that pulmonary embolism has a variety of clinical manifestations—sudden death due to massive pulmonary embolism, clinically silent pulmonary embolism, pulmonary infarction, and right heart failure due to recurrent pulmonary emboli. The pathology of these conditions can be studied from examination of many lungs at necropsy and from animal experiments.

At necropsy fibrous bands may sometimes be found in the conducting pulmonary arteries and these are considered to be one of the end results of pulmonary embolism. If these cases are taken into account, and if inflated fixed lungs are examined with care, the incidence of pulmonary embolism in hospital patients is very high, being at least 52%.

Occasionally, a relatively small embolus may be responsible for sudden death. This may be due to the fact that the patient is already suffering from cardiac or respiratory disease, but evidence is available pointing to the fact that in many of these cases there have been previous silent emboli occluding large portions of the pulmonary arterial tree.

Clinical Features, Management, and Follow-up

D. W. Barritt reviewed briefly the symptoms and signs of massive pulmonary embolism and of pulmonary infarction. The features of right heart catheterization in the acute attack are a modest rise in pulmonary artery pressure with evidence of right ventricular failure and low cardiac output. Arterial oxygen saturation is reduced. Pulmonary arteriography may reveal the obstructions. In the acute attack oxygen, digitalis, heparin, and occasionally pressor amines are indicated. The mainstay of longer-term treatment is oral anticoagulants. Inferior vena cava interruption is rarely called for. Long-term follow-up studies show that persisting pulmonary hypertension leading to incapacity and right heart failure is rare.

Angiography and Isotope Scanning

R. H. Greenspan said that the diagnosis of pulmonary embolism is difficult. Angiography is the definitive diagnostic method. Different techniques are necessary for the study of massive, branch, and small peripheral embolism. Magnification angiography is the only method available for diagnosing the latter. Strict criteria must be used in interpretation to avoid confusion with other states causing inadequate filling of pulmonary vessels.

Correlation of angiography with plain films and isotope scan is essential. Angiography should not be limited to patients in whom embolectomy is contemplated, nor to those in whom the plain film is suggestive of embolism, but should be used in all suspected cases regardless of whether or not clinical examination, routine or special laboratory studies and plain chest films are suggestive.

Surgical Treatment of Deep Vein Thrombosis

A. J. Gunning said that thrombectomy is the treatment of choice for acute ilio-femoral venous thrombosis for two reasons: (1) to prevent a fatal pulmonary embolus (embolization occurs in 40% of these cases); and (2) to relieve the discomfort of acute ilio-femoral thrombosis and its consequent morbidity of venous gangrene or 'post-phlebitic limb'. Local surgical treatment is also indicated when the long saphenous vein becomes thrombosed. This is treated by high saphenous vein ligation. A method of treating deep vein thrombosis is described.

Pulmonary Embolectomy

M. Paneth said that the incidence of massive pulmonary embolism is rising. It is important to make the diagnosis with accuracy on clinical evidence in the critically ill patient. The experience gained at the Brompton Hospital over the last four years had shown that the diagnosis can indeed be correct in 90% of cases without the use of pulmonary angiography, the diagnosis being based on the clinical, radiographic, and electrocardiographic evidence alone. The place for more elaborate investigations, such as pulmonary angiography, was indicated and the rationale for emergency pulmonary embolectomy was discussed.

PLEURAL FIBROMAS AND THEIR RECURRENCE

J. R. P. Gibbons (introduced by W. P. Cleland) said that pleural fibromas are a rare condition and are usually considered to be benign growths. The late recurrence of these tumours is seldom reported and, in the patients reviewed in this paper, a second tumour had been excised after a period of three to 11 years following the original operation. Histological examination of the 'recurrent' tumour had generally shown sarcomatous change, and several of the patients had died from metastases following their second operation.

MYCOPLASMA INFECTIONS

Clinical Aspects

G. James said that mycoplasma and bacterial L-forms are the jokers in the microbiology pack, for

their purpose and place in the microbial kingdom and their role in human disease remain enigmatic. Mycoplasmas, like viruses, are small and filterable. They have no rigid cell wall, so they are unaffected by penicillin or cephaloridine, but their growth is inhibited by specific antisera. Mycoplasmas resemble bacteria in chemical composition, in their ability to grow on acellular agar, and in their sensitivity to the tetracyclines. They cause cold haemagglutinin pneumonia, bullous myringitis, auto-immune haemolytic anaemia, and may contribute to the pathogenesis of the Stevens–Johnson and Brodie–Reiter syndromes. Their possible role in leukaemia, neoplasia, rheumatoid arthritis, and uveitis remains speculative.

Laboratory Aspects

P. N. Meenan said that the isolation of mycoplasma is difficult and time-consuming; special media are required. In the diagnosis of primary atypical pneumonia advantage is taken of the capacity of *Mycoplasma pneumoniae* to act on glucose in a selective medium producing a colour change; the isolation rate appears to be about 20%. In practice, serological tests are of greater value. The standard serological test is immunofluorescence. This is technically very difficult. Other tests available are cold agglutinins; indirect haemagglutination using tanned red cells; complement fixation; growth inhibition; tetrazolium reduction inhibition; and haemagglutination inhibition. These do not all peak at the same time, and measure different antibodies depending on whether they consist mainly or predominantly of IgM or IgG. Epidemiologically, spread occurs most in family units; close and prolonged contact is required. The incubation period is two to three weeks.

MEASUREMENT OF BRONCHIAL COMPLIANCE IN SHEEP'S LUNGS

R. McHardy (introduced by J. Crofton) considered that if a method could be evolved for measuring the compliance of the bronchial wall it might be a useful technique for measuring the 'static spasm' of bronchial muscle in bronchitis and asthma; presumably the greater the muscle tone the less the compliance. Such a system had been tried out in resected sheep's lungs. The principle is to insert a fluid-filled balloon by means of a long probe into a segmental bronchus. Very small quanta of fluid are added to the system by means of a micrometer syringe and the resultant increases in pressure are measured. The pressure–volume relationships will depend on the compliance of both the balloon and the bronchial wall, possibly with some contribution from the lung. The balloon compliance is calibrated and the bronchial wall compliance can then be calculated.

Over the relevant ranges the pressure–volume relationships had been found to lie on a straight line. Bronchial compliance had been measured with the lung suspended in an air-tight jar, at atmospheric pressure, and at -20 and -40 cm. H_2O. Subsequently the lung had been dissected away from the bronchus and the procedure had been repeated at atmospheric pressure. Experiments on six lungs had been planned on a Latin-square design to minimize any possible effect of the time elapsed since resection. The results were presented.

HAEMODYNAMICS AND LUNG FUNCTION IN CONGENITAL HEART DISEASE

J. Meecham (introduced by C. Ogilvie) reported that 40 patients with left to right shunts had been investigated with cardiac catheter and pulmonary function studies.

Vital capacity was normal at normal pulmonary artery pressures and fell with increasing pressure ($P<0.0001$). Maximum voluntary ventilation was normal at normal pressures and high pulmonary blood flows, and fell with increasing pressure ($P<0.0001$) and with falling blood flow ($P<0.05$). Transfer factor for carbon monoxide was above normal in 86% of patients with normal pulmonary artery pressures and in 11% of patients with raised pressures ($P<0.001$). Transfer factor was normal in two-thirds of patients with normal pulmonary blood flows and was always raised at high flows ($P<0.005$).

Twenty patients were studied again after surgical closure of their defect. Fourteen showed a fall in transfer factor toward normal, five showed no change, and one showed a marked rise.

It was concluded that pulmonary function tests in such patients give a reflection of pulmonary artery pressure and flow, and that serial measurements may give an early indication of the development of pulmonary arterial hypertension.

LUNG RE-IMPLANTATION

K. M. Shaw reviewed his experience with 90 operations for pulmonary re-implantation in dogs. The criterion of satisfactory function in the re-implanted lung is survival in apparently normal health and activity following contralateral pneumonectomy; mortality and morbidity are high, chiefly owing to a high incidence of thrombosis or stenosis of the pulmonary venous or atrial anastomosis. The reasons for failure were discussed and probably include (1) ischaemic necrosis of the atrial cuff used in the standard operation, and (2) a natural tendency to vascular thrombosis in the dog. A modification of the standard atrial cuff technique was described which decreases but does not abolish the tendency to pulmonary venous obstruction. Pulmonary hypertension following re-implantation had not occurred in the absence of organic pulmonary venous obstruction. Survival for more than three years on a single re-implanted lung had been achieved with normal function and no evidence of significant pulmonary hypertension.

SOME ATYPICAL FEATURES OF HYPERTROPHIC PULMONARY OSTEOARTHROPATHY

L. DOYLE (introduced by T. WILSON) said that the understanding of the basic mechanisms of hypertrophic pulmonary osteoarthropathy remains obscure. In a series of 90 cases, observed over the past 11 years, some atypical features had been noted: (1) variability of symptoms; (2) absence of finger and toe clubbing; (3) transient recurrent acroparaesthesiae; and (4) effusions into olecranon bursae. Along with some other aspects of the condition these features were described and discussed.

THE ROLE OF BRONCHIAL COLLAPSE IN EMPHYSEMA

H. HERZOG considered the mechanics of the expiratory collapse of the bronchioles and small bronchi on the one hand and of the larger bronchi and intrathoracic trachea on the other.

A method was presented for comparing the sagittal diameter of the bronchial system with the thoraco-bronchial pressure gradient to determine the compliance of the walls of the airways during quiet and progressively forced expirations.

By comparing the intrabronchial pressure difference at two levels of the bronchial system with the airflow, the determination of the main zone of bronchial resistance in the individual case is attempted.

Finally the possibilities of surgical repair of an insufficient lumen of the peripheral and central airway in severe pulmonary emphysema were briefly discussed.

ARTERIAL OXYGEN TENSIONS AND BRONCHODILATORS IN CHRONIC NON-SPECIFIC LUNG DISEASE

T. CHAPMAN and D. HUGHES said that in patients with chronic non-specific lung disease, although the forced expiratory volume ($F.E.V._{\cdot 1\cdot 0}$) increases after the inhalation of a bronchodilator, the arterial oxygen tension usually falls. This fall appears to bear a relationship to the steady-state gas transfer. Associated with the alteration in blood gas is an increase in dead space.

The steady-state gas transfer appears to have a linear relationship to ventilation, as measured by the forced expiratory volume, but it does not increase, like the latter, after a bronchodilator. It is inferred that it is, in fact, related to perfusion, and a diminished perfusion prevents a rise in oxygen tension after the bronchodilator.

The purpose of breathing being the promotion of gaseous exchange in the lungs, it must be concluded that, in most cases of chronic non-specific lung disease, the inhalation of a bronchodilator, while increasing the $F.E.V._{\cdot 1\cdot 0}$, is not physiologically advantageous.

THE EFFECTS OF DIFFERENT BRONCHODILATORS IN ASTHMA

B. J. FREEDMAN (introduced by C. HOYLE) said that the large numbers of bronchodilators available has led to some confusion of choice. (1) Medihaler-Iso Forte, (2) Alupent, (3) Medihaler Duo, (4) Bronchilator, and (5) Prenomiser Plus, which contain isoprenaline, orciprenaline, isoetharine, phenylephrine, atropine, and thenyldiamine, were compared by measuring the F.E.V. increase in 16 asthmatics. The maximal increases obtained yielded a ranking in the above-numbered order. Plotting percentage increase of F.E.V. against log dose demonstrated that (*a*) the differences in maximal increase obtained were due to differences in dosage, and (*b*), when given as aerosols, orciprenaline had 26% the bronchodilator activity of isoprenaline and isoetharine had 40% its activity. Differences in duration of effect were due largely to differences in dosage; phenylephrine in appropriate dosage prolonged the effect of isoprenaline. Incidence of rebound bronchoconstriction was low with Prenomiser Plus (? atropine effect) and with Alupent, and high with Bronchilator.

PULMONARY LAVAGE IN STATUS ASTHMATICUS

H. J. GALVIN (introduced by B. O'BRIEN) said that many of the cases of status asthmaticus that die are found to have the bronchial tract obstructed with plugs of mucus. Lavage has been performed on a number of these cases, under general anaesthetic, through an endotracheal tube with the aim of removing these plugs and improving ventilation. The procedure is life-saving in the comatosed asthmatic but can be useful in the less severe case that fails to improve with modern therapeutic measures.

STATURE IN SIMPLE PNEUMOTHORAX

P. FORGACS said that the incidence of a tall thin build is much higher among young men with recurrent simple pneumothorax than in the general population. This was confirmed by direct measurements of their height and weight, and also by comparison of the vertical and transverse diameter of the chest with those of a control series.

The tall stature could be a feature of an incomplete Marfan's syndrome, but recurrent simple pneumothorax is five times more common in men than in women, while Marfan's syndrome has an equal sex distribution. The discrepancy suggests that this is either another type of inherited defect of connective tissue, or, if it is Marfan's syndrome, that the greater vertical length of the chest in man renders the apex of the lung more vulnerable to gravitational stress.

RECURRENT SPONTANEOUS PNEUMOTHORAX CONCOMITANT WITH MENSTRUATION

R. DAVIES (introduced by E. H. HUDSON) gave the case histories of five women who had had recurrent spontaneous pneumothoraces concomitant with menstruation. The onset of chest symptoms had been within 48 hours of the commencement of menstruation. Four other similar cases had been reported in the literature. The ages of the patients ranged from 29 to 40 years and in all nine cases the episodes of pneumothorax were always on the right side. Evidence of diaphragmatic endometriosis was found in one patient in the present series and in two of the cases reported in the literature.

THE MANAGEMENT OF SPONTANEOUS PNEUMOTHORAX

SURGICAL TREATMENT

R. J. M. MCCORMACK reviewed 242 consecutive cases of spontaneous pneumothorax admitted to the Thoracic Surgical Unit in Edinburgh. The age incidence of spontaneous pneumothorax showed a peak in early adult life and a second peak around age 60, the latter being the result of associated chronic bronchitis. Forty-eight of the 242 patients were admitted as severely ill emergencies and the two commonest causes of severe illness were associated chronic bronchitis with respiratory failure or haemopneumothorax. Intercostal waterseal drainage through a Malecot catheter was the standard initial treatment. In 49 patients thoracotomy was undertaken, usually after preliminary intercostal drainage, and the usual indication was recurrence or persistence of the pneumothorax. Twelve per cent of patients had a recurrence of pneumothorax after discharge from the unit, but none of these had had thoracotomy. The potential dangers of pneumothorax (tension, bleeding, and respiratory failure) and the financial hardships resulting from prolonged conservative management make active surgical treatment of pneumothorax highly desirable. It is suggested that in all patients the first attack of pneumothorax should be treated by intubation: if the pneumothorax recurs in an otherwise healthy patient, pleurectomy should be carried out and any bullae oversewn. In the chronic bronchitic with very poor ventilatory function, repeated intubation is usually the safe course.

L. L. BROMLEY said that, beside a number of patients managed conservatively or by simple tube drainage at the first episode of spontaneous pneumothorax, 22 patients with recurrent pneumothorax had been treated by pleurodesis, using silver nitrate or iodized talc introduced after thoracoscopy. Another group of 28 patients were treated by open thoracotomy. The indications, complications, and results of treatment were presented. It was concluded that chemical pleurodesis cannot be guaranteed to prevent further recurrence, but the incidence is small, whilst open operation provides the greater certainty of a permanent cure.

MEDICAL TREATMENT

G. W. POOLE described a decade's experience of managing spontaneous pneumothoraces conservatively, usually without admission to hospital and often with the patient at work. There were 111 patients with 119 pneumothoraces classified aetiologically as simple, 82; emphysema, 33; and miscellaneous, 4. The cases were also allocated to one of four groups, according to management, and then analysed. Tables were presented relating age to aetiology, management, and duration of collapse.

The management of most patients without hospital admission presented no problems. Only a quarter of this unselected group of pneumothoraces needed any form of active treatment. In the simple group, 80% expanded without intervention, the mean expansion time being 22·5 days and the calculated relapse rate 11% over six years.

Intubation requires admission to hospital, produces discomfort, quite often must be repeated, and the relapse rate after intubation in some series has not been remarkably better than that after conservative treatment alone. It should be reserved for relapses (second or third) and for complicated cases.

Since there is no recurrence in the majority of cases, pleurodesis is usually unnecessary and often undesirable. Certainly it is unpredictable, sometimes producing inadequate adhesions, and sometimes excessive fibrous contraction which may depress lung function. Pleurodesis and pleurectomy should not be lightly undertaken.

It was concluded that a general policy of non-intervention in the unselected group of pneumothoraces described was fully supported.