

Proceedings of The Thoracic Society

The Spring Meeting of The Thoracic Society was held on 7-8 March 1975 at the Royal College of Physicians, London. Summaries of the papers are given below:

The changing pattern of bronchial carcinoma

J. R. BELCHER The age of patients presenting with bronchial carcinoma is changing: they are getting older. This change is happening in both sexes but is less obvious among women. The age incidence of the disease in different age groups is also altering, and in this respect the difference between the two sexes is considerable.

The change in the age of presentation was first noticed in the surgical cases. (In 1950-55 the largest proportion of patients were in their fifties; they are now in their late sixties and 40% are now between 65 and 74.) It was thought that the change might be due to an alteration in surgical policy; this was not so as it was also seen in the Registrar General's figures. (These will be used in this communication from now on.)

At least two factors have been responsible for this change; the rate per 100,000 has gone up substantially, particularly in men over 60 since 1950, and the population at risk in the higher age groups has also increased considerably. (In the age group 60-69, it has increased 37% in men and 27% in women.) If the rate had remained unchanged, the rise in the total incidence in men in this age group would have been from 3,700 to 5,100; in fact it rose to 10,414. This has also been seen among the women as both the population at risk and the rate per 100,000 have also risen in them in the same period.

The sex ratio for bronchial carcinoma has also changed during the last two decades from 5.4:1 in 1950 to 4.9:1 in 1970. The change has happened in both the rates and total numbers. But the greatest difference between the two sexes has been in the changes between the rates in different five-year groups. In both sexes, the highest rate has moved up one five-year period, but in men the rate is actually falling up to the age of 65, whereas in women it has doubled in almost every five-year group in the last 20 years. These changes account for the alteration in the sex ratio overall.

If the present pattern of change continues a fall in the total incidence of bronchial carcinoma may be seen in a very short time.

A relationship between lung cancer, chronic bronchitis, and airways obstruction

M. CAPLIN The evidence that cigarette smoking is an important cause of both lung cancer and chronic bronchitis is incontrovertible (Royal College of

Physicians of London, 1971). It therefore follows that in cigarette smokers both diseases should occur together more often than would result from chance. Such an increased association has been reported in a number of studies (Denoix, Schwartz and Anguera, 1958; Case and Lea, 1955; Campbell and Lee, 1963; Rimington, 1968, 1971).

If it is true that there is an increased association of lung cancer with chronic bronchitis it also follows that airways obstruction which is frequently associated with chronic bronchitis should also be frequently associated with lung cancer. It is the authors' impression that this is not the case. In their experience it is not common for patients suffering from chronic bronchitis with severe airways obstruction to die from lung cancer though they may survive well beyond the lung cancer age; such patients are frequent attenders at chest clinics, and it would be unlikely for the co-existence or the development of lung cancer to be missed.

To test the validity of this clinical impression a prospective survey was established at the London Chest Hospital to determine the prevalence of chronic bronchitis and the prevalence of airways obstruction in a group of patients suffering from lung cancer, and the incidence of lung cancer in a group of patients suffering from chronic bronchitis.

The results of this survey showed, first, that lung cancer and chronic bronchitis occur together more often than would be expected from chance; secondly, that when these diseases occur together severe airways obstruction is uncommon; and, finally, that in patients suffering from severe airways obstruction due to chronic bronchitis death from lung cancer is uncommon though they survive to lung cancer age.

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Immunological parameters indicating prognosis in patients with lung cancer

P. MARKS and B. LACEY The presence of smooth muscle antibody and thyroid auto-antibodies in the sera of patients with neoplastic disease has been well described.

One hundred and twenty patients with pulmonary neoplasms both primary and secondary have been studied for up to four years with special regard to these immunological markers.

The ultimate prognosis has been correlated with these parameters at the time of diagnosis.

The presence of smooth muscle antibody in particular has been found to be of bad prognostic significance in that the group which possessed it at the time of presentation had a mean survival time much less than the group whose sera were negative for this marker.

The clinical significance of smooth muscle antibody and thyroid auto-antibodies in malignant pulmonary disease is discussed.

Immunotherapy in cancer of the lung?

P. L. AMLOT and R. K. KNIGHT 'Immunotherapy' is an attractive approach to the treatment of lung cancer. Unfortunately the word conveys little more at present than scarification with BCG or *C. parvum*, or an explanation for aberrant and unexpected long survival.

One approach would lie in the reconstitution of a generally impaired immune system. This approach has been studied by assessing the general immunocompetence of the cell-mediated arm of the immune system in 50 patients with lung cancer. Evidence will be presented that this is relatively intact until the late stages of the disease. The humoral side has been previously assessed and found to be normal (Krant *et al.*, 1968).

Another approach lies in utilizing specific immunity to lung cancer antigens, and heightening the specific response. The experience and results of using lung cancer homogenates, membrane extracts, and whole cancer cells are presented. Homogenates have been used by Humphrey *et al.* (1971), but the author finds from a limited series of 10 patients that no specific objective criteria can be used to assess whether this works or not. The possibility of using membrane extracts as skin tests, and whole tumour cells admixed with adjuvant, and monitoring by *in-vitro* tests appears hopeful, and the evidence for this approach is presented.

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Segmental resection for bronchial carcinoma

M. BATES Between 1952 and January 1974, 25 segmental resections were performed out of a total number of 1,750 resections for bronchial carcinoma. There were 21 males and four females. Seventeen patients had squamous-cell growths, six undifferentiated, and two adenocarcinomas. Ten apical lower segmentectomies were performed, five apical upper, four anterior upper, three apical lower, and three

lingulectomies. There were several indications for performing this operation, namely emphysema, age of the patient, a previous lobectomy necessitating preservation of lung tissue, a possible tuberculoma, and a complete segmental fissure ensuring a smooth post-operative course.

It is essential that this operation should only be performed in the absence of enlarged hilar nodes, and in this series only one patient had a positive hilar node and he died of recurrence six months after operation.

Twelve of these 25 patients are alive and well today, four of them for 10 years or more. The long-term results of this operation seem comparable with the results for more extensive resection, and provided the case is properly selected, then it is considered that segmental resection is just as correct a procedure for the treatment of bronchial carcinoma as is lobectomy.

The result of local excision of bronchial adenomata

D. K. C. COOPER Seven patients with bronchial adenoma have been treated by local excision of the tumour through a bronchotomy at the London Chest and Middlesex Hospitals. Follow-up has extended from 21 years to five months. In no case has recurrence occurred, and all patients have remained symptom-free with normal chest radiographs. Features of the case histories of these patients are briefly presented, and the place of this conservative approach in the management of bronchial adenoma is discussed in the light of the relevant literature.

Bronchoscopic brush biopsies

C. W. AKINS, I. K. R. MCMILLAN, R. H. STEELE, C. G. SBOKOS, and R. E. LEA The treatment of patients with pulmonary neoplasms which are suspected radiologically or by history depends on the various means used to establish a tissue diagnosis, whether this be by sputum cytology, transbronchoscopic punch biopsy, transbronchoscopic washings, transthoracic needle biopsy, or more recently cytology of specimens obtained by direct abrasive sampling of the involved bronchial mucosa. This last method, popularized by Fennessey as a technique of transnasal catheterization of individual subsegmental bronchi, was modified by Smith and Warrack (1972) into a form of transbronchoscopic abrasive biopsy using acrylic sponge attached to a malleable wire.

A modified method of transbronchoscopic sponge biopsy is presented and a series of 212 patients is discussed. A diagnostic accuracy of 89% was obtained in the 159 cases of proven carcinoma. False positive and false negative results are discussed. This technique was found to be an easy, rapid, accurate, and inexpensive method of obtaining samples for histological evaluation in the preoperative workup of patients with suspected pulmonary malignancies.

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Intravenous infusion of salbutamol in the management of asthma

C. S. MAY, S. G. SPIRO, A. J. JOHNSON, and J. W. PATERSON In the treatment of severe asthma prolonged infusion therapy may be essential. The main bronchodilator drug used in this situation has been aminophylline, although isoprenaline, despite its cardiac effects, has been used on occasion (Wood *et al.*, 1972). The advent of selective β_2 adrenergic drugs has meant that agents with much less cardiac effect are now available for the management of this situation. Initial experience with intravenous infusion of salbutamol in asthma has been limited to assessing the effects of short infusions (10 to 15 minutes) on spirometry and cardiovascular parameters (Warrell *et al.*, 1970; Paterson, Courtenay Evans, and Prime, 1971; Svedmyr, and Thiringer, 1971). There is no information however on the effects of more prolonged infusions of salbutamol.

Ten patients recovering from an acute episode of asthma severe enough to warrant hospital admission were studied. Bronchodilator therapy was stopped the evening prior to the study. The patients reclined on a couch, FEV₁ and FVC were measured using a dry spirometer and PEFR with a Wright's peak flow meter, and the ECG was monitored continuously during infusion. Blood pressure was measured using sphygmomanometry. Intravenous infusions were given using a constant infusion pump. The following rates of infusion were studied: 4.16, 8.32, 16.64, and 25 $\mu\text{g}/\text{minute}$. Each infusion rate was continued for 60 minutes and thus patients received salbutamol for a total of four hours. Highly significant rises in peak flow and FEV₁ occurred at an infusion rate of 4.16 $\mu\text{g}/\text{minute}$. Thus mean PEFR rose by 43% at 30 minutes and 58% at 60 minutes, and mean FEV₁ by 30% at 30 minutes and 48% at 60 minutes. At this infusion rate there was no significant change in blood pressure but mean heart rate rose by 6.6 beats/minute at 60 minutes. Increase of the infusion rate by increments to 25 $\mu\text{g}/\text{minute}$ did not result in any further significant rise in FEV₁ or PEFR. However cardiovascular changes became more obvious at these higher infusion rates. At 25 $\mu\text{g}/\text{minute}$ the mean rise in heart rate was 17.3 beats/minute.

It may be concluded from this study that adequate bronchodilatation can be achieved with an infusion rate of 4.16 $\mu\text{g}/\text{minute}$, that the greater part of this occurs within 60 minutes of starting the infusion, and that at this infusion rate cardiovascular effects are minimal. Although cardiovascular effects did occur at 25 $\mu\text{g}/\text{minute}$ they produced no adverse effects in any patient. Other workers have given infusions up to 133 $\mu\text{g}/\text{minute}$ in the treatment of premature labour, with falls in systolic blood pressure of 30 mmHg (Ng and Sen, 1974).

We conclude that salbutamol given at an infusion rate of 4 $\mu\text{g}/\text{minute}$ provides adequate bronchodilatation with no cardiovascular side-effects, and that the safety margin is considerable in the light of other published work.

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Intravenous injection of salbutamol in the management of asthma

S. G. SPIRO, C. S. MAY, A. J. JOHNSON, and J. W. PATERSON In the domiciliary treatment of an acute asthma attack parenteral therapy may be of value. This is limited to the use of intravenous aminophylline or subcutaneous adrenaline, and more recently subcutaneous terbutaline. We have investigated the use of an intravenous bolus injection of salbutamol in 10 patients with measurable reversible airways obstruction. Intravenous doses of salbutamol were given every 15 minutes, starting at a dose of 50 μg and increasing by increments of 50 μg to a maximum dose of 450 μg (0.45 mg). On a separate day the response of the same patients to aerosol salbutamol was also assessed. In this study an initial dose of 100 μg was given and increments were given every 15 minutes to a maximum dose of 800 μg .

A measurable increase in FEV₁ and PEFR was seen at one minute after an intravenous injection of 50 μg (0.05 mg) of salbutamol, but 15 minutes later these parameters were not significantly greater than those measured prior to the study. From inspection of the dose-response curve, the optimal mean increase in PEFR (48.8%) was seen after an intravenous injection of 200 μg (0.2 mg). The mean FEV₁ rise at this dose was 40.4%. At one minute following this injection mean heart rate had risen by 28 beats/minute but 15 minutes the mean heart rate rise was 12 beats/minute.

It was noted that if the injection was given rapidly, i.e., in one minute, marked tachycardia occurred with in one minute, which became considerably less after 15 minutes. When the injection was given more slowly, i.e., in five minutes, the increase in heart rate was less marked. On average the FEV₁ and peak flow rises were similar when the same dose was given either by aerosol or intravenously. However following aerosol administration no tachycardia was seen.

We feel that intravenous salbutamol given as a single dose of 0.2 mg over a period of five minutes represents a useful addition to existing parenteral bronchodilator therapy.

Prostaglandins and the bronchus

A. P. SMITH Prostaglandins E2 and F2a (PGE2 and PGF2 α) occur in human bronchus and lung. PGF2 α

a bronchoconstrictor agent whose effects were not inhibited by atropine, disodium cromoglycate or flufenamic acid but were reversed by inhaled PGE₂ and isoprenaline. Study of the dose response curves to inhaled PGF₂ α and histamine revealed that asthmatics were about 161 times more sensitive to PGF₂ α than were healthy volunteers and about eight times more sensitive to histamine. Some of this difference may be explained by the very irritant nature of PGF₂ α when inhaled. PGF₂ α also causes bronchoconstriction when given intravenously.

PGE₂ is a bronchodilator which is irritant when inhaled. Dose response curves in asthmatics indicate that it is of similar potency to isoprenaline. When given by the intravenous route it loses its bronchodilator effect, suggesting that it undergoes metabolism by the lungs. Side effects are frequent, including hypotension and bronchoconstriction, but the nature of the active metabolite is unknown.

Indomethacin, 200 mg daily, a potent inhibitor of PG synthesis in man, failed to prevent exercise-induced asthma, antigen-challenge-induced wheezing or day to day asthma, suggesting only a minor role for PGF₂ α in the bronchoconstriction of asthma.

The influence of bronchomotor tone on bronchial reactivity

M. K. BENSON Patients with asthma have increased bronchial reactivity to non-specific constrictor stimuli. Inhalation challenge studies have been used as a diagnostic test but their interpretation is complicated when there are differences in baseline conditions. For example, the laws governing gas flow would mean that for a given change in airway diameter there will be a larger increase in airway resistance in patients with pre-existing airway narrowing. In addition there may be potentiation between a smooth muscle agonist and the level of resting bronchomotor tone.

The effect of changes in baseline tone on histamine-induced bronchoconstriction was examined by measurement of changes in bronchial diameter in dogs in whom airways were outlined by tantalum dust. Bilateral vagotomy was performed and reactivity to inhaled histamine measured (1) without vagal stimulation and (2) with electrical stimulation of the distal ends of the cut vagi. Doses of histamine which had little effect on airway diameter when the vagi were unstimulated (mean reduction 0.3 mm) produced significantly greater changes during vagal stimulation (mean reduction 1.2 mm).

There are several possible reasons for enhanced reactivity to non-specific constrictor stimuli in patients with asthma. This study emphasizes two of these factors:

1. initial airway diameter on purely geometric grounds;
2. the degree of vagally induced airway tone which may interact with and potentiate an inhaled stimulus.

Immune mechanisms in chronic asthma

A. B. KAY, D. G. JONES, G. D. BACON, BARBARA A. MERCER, and J. W. CROFTON This laboratory is currently investigating immune mechanisms independent of IgE which may play a role in the pathogenesis of chronic asthma. We have recently shown that there are alterations in the complement profile in this form of the disease and that complement activation may result from infective agents combining with natural antibody. Levels of the fourth component of complement (C₄), a particularly sensitive index of classical pathway complement activation, were significantly depressed in chronic asthma and correlated better with the clinical features of this form of the disease than those of circulating IgE (Kay *et al.*, 1974).

In order to support the concept that in chronic asthma complement-derived biologically active peptides (possibly anaphylatoxins) are liberated which in turn release histamine and other pharmacological mediators we have measured the sputum histamine in patients with episodic (allergic) and chronic (non-allergic) asthma. We found no difference between the two groups in terms of both sputum histamine and the peripheral blood eosinophil counts. In contrast significantly higher values of IgE were present in patients with episodic asthma and lower levels of C₄ in the chronic asthmatics. Thus the data support the concept that there is a final common pathway in both groups of patients which leads to mast cell degranulation with the release of histamine (and other agents including eosinophil chemotactic factor of anaphylaxis (Kay and Austen, 1971; Kay, Stechschulte, and Austen, 1971)) since the sputum histamine and circulating eosinophils were not different in the two groups.

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A morphometric study of the carotid bodies of rats living at simulated high altitude

J. M. KAY and P. LAIDLER The carotid body is a chemoreceptor which responds to the oxygen tension of systemic arterial blood. It enlarges in human subjects and animals living at high altitude, and also in patients with pulmonary emphysema complicated by right ventricular hypertrophy. In order to determine the precise nature of this enlargement, we have carried out a quantitative histological study of the carotid bodies of 10 rats living in a hypobaric chamber at a pressure of 460 mmHg (simulated altitude 4,300 metres) from 25 to 96 days. The results were compared with those from 10 control rats living at normal atmospheric pressure. In the chronically hypoxic rats there was a fourfold increase in the mean combined volume of the carotid bodies. Morphometric analysis

disclosed a threefold increase in the mean volume of specialized glomic cells and a tenfold increase in the mean volume of capillaries, although the proportion of glomic cells was actually significantly decreased. In all our hypoxic rats there was evidence of both right and left ventricular hypertrophy. However, there was no linear relation between total carotid body volume or volume of glomic cells on one hand, and the right and left ventricular weight on the other hand. There was no simple relation between the combined total carotid body volume and duration of exposure to hypoxia, but the volume of specialized glomic cells was linearly related to the duration of hypoxia. The increase in the volume of specialized glomic cells was apparently due mainly to enlargement of the type I (chief cells). The increase in vascularity of the hypoxic carotid body may be a mechanism to increase blood flow and thus oxygen transport to a hypoxic organ with increased metabolic activity. Small quantities of an amorphous hyaline substance of unknown nature were found in relation to capillaries and type I cells in all the hypoxic rats.

Exercise testing as a guide to prognosis in early Hodgkin's disease

G. LASZLO, JANE JONES, and YVONNE L. MILLETT The pulmonary function of 90 patients with Hodgkin's disease was assessed during their initial investigation by measurement of FEV₁, VC, and single breath CO transfer factor (Tl_{CO}). Abnormal results were obtained in many cases with advanced disease but these measurements lay within 80% of 'predicted normal' in all but three of 38 individuals in whom the disease had not apparently spread beyond the lymphatic system in one half of the body (stages I and II).

Eleven patients with hilar adenopathy but no radiologically apparent lung disease performed progressive exercise tests. They were all under 45 and apparently free from any other disease. They exercised by pedalling an electrically braked cycle ergometer for three minutes at 50 watts work, then if possible three minutes at 100 watts and 150 watts. Ventilation and mixed expired gas pressures were measured during the third minute at each work load, expired gas being collected in a Douglas bag.

The most useful measurement was the mixed expired PCO₂, which, if low, indicates the presence of alveolar hyperventilation, of an increased dead space, or of both. A normal value (above 32 mmHg, after correction for the dead space of the valve box) excludes both these disturbances.

Five patients had normal exercise ventilation and expired PCO₂. Four of these responded well to initial treatment and are alive after four years. One has died of disseminated non-pulmonary Hodgkin's disease. In contrast, four of the six patients with low expired PCO₂ developed radiologically apparent pulmonary metastases within two years, one developed disseminated disease without chest x-ray changes and only one remained well after initial treatment.

Seven of these patients were treated by irradiation to the mediastinum. This caused no functional disturbance in three patients with normal exercise ventilation but was followed by a persistent fall of vital capacity and effort tolerance in four with previously abnormal exercise tests. The latter subsequently developed pulmonary metastases.

CONCLUSION: An abnormally increased exercise ventilation in a patient with lymphoma indicates a predisposition to the development of radiologically apparent pulmonary metastases within a short time.

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Oxygen breath tests in patients with pulmonary diffusion defects

R. A. STOCKLEY and K. D. LEE Oxygen breath tests originally devised to estimate the reflex hypoxic respiratory drive in normal subjects (Dejours, 1962) have recently been applied to patients with chronic bronchitis (Lee and Bishop, 1974). These patients, though numerous, are not ideal subjects for oxygen breath tests, because their arterial PO₂ (Pa_{O₂}) rises slowly on oxygen. The percentage fall in ventilation observed therefore has to be interpreted against background of possible secondary factors.

The ideal oxygen breath test should raise the Pa_{O₂} rapidly above the chemoreceptor threshold which lies between 13.3 kPa and 22.7 kPa. It is demonstrated here that this occurs in patients who have interstitial lung disease but no significant airways obstruction.

Nine such patients with varying degrees of hypoxaemia were studied using methods described previously (Lee and Bishop, 1974). Oxygen was substituted for the inspired air for periods of 30 s and the mean fall in ventilation was measured over the last 10 s, by which time the Pa_{O₂} had reached at least 16 kPa in each patient. The following are the percentage falls in ventilation observed, together with the resting Pa_{O₂} for each patient: 21%, 8.9 kPa; 15%, 9.3 kPa; 18%, 9.4 kPa; 14%, 9.5 kPa; 21%, 9.8 kPa; 5%, 10.5 kPa; 13%, 11.3 kPa; 5%, 11.8 kPa; 12%, 10.9 kPa (the resting Pa_{CO₂} ranged from 5.0–5.8 kPa).

A reflex hypoxic drive to respiration was therefore demonstrable in each patient. The drive tended to be greater in the more hypoxaemic patients. Over the range of Pa_{O₂} considered the size of the hypoxic drive was comparable with that found by Lee and Bishop (1974) in patients with chronic bronchitis.

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Lung function in fibrosing alveolitis

N. MCC. SCHOFIELD, M. GREEN, R. J. DAVIES, and I. CAMERON Fibrosing alveolitis has been characterized as a disease affecting alveoli, but histological studies

have suggested that in some cases the small airways may also be affected (Seal, Hapke, and Thomas, 1968). It seemed possible that the fibrosis of parenchyma around small airways might prevent them closing, or alternatively that fibrosis of the airways themselves might cause earlier closure. We therefore studied small airway function in ten patients with chronic fibrosing alveolitis (seven had extrinsic fibrosing alveolitis with a history of avian exposure together with positive precipitins, and three had intrinsic fibrosing alveolitis). FEV₁, FVC, PEFR, lung volumes, single breath transfer factor, total lung resistance and closing volumes by the helium and nitrogen methods (Travis, Green, and Don, 1973) were measured with the patients seated. Static lung recoil pressures were recorded with an oesophageal balloon.

TLC, RV, VC, and FEV₁ were reduced (means 80%, 84%, 83%, 80% of predicted respectively). The mean ratio of FEV₁/FVC was 80%. Total lung resistance was normal but transfer factor was reduced (mean 52% predicted). Static lung recoil was normal when related to the patient's measured TLC but reduced in relation to predicted TLC, confirming the findings of Gibson and Pride (1973). In all ten patients a definite closing volume was seen. Indeed closing volume and closing capacity were markedly increased in relation to the patient's own lung volumes (means 31% VC and 58% TLC respectively). Static recoil pressure at closing volume was normal. Although this might suggest intrinsic disease of the small airways, these abnormalities could also be explained by loss of lung units, the small airways remaining relatively unaffected physiologically.

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Results of treatment of bronchiectasis by surgery

J. M. SANDERSON The distribution, extent, and patterns of bronchial dilatation and the details of the clinical manifestations of a consecutive series of 393 cases of bronchiectasis seen in one thoracic surgical practice between 1952 and 1966 are presented. No correlation was found between defined grades of clinical severity and the number of pulmonary segments affected. Nearly always dependent segments were involved and only rarely were non-dependent segments affected alone. The segments most commonly affected were the medial basal (7th), medial division of middle lobe, and inferior division of lingula (5th). The 4th, 10th, 8th, and 9th segments were also frequently affected. Sepsis of the upper respiratory tract or ears was present in 30% of the patients, and in these bilateral bronchiectasis was more common than unilateral.

The patients were followed up for 2-15 years (42% for more than ten years); about two-thirds were

treated surgically and the remainder by conservative measures. At the final follow-up (2-15 years) 61% were improved but at 10-15 years only 50% were improved. The overall mortality excluding those patients lost to follow-up was 8% and mortality attributed to bronchiectasis was 5.3%.

While no overall comparison between results of surgery and conservative measures was possible, it was found that comparison of a small group of patients who had refused surgery when matched against cases that had surgery showed better results in the surgical group and that correlation of defined grades of end results with grades of clinical severity at first attendance suggested that surgery as performed in this series was beneficial. There was a trend to a progressive deterioration in clinical fitness of the patients and a significant mortality.

Local bronchial production of immunoglobulin in chronic bronchitis

C. A. SOUTAR The number of cells containing immunoglobulins in the main bronchus of four subjects dying from complications of chronic bronchitis have been estimated by counts of plasma cells and other cells containing immunoglobulin in serial sections of right main bronchus stained by direct immunofluorescent methods to demonstrate the presence of IgA, IgG, IgM, and IgE. The results have been compared with counts in four subjects without respiratory disease.

The predominant immunoglobulin was IgA and it was found in plasma and other cells in the submucous gland and lamina propria of the bronchus. IgA cells were found in much smaller numbers in the bronchitics than in those without respiratory disease and cell counts confirmed this observation: the mean IgA cell count in the normals was 580 cells/5μ sections, and in the bronchitics was 113 cells/section (significance of difference $P < 0.025$).

This work suggests that a deficiency of bronchial secretory IgA may be present in fatal chronic bronchitis and is consistent with the finding of Medici and Buerger (1971) that in contrast to mild bronchitics, severe chronic bronchitics are unable to increase their sputum IgA in response to infection and the work of Deuschl and Johannsen (1974) which demonstrated that the IgA in the sputum of some chronic bronchitics is largely derived from serum and is not locally secreted.

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Pneumoconiosis and chronic bronchitis in coalminers

D. C. F. MUIR, M. JACOBSEN, and J. BURNS The radiological progression of simple pneumoconiosis in a cohort of British coalminers is examined. The men selected are those whose chest radiographs, at the

start of the period of observation, were classified as category O on the ILO classification. They are divided into two groups. The first group contains men who denied that they produced sputum when interrogated with a modified form of the MRC questionnaire. The remainder consists of those who replied in the affirmative.

The amount of radiological progression in the two groups is compared after a period of ten years, taking into account the degree of dust exposure in the intervening period.

The purpose of the investigation is to examine the validity of the hypothesis that abnormalities of the upper airways may either prevent inhaled dust reaching the alveoli or increase the rate of its excretion. If this were so then there might be a tendency for men with chronic bronchitis or airway obstruction to be protected to a certain extent from developing simple pneumoconiosis.

This possibility has become of practical importance in the recent controversy over disability in coalworkers since it has been postulated that the mechanism could obscure a relationship between radiological pneumoconiosis and abnormalities of pulmonary function. The results show that the incidence of simple pneumoconiosis is similar in the two groups. They do not support the suggestion that bronchitis protects against pneumoconiosis.

The assessment of lung elasticity

G. J. GIBSON and N. B. PRIDE Use of the pressure volume (PV) curve of the lungs is the only practicable means of assessing pulmonary elasticity *in vivo*. From it the compliance and values of lung recoil pressure (Pstl) at various lung volumes can be derived as quantitative indices for comparison between subjects. The volume range over which the PV curve can be reliably estimated lies between functional residual capacity (FRC) and total lung capacity (TLC). The values of Pstl at each of these limits, however, are not dependent solely on the elasticity of the lungs; both in addition reflect properties of the chest wall, and the magnitude of Pstl at TLC is also related to the force which can be generated by the inspiratory muscles. These extrapulmonary factors influence the indices of lung elasticity and complicate the assessment of physiological and pathological differences.

Analysis of the PV curves of normal subjects shows higher values of Pstl at TLC in young men compared to young women; this is explicable by greater muscular strength, while the lower values of Pstl found in elderly subjects represent a true difference in the elastic properties of the lungs. In pulmonary fibrosis much of the abnormality of the PV curve can be accounted for by the reduction in lung size; abnor-

mally high values of Pstl are found only near TLC and may again reflect the properties of the inspiratory muscles.

The management of the severely disrupted oesophagus

H. R. MATTHEWS In a personal series of 36 cases of ruptured oesophagus, 20 have required thoracotomy. In 16 the dehiscence was either gross (6) or complicated by additional oesophageal disease (10), viz. benign oesophageal stricture (5), carcinoma (2), hiatal hernia repair (2), gross infection (1).

Four particularly problematical cases are described. Case 1 had a perforation above a benign stricture of the middle third, was on long-term steroids for asthma, and had previously had vagotomy and gastroenterostomy for duodenal ulceration, making reconstruction difficult. Case 2 had a perforation through recurrent tumour at the site of anastomosis following previous oesophagogastrectomy for carcinoma. Case 3 had a postmetabolic rupture of the oesophagus extending from the right side at the level of the aortic arch to the left side just above the hiatus, associated with acute cholecystitis. Case 4 had a gross and persistent oesophagopleural fistula following repair of right-sided postmetabolic rupture.

Awareness and early confirmation of the diagnosis is vital. First aid consists of intercostal drainage and fluid restoration and is followed by immediate surgery. Operation must reduce the risk of postoperative mediastinitis to a minimum and should deal radically with associated oesophageal disease. If the oesophagus is irreparably damaged total excision and delayed reconstruction may be the only solution.

Mobilization of the chest wall for the fixed chest in ankylosing spondylitis

C. E. DREW, C. FOSTER COOPER, D. GOULDING, and R. MARKS In 1956 one of us was presented with the problem of a patient with ankylosing spondylitis who had a fixed chest and severe respiratory insufficiency. The theoretical problems and the possible complications of attempting mobilization of the chest wall were studied before the operation was carried out. This consisted in removing parts of the ribs on both sides adjacent to the costovertebral joints in two stages. The patient was greatly improved by the procedure and, as an unforeseen bonus, showed greater movement of the head and neck.

Since that time a further five patients have been operated upon, three with the intention of improving respiratory function and two in the hope that head and neck movement would be improved.

The surgical technique, complications, and results are discussed with indications for this type of surgery in possible future cases.