Thorax (1950), **5**, 374.

ABSTRACTS

This section of THORAX *is published in collaboration with the two abstracting journals, Abstracts of World Medicine, and Abstracts of World Surgery, Obstetrics and Gynaecology, published by the British Medical Association. In this Journal some of the more important articles on subjects of interest to chest physicians and surgeons are selected for abstract, and these are classified into five sections: experimental; tuberculosis; neoplasm; asthma; thoracic surgery. Each section is not necessarily represented in any one issue.*

Experimental

Respiratory Function

Ventilatory Function Tests. I. Voluntary Ventilation Capacity. GRAY, J. S., BARNUM, D. R., MATHESON, H. W., and SPIES, S. N. (1950). *J. clin. Invest.*, **29**, 677.

The aim of this work, undertaken at the North-western University Medical School, Chicago, was to find a reliable method for the determination of the so-called voluntary ventilation capacity, that is, the capacity when the subject breathes voluntarily at the maximum rate. The results of the tests were expressed in litres per minute. The procedure was standardized in such a way as to eliminate many factors, such as acapnia, involuntary inhibition of respiration, and individual differences in performance of breathing, which made the results of previous investigators unreliable.

In 283 healthy young men and 40 healthy young women the normal values were 167 ± 21 and 116 ± 21 litres a minute respectively, with reliability coefficients of 0.8 to 0.9.

A. I. Suchett-Kaye.

Ventilatory Function Tests. II. Factors Affecting the Voluntary Ventilation Capacity. MATHESON, H. W., SPIES, S. N., GRAY, J. S., and BARNUM, D. R. (1950). *J. clin. Invest.*, **29**, 682.

An experimental investigation in healthy young adults was designed to find out to what degree the following three factors affect the voluntary ventilation capacity. (1) *Vital capacity* in 194 healthy male subjects averaged 5.13 ± 0.66 litres and in 40 healthy female subjects 3.58 ± 0.53 litres; the voluntary ventilation capacity was found to correlate weakly (0.4 to 0.7) with the vital capacity, and the capacity ratio obtained by dividing the ventilation capacity by the vital capacity (and expressing the ventilation capacity in terms of each litre of vital capacity) remained constant when the other factors (muscular force and pulmonary resistance) remained unchanged. Abnormalities in the capacity ratio therefore indicated deviation from normal as regards either muscular force or air-flow resistance. The mean value of the capacity ratio was found to be 32.8 (for both men and women). (2) *Maximum expiratory pressure* was found to be 140.8 mm. Hg in 54 healthy individuals blowing through a mouth-piece into an aneroid manometer. No correlation could be established between the ventilation capacity and the maximum expiratory pressure in the normal people investigated. The results indicated that the effects of the latter would be small unless there was gross muscular impairment. (3) *Air-flow obstruction.* The introduction of artificial air-flow resistances profoundly depressed the voluntary ventilation capacity and the capacity ratio, without altering vital capacity.

It is concluded that the estimation of the voluntary ventilation capacity is a more accurate measure of the pulmonary function than the much-abused vital capacity test, by which only one of the factors influencing the ventilation capacity is assessed.

A. I. Suchett-Kaye.

Ventilatory Function Tests. III. Resting Ventilation, Metabolism, and Derived Measures. MATHESON, H. W., and GRAY, J. S. (1950). *J. clin. Invest.*, **29**, 688.

This paper is concerned with the results of various procedures for testing ventilatory function in 100 young healthy adult subjects. A critical evaluation is given of the performance and reliability of such tests as the measurements of voluntary ventilation capacity, vital capacity, resting pulmonary ventilation, and resting oxygen consumption, and of the three derived measurements of resting ventilatory reserve, capacity ratio, and ventilation equivalent for oxygen. Based on the above considerations, the authors present a

scheme for the classification of impairment of pulmonary ventilatory function under two main headings: (1) reduction in resting ventilatory reserve; (2) excessive pulmonary ventilation. *A. I. Suchett-Kaye.*

The Physiological Effects of Pneumoperitoneum upon the Respiratory Apparatus. WRIGHT, G. W., PLACE, R., and PRINCI, F. (1949). *Amer. Rev. Tuberc.*, **60**, 706.

The size of lung, tidal air, and minute ventilation of 19 patients were measured before and after induction of pneumoperitoneum. In one case a bronchospirometric study was carried out on a patient who also had a hemidiaphragmatic paralysis. The maximum breathing capacity (in litres per minute) was determined in 10 of the cases before and after pneumoperitoneum induction. In all 19 the functional residual air (FRA), that is, the total of the supplemental and residual air was measured, as well as the total volume, the vital capacity, the residual air, the supplemental air (here called reserve air), and the complemental air (including here the tidal air).

In all cases the FRA was reduced, before pneumoperitoneum induction, by 12 to 43% (mean 32%) when the patient lay down after standing up. In the standing patient pneumoperitoneum reduced the FRA by 15 to 44% (mean 30%). When the FRA was measured on the patient lying down, 15 patients showed a decrease in FRA of 9 to 15%, one patient showed no change, and three patients showed increases of 6, 10, and 13% respectively. One of these three had advanced emphysema and one had severe fibrosis of the lungs, and in these two cases the presence of a pneumoperitoneum with an abdominal binder caused a reduction in FRA when the patient was lying down. The binder had no effect in the third case, in which the patient had very flabby abdominal muscles after multiple pregnancies. The combined effects of pneumoperitoneum and the change from standing to lying down were noted in 17 cases; there was a decrease in FRA of 30 to 57% (mean 46%). The maximum breathing capacity was not greatly affected, and the authors state, without figures, that this is probably due to the increased frequency of breathing. The tidal air was unchanged.

The work suggests that pneumoperitoneum is an effective means of partial collapse, and the authors suggest that it might well be as effective as diaphragmatic paralysis in many cases. *Jeffrey Boss.*

Electrophrenic Respiration. IV. The Effectiveness of Contralateral Ventilation during Activity of One Phrenic Nerve. SARNOFF, S. J., GAENSLER, E. A., and MALONEY, J. V. (1950). *J. thorac. Surg.*, **19**, 929.

Detailed studies and analyses of the results of electrophrenic respiration have revealed some interesting points.

If only one phrenic nerve is electrically stimulated, the arterial oxygen content is maintained at a normal level; the implication of this is that either the opposite lung is being ventilated or the blood vessels in the opposite lung are constricted, so as to shunt the blood through the lung on the side of the pleural stimulation. This point was settled by bronchospirometry and radiological investigation, which demonstrated that the opposite lung was adequately ventilated by phrenic stimulation. The mechanism involved was a pull-over of the mediastinum by the contracting diaphragm, so that the contralateral lung was actually expanded by mediastinal movement.

The clinical application of these studies to the role of phrenic nerve interruption is important. Phrenic paralysis produces about 10 to 15% reduction in lung volume, but if the mediastinum is mobile the motion of the normally moving side of the diaphragm will be transmitted via the mediastinum to the lung on the side operated upon. The authors think that the benefits of phrenicectomy depend on actual diminution in lung volume rather than on rest or reduction of function. *T. Holmes Sellors.*

The Mechanism of Pleural and Ascitic Effusions, with a Suggested Method for the Indirect Estimation of Portal Venous Pressure. JAMES, A. H. (1949). *Clin. Sci.*, **8**, 291.

The pressure in the antecubital vein was measured in patients with pleural effusion (17) or ascites (24) due to a variety of causes. The pressure in a paracentesis needle inserted into the fluid collection was measured manometrically at the same time. The albumin and globulin values in the effusion and in the plasma were determined, and from this information the colloidal osmotic pressure and the hydrostatic pressure differences between the blood and the effusion could be estimated. In pleural effusion and in ascites due to causes other than cirrhosis of the liver the difference between the venous and the effusion pressures was equal to the difference in the colloidal osmotic pressures.

In patients with cirrhosis the pressure in the effusion greatly exceeded the venous pressure, especially if haematemesis was a feature of the history of the disease; this difference was a measure of the degree of portal obstruction. Albumin levels in the effusions and the plasma were proportional to one another, but the relative levels of globulin were quite unrelated. Inflammatory "exudates" contained more total protein than did the effusions found in cardiac failure. It is suggested that albumin diffuses through the capillaries, the amount in an effusion fluid being related to the plasma level and the pressure differences, whereas globulin only passes through capillary walls damaged by inflammation. Hypoproteinaemia is found in most patients with effusion, but it is more marked in those with cirrhosis of the liver. *James D. P. Graham.*

Observations on Mechanisms of Edema Formation in the Lungs. PAINE, R., BUTCHER, H. R., HOWARD, F. A., and SMITH, J. R. (1949). *J. Lab. clin. Med.*, **34**, 1544.

The two opposing theories of the mechanism of production of pulmonary oedema, the "mechanical" and the "neurogenic," are considered critically and the work of others in this field is reviewed. The authors then describe experiments undertaken with the limited objective of determining whether Starling's principles governing the passage of fluids between capillaries and lymph spaces applied to the pulmonary as well as to the greater circulation. Heart–lung preparations from dogs were used and pulmonary lymph flow, systemic arterial blood pressure, pulmonary arterial blood pressure, and left auricular pressure were measured. When diluted blood was used in the circuit it was found that the pulmonary lymph flow increased and the circulating blood volume diminished; but the heart size and pulmonary and systemic blood pressures were unaltered, and the lungs remained pale. It is concluded that the transudation of fluid from the capillaries was due simply to the fall in osmotic tension of the plasma. Curiously enough, it was noted that although, as a consequence of loss of fluid into the lymph spaces, the plasma protein concentration rose to normal levels or higher, the transudation of fluid continued. This continued loss could not easily be explained on the basis of Starling's principle.

In further experiments left ventricular dilatation was produced by raising the aortic pressure from about 100 to 170 mm. Hg, or increasing the rate of venous inflow from about 250 ml. to 650 ml. per minute. In such cases the lungs rapidly became dusky and turgescent, while lymph, at first sanious and later frankly blood-stained, passed in progressively increasing volume out of the right thoracic duct, and foamy fluid sometimes collected within the bronchial tree. In every instance where there was increase of lymph flow, the gross or histological appearances of pulmonary oedema were afterwards found. It is concluded that, in the heart–lung preparations of the dog, the same principles govern the capillary lymph exchange in the pulmonary as in the greater circulation.

John Naish.

The Bronchi during the Acute Phase of Asthma. An Experimental, Bronchoscopic, and Histological Study. VALLERY-RADOT, P., HALPERN, B. N., DUBOIS DE MONTREYNAUD, J. M., and PÉAN, V. (1950). *Pr. méd.*, **38**, 661.

Young guinea-pigs were sensitized with crystalline egg albumen. After three weeks they were exposed to aerosol inhalations of 10% ovalbumin. Examination of the killed animals revealed considerable oedema of the bronchi. It was assumed that oedema played a greater part than bronchial constriction in lethal anaphylactic shock in guinea-pigs.

In normal guinea-pigs asthma-like dyspnoea was produced by inhalation of histamine. Necropsy revealed the result of the histamine action on muscle fibres. The bronchial lumen was narrowed. Moderate capillary dilatation was seen, but no oedema. It was concluded that spasm of the bronchial muscles was the main cause of death of these animals.

The presence of bronchial oedema thus distinguishes experimental anaphylactic asthma from pharmaco-dynamic bronchial attacks. Antihistamine drugs, when given before the lethal inhalations, protected the animals against both types of asthma. On the other hand, the same drugs given during the attack were without effect in the anaphylactic type, whereas they acted quickly and effectively in attacks produced by histamine. The authors conclude that antihistaminic drugs can prevent the development of acute oedema, but cannot abolish oedema once it has developed. On the other hand they can completely overcome fully established bronchospasm.

Bronchoscopic examinations were carried out on human subjects before, during, and after an asthma attack. Biopsy specimens of

the bronchial mucous membrane were taken during the crisis, six cases of "allergic" and "non-allergic" asthma being investigated. (By the term "allergic asthma" the authors mean asthma in subjects with positive skin reactions to antigens. "Non-allergic" attacks were diagnosed in patients with negative skin tests and no history of allergic reactions.)

In allergic asthma the dominant feature was oedema with consequent diminution of the bronchial lumen. Hypersecretion was scarce. The epithelium showed metaplasia; no eosinophil cells were seen. In non-allergic asthma, no oedema was noted. There was considerable reduction of the bronchial lumen and abundant hypersecretion. The ciliated epithelium was present. Many mucus cells were seen, and the basal membrane was enlarged. No eosinophil cells were noted. The absence of eosinophils in both types of asthma was surprising, for they were present in the blood and bronchial secretions in these cases.

Antihistaminic drugs gave favourable results in the allergic type of asthma if administered at the onset of the attack. However, the authors admit in a footnote that the response in pollen and dust asthma is less than in other allergic types. [In the abstracter's experience those two groups constitute the majority of cases of allergic asthma.] On the other hand, the non-allergic asthmatics did not respond to antihistaminic drugs. [No explanation is given for the failure of antihistaminic drugs to relieve the bronchial spasm in man.]

The experiments in guinea-pigs, as well as the bronchoscopic and histological examinations in man, show that the asthmatic allergic crisis may be attributed to acute oedema of the bronchial mucous membrane, whereas the non-allergic asthmatic attack may be due to a different mechanism. *Kate Maunsell.*

Tuberculosis: Clinical

The Relation of Cavity to the Development of Streptomycin-resistant Tubercle Bacilli in Pulmonary Tuberculosis. MITCHELL, R. S. (1949). *New Engl. J. Med.*, **241**, 450.

The authors analyse the changes in degree of streptomycin sensitivity in 116 patients treated with streptomycin, from whom adequate sputum specimens were obtained during and after completion of streptomycin therapy. All had active pulmonary tuberculosis. The daily dose varied from 0.5 g. to 2 g. per day, but was usually 1 g. per day. The mean duration of treatment was two months. Sputum or gastric cultures contained tubercle bacilli in 100 cases at some time after therapy was completed. Streptomycin resistance developed in 40% of 51 cases in which there was radiological evidence of cavitation before treatment and no coincidental collapse; in 10% of 20 cases with cavitation before therapy but with a coincident satisfactory collapse of lung; and in 11% of 29 without cavitation before therapy. The authors suggest that, if these findings were confirmed by other workers, it would be logical to withhold streptomycin whenever possible until collapse is well established. *M. Daniels.*

Lessening the Risk of Streptomycin Resistance by Combined Sulphone–Streptomycin Treatment. A Study of 100 Cases of Pulmonary Tuberculosis. BERNARD, E., NOUVION, —., COLETSOS, P. J., and KREIS, B. (1950). *Bull. acad. nat. Méd., Paris,* **114**, 461.

For this trial 100 adult male patients at Champrosay Sanatorium were selected. All had pulmonary tuberculosis, the duration of the disease ranging between four months and five years, with positive sputum and lung cavities, usually bilateral. None had had any previous chemotherapy. They were divided into two comparable groups of 50, the first group receiving streptomycin and sulphone, and the second streptomycin only. The sulphone was given thrice daily in a total daily dose of 90 mg. during the first week, 105 mg. during the second, 120 mg. during the third, 135 mg. during the fourth, and 150 mg. during the fifth and subsequent weeks. Streptomycin, 1 g. daily, was given by intramuscular injection for 132 days, commencing seven weeks after the start of sulphone therapy. Various toxic reactions due to the sulphone were recorded.

The degree of resistance of the tubercle bacilli in the sputum of each patient was titrated every 15 days, using the standard method of the Pasteur Institute. The results were as follows: after 42 days of streptomycin treatment the incidence of resistance was 38% in the first group and 78% in the second group. After 70 days the figures were 51% and 91%, and after 122 days 48.5% and 90.6% respectively. These results were confirmed in another group of cases with long-standing cavities, in whom the development of resistance was likely to have been particularly

rapid. The treatment, so far as the patients' clinical condition was concerned, was not considered to have been effectual.

Donough O'Brien.

Treatment of Pulmonary Tuberculosis by Posture. NEDELJKOVIĆ, J., PUTNIK, D., POPOVIĆ-SAVIĆ, J., LABAN, M., and BOGDANOVIĆ, M. (1949). *Srpski Arkhiv*, **47**, 411.

Between 1942 and 1946, 138 patients were treated solely, and 42 in combination with pneumothorax, phrenic crush, or other collapse therapy, by the gradual raising of the foot of the bed over seven to eight days to 60 to 70 cm. above the ground, this position being maintained continuously on an average for 49 days. The cases were selected from those thought unsuitable for other forms of treatment or because their condition was stationary or they were awaiting surgical treatment. Of those treated by posture alone 57 had unilateral and 81 bilateral disease; of these two groups respectively the condition improved in 27 and 30, and in 4 and 2 healing took place; in 5 and 11 the condition became worse. Close supervision, in the early days, of temperature, expectoration, and radiological appearances is essential. Complications were haemorrhage, inflation of cavities, and rise in temperature. This treatment is contraindicated in severe caseous and bronchopneumonic conditions and must be discontinued if a high temperature persists or there are recurrent haemoptyses. It is advised especially where collapse fails and where there is unilateral or bilateral cavitation. Beneficial results are attributed to the raising of the diaphragm, hyperaemia, and mechanical drainage. *Dushanka Wolstenholme.*

Treatment of Tuberculosis with Promizole. A Clinical Investigation with Matched Controls. BURNS, H. A., FELDMAN, W. H., HINSHAW, H. C., MYERS, J. A., and PFUETZE, K. H. (1949). *Dis. Chest*, **16**, 867.

The therapeutic efficacy of 4:2-diaminophenyl-5-thiazolesulphone or "promizole" was tested by a clinical investigation, with matched controls, of cases of tuberculosis in the mental hospitals in Minnesota. Serial radiographs over a period of years were available in these cases; in those selected for the study disease was progressive and in general exudative and bronchopneumonic in type. Any with lesions of a chronic nature were excluded. Patients were paired so that age and disease were as closely comparable as possible. A coin was then tossed to decide which would be the control and which would receive the promizole. Difficulties because of psychiatric conditions were considerable. Some refused oral medication and in others toxic reactions occurred. Because of this quite a number had to be excluded. Clinical records were adequate and radiographs were taken monthly. Results were evaluated on radiological improvement alone. Films were assessed by observers with no knowledge of the treatment.

The study started in autumn, 1943, and ended in December, 1944. Only 24 pairs (48 patients) eventually qualified for assessment of the trial. Of all patients 66% were dead or worse and only 15% had shown any improvement, and that was usually slight. There was little difference in the treated and control series. It is possible that the conditions of the trial were too strict and that patients with mental disease respond poorly to treatment, but the authors feel that temporary improvement at any rate would have been observed had streptomycin been available then. *Ronald S. McNeill.*

Neoplasm

Diagnostic Value of Pulmonary Arteriography in Bronchial Carcinoma. KEIL, P. G., VOELKER, C. A., and SCHISSEL, D. J. (1950). *Amer. J. med. Sci.*, **219**, 301.

The authors base their findings on findings in 15 cases of bronchial carcinoma and a number of cases of other pulmonary lesions and a study of the normal vascular pattern carried out at the Veterans' Administration Hospital, Des Moines, Iowa. Diminished vascularity distal to the tumour was found in 14 of the cases, due to (*a*) mechanical obstruction of the arterial system by the tumour mass, (*b*) necrosis of the pulmonary parenchyma, and (*c*) obstructive emphysema. Less frequently interference with the normal vascular pattern was found in the region of the main pulmonary artery. Diminished vascularity was also noted in cases of senile and bullous emphysema and lung abscess, but no difficulty in differential diagnosis was encountered. The authors injected into an antecubital vein 50 ml. of 70% diodone in one to two seconds and took a series of postero-anterior films from a distance of 6 ft. (15 m.) with the patient seated, a

multiple cassette tunnel being used and exposures made two, four, six, and eight seconds after injections. They increased the normal chest-penetration voltage by 10 kV. It is concluded that pulmonary arteriography should be added to bronchoscopy, bronchography, and tomography as an established method of diagnosis in all cases of suspected bronchial carcinoma. *G. A. Stevenson.*

Lung Carcinoma in Iceland. DUNGAL, N. (1950). *Lancet,* **2**, 245.

Lung cancer is relatively rare in Iceland and was found in only 12 out of 337 necropsies on cases of carcinoma performed in Reykjavik during the period 1932–48. These 12 cases were distributed more or less evenly over the period concerned, affording no evidence that the disease is increasing in frequency in Iceland. If it be assumed that cigarette smoking is an important cause of lung cancer, this may explain the continued rarity of the disease in Iceland, where until recent years the consumption of cigarettes was relatively small. *R. A. Willis.*

Tobacco Smoking as a Possible Etiologic Factor in Bronchiogenic Carcinoma. A Study of Six Hundred and Eighty-four Proved Cases. WYNDER, E. L., and GRAHAM, E. A. (1950). *J. Amer. med. Ass.,* **143**, 329.

Impressed by the increased incidence of bronchial carcinoma the authors investigated factors which might play some part in this increase; their findings in respect of tobacco smoking are important. They designed a special questionary, and by a series of careful controls appear to have eliminated possible personal bias; in all, 684 patients with proved bronchial carcinoma and 780 controls were examined.

The main increase has been in squamous and undifferentiated growth. Adenocarcinomata are separated because the possible role of tobacco is less definite; there were 39 men and 13 women with this type of tumour. The over-all sex ratio is 17:1, and, as would be expected, there are far fewer "heavy" and "excessive" smokers among the females. Of 605 males with squamous and undifferentiated carcinoma, 86.4 (54.7)% and 51.2 (19.1)% are classed as "heavy to chain" and "excessive to chain" smokers (control figures in brackets): non-smokers total 1.3 (14.6)%. The authors wisely emphasize that tobacco is only one factor, but conclude that its importance is statistically significant. They point out a lag between many years of smoking and the appearance of growth, that no less than 98.7% of cigarette smokers in the cancer group "inhaled consciously," and that it is rare to find such a tumour in a male who has not been at least a moderately heavy smoker for many years (96% for over 20 years). Cigar and pipe smokers appear to be less at risk. *Maxwell Telling.*

Thoracic Surgery

Resection of an Aneurysm of the Arch of the Aorta with Preservation of the Lumen of the Vessel. MONOD, O., and MEYER, A. (1950). *Circulation,* **1**, 220.

A 20-year-old girl complained of pain in the right chest, cough, and loss of weight. Radiographs of the chest showed a well-defined spherical shadow lying adjacent to the aortic arch in both the postero-anterior and lateral views. Thoracoscopy revealed a smooth, yellowish-white, spherical, non-pulsating tumour lying in front of the vertebral bodies. Exploration with a needle produced a quantity of bright blood. Serological tests for syphilis were negative.

Thoracotomy was thereupon performed and a saccular aneurysm of the aortic arch with a narrow pedicle was discovered. The aneurysm was readily mobilized and removed after clamping the aorta with Crafoord clamps without occluding its lumen. The narrow slit-like opening was sutured with silk, reinforced with parietal pleura. Convalescence was uneventful.

Histological examination of the aneurysm revealed the various elements of the wall of a large artery which, however, showed signs of damage, especially in its elastic-tissue elements. There was no indication of the aetiology, and the authors consider the most likely diagnosis to be a dissecting aneurysm due to embolism of a vessel supplying the aortic arch. *W. P. Cleland.*

Intrapericardial Anatomy in Relation to Pneumonectomy for Pulmonary Carcinoma. HEALEY, J. E., and GIBBON, J. H. (1950). *J. thorac. Surg.,* **19**, 864.

Division of the great vessels within the pericardial sac during pneumonectomy for cancer extends the range of operability, leaves a greater margin of healthy tissue, and provides the only means of removing certain lesions of

the hilum or lower lobe, for example, where pericardium or veins are invaded. To determine the anatomical relations in the normal, 185 cadavers were dissected.

As well as the transverse and oblique sinuses, there exist a left pulmonary recess (behind the fold of Marshall) and on the right a postcaval recess and a right pulmonary recess (between the inferior and superior pulmonary veins). The reflexions of the pericardium on the various vessels, and their degree of protrusion within the sac, are described. The right pulmonary artery can readily be ligated in the transverse sinus, medial to the superior vena cava and below the aorta.

Various venous anomalies were encountered. In 25% of subjects there was a common left pulmonary vein, usually formed at the edge of the sac. On the right side a common vein occurred in 3%, and in half this number there were three separate veins.

The fold of Marshall, between the pulmonary artery and the left superior pulmonary vein, contains the remnant of the embryological left superior vena cava. Occasionally this vessel remains patent. It is nearly always small, and communicates with the oblique vein of the left atrium.

M. Meredith Brown.

Segmental Pulmonary Resection. Details of Technique and Results. OVERHOLT, R. H., WOODS, F. M., and RAMSAY, B. H. (1950). *J. thorac. Surg.*, **19**, 207.

The anatomy of the pulmonary unit or segment is described in detail. It is conical, covered by pleura, and contains an axially situated bronchus and artery. A small vein may accompany the artery and bronchus. The principal veins, however, lie on the surface and converge on the hilum. When two or more of these units combine to form compound units or larger segments, the surfaces in contact lose their pleural covering and the subjacent veins become intersegmental in position. Elsewhere they remain as subpleural veins. Because of the peripheral branching of intersegmental veins, these should always be identified at the hilum of the segment and not in the intersegmental plane. In the upper lobe they lie anterior to the segmental arteries and bronchi, in the middle lobe anterior and inferior, and in the lower lobe posterior. Further ways of recognition are discussed.

In the operation of segmental resection there are four essential steps: (1) The segmental artery is dissected out, ligated, and divided. (2) The segmental bronchus is cleared, ligated distally, and divided, and the proximal stump closed. (3) The segmental vein, when present, is ligated and divided. (4) The segment to be removed is then separated from the lobe by locating the intersegmental vein in the hilum of the segment and following this as a guide to the intersegmental plane. If subpleural veins draining the diseased segment are encountered, they are ligated and divided. In the separation of the diseased tissue the dissecting motion should be a side-to-side sweep between the intersegmental vein and its branches on the healthy side and the diseased tissue on the other. Inflation of the normal segment aids dissection.

Sources of error are reviewed. Because bordering segments may be distorted by traction or may fit like a hood on the basal segments (as does the apical segment of the lower lobe) and extend unexpectedly far down the side of the segment being removed, as the pleural surface is approached it is better to follow the veins to the pleura than to cut through the remaining lung tissue. To avoid the theoretical possibility of the remaining portion of a lobe undergoing torsion after segmental resection any adhesions between one lobe and another are left undisturbed. To aid re-expansion, however, all parietal pleural attachments are separated. Two catheters for intrapleural drainage, a high one to remove air and a low one for fluid, are inserted through stab wounds.

The results of 28 recent segmental resections for bronchiectasis, tuberculosis, and chronic abscess are reviewed. The segments removed are tabulated. In 15 cases the lung was completely expanded and both catheters were removed within 24 hours, and in 10 within 48 hours. The average post-operative period in hospital was 14 days. Complications were few—no empyemata, two fistulae—and there was one death. Engorgement of the remaining apical segment of the lower lobe after segmental resection of the basal group was also encountered. *John Borrie.*

A Series of 150 Cases of Lung Resection for Tuberculosis. BÉRAND, M. (1950). *Mém. Acad. Chir., Paris*, **76**, 147.

Tomography, bronchoscopy, and bronchography affording more accurate diagnosis, advances in anaesthesia, resuscitation, and surgical technique and the use of antibiotics

have made possible the resection of tuberculous lung tissue—not to supplant collapse therapy, but in those cases where this would afford little chance of cure, or where a cavity persists. Thoracoplasty or extrapleural pneumothorax fail where destruction is extensive, where there is bronchial stenosis, when the disease is basal, or when there is an associated empyema.

The surgical technique is described. After a thoracoplasty, regenerated and deformed ribs make the approach difficult: the anterior part of the highest remaining rib should be resected. The dissection should be carried out in the extrapleural plane so that the pleura, which is usually adherent and may contain foci of disease, is removed with the lung. Extensive fibrosis and destruction mean that dissection must be carried out with extreme care, as distortion of the normal anatomy may be marked; this is especially so in the anterior mediastinum. Enlarged and matted lymph nodes mask the structures at the hilum; sometimes it is advisable to open the pericardium in order to secure the great vessels. The bronchus should be secured first, if possible, and must be divided through healthy tissue near the trachea; it is sutured with fine interrupted silk stitches and the stump buried. Although lobectomy only has been planned, during its performance dissection of the fissure may be found impossible, or disease may be found in a lobe which had not been suspected on radiography, so that pneumonectomy may have to be carried out.

In 150 such operations during 1948 and 1949, many in desperate cases, there were five deaths on the table and 26 subsequently, giving a total mortality of 20%. Major complications were: Activation of lesions in the remaining lung tissue; cardio-respiratory insufficiency; and empyema. Without fistula this last was usually cured by thoracoplasty, but with a bronchial fistula the prognosis was grave; of late onset, it was due to tuberculosis of the stump. *M. Meredith Brown.*

The Surgical Treatment of Complete Transposition of the Aorta and the Pulmonary Artery. BLALOCK, A., and HANLON, C. R. (1950). *Surg. Gynec. Obstet.*, **90**, 1.

Complete transposition of the aorta and pulmonary artery is a comparatively common congenital lesion. It exists without corresponding transposition of the great veins, so that blood from the right ventricle enters the aorta and is returned to the right auricle. The left ventricle pumps blood into the lungs and receives it back again. Life is possible if there is some septal defect which allows mixing of the blood so that some "blue" blood from the right ventricle can cross over and reach the pulmonary circuit. The expectation of life is longest if there is a patent interventricular septum, and progressively less with auricular septal deficiency, patent ductus, and transposition of great veins. Excluding six patients who lived for over 10 years, a collected series of 117 patients were found to have died before reaching the age of 6 months.

The surgical treatment of these small patients is a matter of extreme difficulty and has had to be undertaken without experimental study, since such a transposition cannot be effected in animals. The authors considered three different approaches to the problem. (1) Extra-cardiac shunt was used in nine patients, with one operative death and later death of all the remainder. The types of operation included anastomosis of right superior pulmonary vein to superior vena cava, of left innominate vein (proximal) to left pulmonary artery, of right upper pulmonary artery (proximal) to superior vena cava with union of distal end of upper pulmonary artery to right subclavian artery, of right main pulmonary artery (proximal) to superior vena cava with union of distal end of the artery into the right subclavian artery. The failure of this form of surgery is possibly due to reversal of the intracardiac shunt. (2) A defect was made in the auricular septum so that blood from the two sides of the heart could interchange. Blalock has already described a method of making this opening deliberately at the point where the right pulmonary vein is adherent to the back wall of the right auricle. The right hilar vessels and right auricle are exposed intrapericardially. The left pulmonary artery is temporarily clamped; a clamp is placed across the lung side of the superior pulmonary vein and a special curved clamp across the right auricle and central end of the vein. A transverse incision is made into anterior aspects of vein and auricle, and the intervening bar, which includes the lateral edge of the septum, is excised. The opening is then sutured, this involving only an anterior row of stitches. Twelve patients were treated in this way, but nine died shortly after operation. Many of these patients were very poor surgical risks (one was a baby 8 days old). The three

survivors have done fairly well. (3) Creation of a septal defect as described above may be supplemented by the Blalock type of shunt with union of a systemic artery to a pulmonary artery. It is essential to ensure that blood flows from systemic to pulmonary system. This can be achieved by dividing the right upper pulmonary artery and effecting an end-to-end junction between the distal end of this vessel and the right subclavian artery; otherwise the high pressure in the pulmonary artery might drive blood into the systemic field. Twelve patients were operated upon along these lines with four deaths shortly after the operation.

The results have not been as promising as might have been hoped, when the dramatic improvements achieved in the treatment of pulmonary stenosis are borne in mind, but the disappointingly high mortality is compensated for by the successful outcome in more recent cases. *T. Holmes Sellors.*

Indications, Technique, and Results of Ligation of the Inferior Vena Cava in 55 Cases of Cardiac Decompensation. DONZELOT, E., D'ALLAINES, F., LENÈGRE, J., DE BALSAC, H. (1950). *Sem. Hôp. Paris,* **26**, 2319.

This article records the results of ligation of the inferior vena cava in 55 cases of congestive heart failure. A brief description of the physiology of the normal heart is given with reference to cardiac filling and cardiac output. It is explained that increase of pressure in the inferior vena cava leads to increase of pressure in the renal veins, and this, coupled with diminished general arterial pressure, results in a narrowing of the pressure difference in the renal artery and vein and thus a diminution in the output of urine, increasing the already excessive blood volume. Similarly the return of blood from the liver is obstructed, causing congestion and the symptoms resultant therefrom. Ligation of the inferior vena cava below the level of the renal veins facilitates return of blood from the liver and kidneys, thereby increasing the pressure difference in the renal vessels, increasing the output of urine from the kidneys, and, paradoxically as it may appear, leading to diminished oedema of the lower extremities. Furthermore, after ligation of the vessel, blood from the abdominal venous lake cannot rapidly reach the right auricle but has to take a roundabout route, thus diminishing the sudden changes in auricular pressure occurring with changes in posture. Similarly, on lying down there is a much slower return of blood to the right heart and consequently a marked or complete relief of symptoms.

The authors at first operated on patients in the last stages of congestive heart failure, with cyanosis, oedema, enlarged liver, pulmonary congestion, tachycardia, dilated heart, and constant dyspnoea; the mortality was high, but some of the results were extremely satisfactory. More recently they have treated patients who have responded to medical treatment only slowly or incompletely, or who have relapsed shortly after efficient medical treatment. Cases of mitral disease have been most often chosen for operative treatment since, although the best results have been in cases of left heart failure, operation in such cases has been attended by a considerable immediate mortality. Of the 55 patients operated upon by the authors 39 are alive [the post-operative interval is not stated], 33 have undergone "a veritable transformation," and six are improved. One patient has taken up his previous work as a mechanic and is living an entirely normal life. *Peter Martin.*

The Surgery of Mitral Stenosis. BAILEY, C. P., GLOVER, R. P., and O'NEILL, T. J. E. (1950). *J. thorac. Surg.,* **19**, 16.

Operations for the relief of the associated pulmonary hypertension of mitral stenosis by the creation of anastomoses between the azygos and pulmonary veins or the formation of an interauricular septal defect may relieve symptoms, but if they substantially reduce the left auricular pressure and thus prevent the forcing of blood through the stenotic orifice into the left ventricle, they may so lower cardiac output that the patient is incapacitated or killed, the post-operative condition reproducing Lutembacher's syndrome, which terminates fatally at an average age of 40. Hence a direct attack upon the stenosis itself is the sounder approach, providing an equally dangerous regurgitation is not substituted. Details are given of 15 cases in which such an attack was made, the methods used ranging from digital dilatation to deliberate commissurotomy. Five of the patients survive, on four of whom commissurotomy was performed. (Seven further cases since treated by commissurotomy, with only one death, are reported in a footnote.) All the survivors were greatly improved.

Patients selected for operation should show no evidence of rheumatic activity, and there should be normal sinus rhythm, a predominant stenosis, and marked pulmonary hypertension with increasing dyspnoea. Uncontrolled cardiac failure, left ventricular enlargement, associated disease, or much regurgitation are regarded as contraindications. Complete investigations must include determination of right heart pressure by catheterization. In the performance of commissurotomy a finger is introduced into the left auricle through the appendage, which has a purse string about its base, reducing blood loss to a minimum. Two gloves are worn, and a curved commissurotomy knife inserted between them from the finger base to tip. In this way the thickened commissures between the valve cusps can be directly palpated and cut with the controlled hook-blade, so that the cusps are freed and their function restored without damage to them or to the chordae tendineae and consequent regurgitation. As the finger and knife are withdrawn the purse-string is tied, preventing later embolus formation, and the appendage tip oversewn. *Geoffrey Flavell.*

General

Disseminated Pulmonary Calcification. A Report of 114 Cases with Observations of an Antecedent Pulmonary Disease in 15 Individuals. WHITE, F. C., and HILL, H. E. (1950). *Amer. Rev. Tuberc.*, **62**, 1.

A series of 114 cases of disseminated pulmonary calcification encountered in the Ray Brook State Tuberculosis Hospital district, New York, is reviewed. In 15 cases clinical, as well as radiological, observation was possible. A brief review of the literature is given and the frequent association of pulmonary calcification with a positive histoplasmin skin reaction is noted.

In all patients under review a complete history was obtained and clinical and radiological examinations were made, together with tuberculin and histoplasmin skin tests.

Of the 114 patients 106 were found to have spent at least two-thirds of their lives in rural areas and 84% were engaged in farming or similar rural occupations; 12 of the 18 patients who were non-rural residents had been exposed to dust about the habitat of pigeons; 95% of patients gave a history of exposure to dust either from threshing or about the habitat of pigeons or domestic fowl. The period of observation varied from a single visit to 16 years.

In the majority of patients there were no abnormal physical signs on examination, though a typical radiological picture of multiple disseminated calcified foci existed in both lung fields. Tuberculin and histoplasmin skin tests were carried out on 84 of the 114 patients; 94% reacted to histoplasmin and 52.4% to tuberculin, while 44% reacted to histoplasmin alone, 2.4% to tuberculin alone, and 3.6% to neither antigen. Of 305 comparable patients without pulmonary calcification used as controls 14.2% reacted to histoplasmin and 29.8% to tuberculin.

In 15 of the cases reviewed, a history of a chronic pulmonary disease was obtained, and in 12 of these the natural history of the condition was studied from onset to the development of calcification in the lung. Of these, 13 reacted to histoplasmin and nine to tuberculin, and eight patients reacted positively to the complement-fixation test for histoplasmosis. One necropsy is reported, the patient having died as the result of an accident; discrete calcified nodules were found in the lungs and were surrounded by hyalinized fibrous tissue without any giant cells.

The authors suggest that there is some relation between this disease and the inhalation of organic dust by farmers in valley regions. The fact that the condition is not a constant finding in rural communities suggests that the dust may be carrying the causal organism. They incline to the view that this organism is probably *Histoplasma capsulatum*, but stress the need for further investigations to establish this theory. *R. H. J. Fanthorpe.*

Fibrosis of the Lungs Due to Infestation with *Oxyuris* (*Enterobius*) *vermicularis*. BRANDT, M. (1949). *Tuberkulosearzt*, **3**, 685.

A case of chronic pulmonary fibrosis due to infestation of the lungs with immature eggs of *Oxyuris* (*Enterobius*) *vermicularis* had been diagnosed *in vivo* as a case of tuberculosis. Necropsy revealed fibrotic induration of both lungs; the spleen was enlarged, hard, and fibrotic; the left ovary was replaced by a hard tumour. Histologically both lungs showed in the hilar area multiple, miliary giant-cell granulomata (foreign-body granulomata), containing calcified, oval, shell-like double-contoured bodies, 54.4 μ × 23.8 μ. These eggs were situated within fissures,

simulating furrows. No specimen of *Oxyuris* was found. The spleen was infiltrated by similar giant-cell granulomata, and so was the ovarian tumour, but no eggs were found in these organs.

Two parasitologists independently made the diagnosis of immature eggs from *Oxyuris*, in spite of the impossibility of tracing their origin. The possibility of infestation by aspiration from the mouth was dismissed. The finding of old granulomata as well as of "fresh" (immature) eggs would point to repeated aspiration, which is unlikely. The possibility of inhalation of eggs by dust was also rejected. The chance that some worms perforated the intestine and were carried by lymph or the blood stream to the lungs is thought to be more likely.

Chronic Pneumonitis: Its Clinical and Pathologic Importance. Report of 10 Cases showing Interstitial Pneumonitis and Unusual Cholesterol Deposits. WADDELL, W. R., SNIFFEN, R. C., and SWEET, R. H. (1949). *J. thorac. Surg.*, **18**, 707.

The authors report 10 cases of a form of chronic pneumonitis, recognized for many years and described under various names, which is characterized by the development of marked fibrosis and unusual deposits of cholesterol. The 10 patients were all treated by surgical removal of the affected portion of the lung and the pathological material studied was, in consequence, not in so advanced a stage as the necropsy material available in previous cases. The illness starts, either abruptly or insidiously, with fever, cough, sputum, and pain in the chest. Haemoptysis occurs occasionally. Acute episodes may recur at intervals during a prolonged course. Clinically and radiologically there is evidence of consolidation or atelectasis of lung tissue. Bronchoscopy in the authors' cases revealed no abnormality and cytological examination of the sputum showed nothing significant. On bronchography in three of the ten cases the medium failed to fill the affected segments. In six of the ten patients carcinoma was the pre-operative diagnosis.

At thoracotomy, chronic pneumonitis is suggested by the denseness of the pleural adhesions, by the firm rubbery consistence of the inflammatory masses, and by the firm, chronically inflamed, hilar glands. Frozen section of biopsy material may also be of value. Technically, resection in this type of case may be extremely difficult owing to the severity of the inflammatory reaction in the pleura and the hilum, but all 10 patients made an uninterrupted recovery and were completely relieved of their symptoms.

Macroscopically, the specimens showed marked thickening of the pleura overlying a somewhat shrunken lobe or segment, with no obstructive lesion in the bronchus. The cut surface was consolidated, but its appearance varied somewhat, some cases showing an intense and extensive yellow coloration in the diseased parenchyma, while in others there was more fibrosis and less yellow discoloration. The walls of the larger bronchi were thickened and their lumen usually contained mucoid material, but they were not dilated. Occasionally small abscesses were present. The involved pneumonic area was fairly sharply demarcated from surrounding normal lung. Histologically, the earliest changes appeared to be the accumulation of many large mononuclear cells containing cholesterol or cholesterol esters in the alveoli and alveolar ducts. This was closely followed by an inflammatory reaction in the interstitial tissues, ushered in by oedema and infiltration with lymphocytes and plasma cells. "Foamy" mononuclear cells then began to appear in the alveolar walls, which became greatly swollen and eventually obliterated the alveolar space. Later, collagen fibrils were deposited around the foam cells to produce an extensive fibrosis which maintained the obliteration of the alveoli.

These appearances were very similar to those found in "paraffin pneumonia," though the latter is readily distinguished by the variation in size of the fat droplets. Other forms of chronic pneumonitis (primary atypical pneumonia, pneumonia associated with virus infections) do not show such extensive cholesterol deposits, which are found in the lung distal to stenosis of a major bronchus (by carcinoma or adenoma) and occasionally in bronchiectatic lung abscess. The authors were unable to determine the origin of the cholesterol in their cases.

W. P. Cleland.