receptor function and importance in states of chronic hypoxia.

Microanatomy of Glomic Tissue of the Pulmonary Trunk

C. W. EDWARDS The microanatomical structure and cytology of glomic tissue of the pulmonary trunk in man and animals.

Peripheral Glomic Tissue within the Lung

H. SPENCER The microanatomical structure of glomic tissue around small pulmonary veins. Possible functional significance. Intrapulmonary chemodectomas.

The Concept of a 'Glomus Pulmonale'

V. E. KRAHL The concept of a glomus of the sixth branchial arch. Its possible functional significance.

Vascularization of the So-called 'Glomus Pulmonale'

A. E. BECKER A demonstration that the glomus pulmonale is supplied by the intertruncal branch of the left coronary artery and not by a branch of the pulmonary trunk. The hypothesis that glomic tissue of the pulmonary trunk does not represent a true glomus pulmonale and does not have a true pulmonary chemoreceptor function.

Physiological Evidence for and against the Presence of a Pulmonary Chemoreceptor

HELEN DUKE

The symposium is supported by demonstrations.

REGULATION OF CEREBRAL BLOOD FLOW IN CHRONIC RESPIRATORY INSUFFICIENCY

BARBRO EKSTRÖM-JODAL and EGIL HÄGGENDAL Acute changes in the arterial carbon dioxide tension and oxygen saturation have marked effects on the resistance of the cerebral blood vessels so that hypocapnia causes vasoconstriction while hypercapnia and hypoxia cause vasodilatation. In conditions with long-standing alterations in the arterial blood gas situation, however, there has been evidence of normalization of the cerebral blood flow and simultaneously a return of the cerebrospinal fluid *p*H towards normal values. This investigation has been performed in patients with chronic respiratory insufficiency. The cerebral blood flow, arterial and cerebral venous blood gases and cerebrospinal fluid composition have been studied during several consecutive days in patients with an exacerbation of the disease and in patients who have been in a 'steady state' in relation to blood gases for a long time. In both groups the blood gas situation has been acutely changed by hyperventilation or inhalation of different gas mixtures.

The cerebral blood flow has been measured with a modified Kety-technique, *i.e.*, a saturation technique using ^{133}Xe as the indicator. Acute changes in cerebral blood flow have been estimated from the arteriovenous oxygen difference.

PARTICLE DEPOSITION IN THE LUNGS OF CHILDREN

D. C. F. MUIR, A. HISLOP and LYNNE REID There is no method at present whereby the site of particle deposition in the lungs of human subjects can be determined directly. Our best estimates are based on considerations of the size of the particles and on the dimensions of the airways. Three authors (Findeisen, 1935; Landahl, 1950; and Beeckmans, 1965) have attempted an analysis of this type. Airborne infections and allergic reactions are common in children and inhalation therapy is widely used in the treatment of children with respiratory disorders. It is thus important to obtain some idea of the manner in which inhaled particles are handled by the lungs of children. In this paper an attempt is made to understand the particle deposition pattern as a function of age using the mathematical approach developed by Landahl (1950) for determining the probability of deposition in different regions of the lung.

PROLONGED SURVIVAL AFTER HUMAN LUNG TRANSPLANTATION

P. VERMEIRE AND COLLEAGUES (BELGIUM) Homotransplantation of one lung was carried out in a 23-year-old man suffering from acute silicosis in November 1968. This patient has survived until the time of writing. His progress and present state will be described on behalf of the team responsible for the operation, which was carried out at the Akademisch Ziekenhuis, Gent. The members of the team are F. Barbier, P. Vermeire, F. De Rom, J. Versieck, S. Ringoir, J. Tasson, H. Lamont, and R. Verbeke.

SOME RADIOLOGICAL STUDIES OF THE PULMONARY CIRCULATION

Pulmonary Air Embolism: Physiological Aspects

ERIK BERGLUND and STAFFAN JOSEPHSON Pulmonary air embolism was followed by acute pulmonary arterial hypertension starting within 5 seconds and reversing totally within 15 minutes. Pulmonary blood flow fell by 0–52% and reversed to control level within one minute.

The role of vasoconstriction in the increased vascular resistance was evaluated. Air was injected into only one lung with the dog in the lateral position. In five dogs 17 air injections (0·5–2 ml./kg. body weight) were performed. The PA pressure rose from an average of 18 mm. Hg to 35 mm. Hg, which is much more than on unilateral PA block. Thus a substantial part of the pressure rise is caused by vasoconstriction. This interpretation was confirmed by injecting air into a previously occluded pulmonary artery: a similar pressor response occurred in 20 of 36 experiments. We believe that this is due to a nervous reflex, but neither vagotomy nor alpha or beta receptor blocking prevents the pressure rise.

During embolization the arterial oxygen saturation falls. Like the pressor response, the saturation change is reversible. On unilateral air injection into a previously

occluded pulmonary artery, the saturation fell only in those instances when a pressor response was obtained. On bilateral air injection the degree of unsaturation was quantitatively related to the rise in PA pressure. The saturation fell 6–21% (average 14·3%). In six experiments, arterial CO_2 pressure changed less than ± 2 mm. Hg.

During oxygen breathing, embolization lowered the arterial Po_2 from 490 to 399 mm. Hg, corresponding to a shunt of 18% of the cardiac output. This explains only part of the desaturation during air breathing.

Pulmonary Air Embolism: Radiological Changes

S. JOSEPHSON and C. O. OVENFORS Following experimental unilateral and bilateral air embolism in 16 dogs, the pulmonary circulation was studied by means of serial angiography. The pulmonary artery pressure and the arterial oxygen saturation were simultaneously recorded during this procedure. Control studies were carried out before embolization and serial angiography was in some cases continued up to 30 minutes after air injection.

After bilateral embolization the following changes occurred:

(1) The diameter of the pulmonary arteries increased and showed a cork-screw appearance in their distal branches, where there was also a reduction in side branching.

(2) The contrast passage time to the pulmonary veins was shortened despite delayed emptying of the pulmonary arteries.

(3) Abnormal vessels appeared in the periphery of the lungs.

(4) The pulmonary artery pressure doubled.

(5) The arterial oxygen saturation decreased.

It is to be noted that all of these findings were also demonstrated bilaterally when only one lung was subjected to embolization.

These were considered to result from a reflex pulmonary vasoconstriction and opening of precapillary arteriovenous anastomoses, probably indicating one of the causes of arterial hypoxaemia.

All the above changes disappeared within 15–20 minutes after the air injection.

The Plain Radiograph in Acute Massive Pulmonary Embolism

R. E. STEINER On reviewing the plain radiographs in acute massive pulmonary embolism the following vascular and parenchymal changes can be seen: enlargement of the main pulmonary artery or hilar arteries, zones of variable oligaemia or hyperaemia in the lungs, and shadows indicating areas of pulmonary infarction, elevation of the diaphragmatic dome on the affected side, and variable pleural effusions.

The findings are compared with pulmonary angiograms to assess the value of the plain radiograph.

Pulmonary Wedge Arteriography in Clinical Diagnosis

SVEN PAULIN Pulmonary wedge arteriography is specially adapted for demonstration of the peripheral vasculature of the pulmonary circulation. Compared with more conventional angiographic examinations the visualization of small structures is greatly enhanced and vascular branches of as small a calibre as approximately 0·1 mm. can be subjected to analysis. The procedure has been employed in patients with different cardiopulmonary diseases, and highly satisfactory demonstrations of vascular abnormalities have been accomplished. Thus the increased diagnostic potentials of angiography permit the *in vivo* diagnosis of vascular changes known to be associated with certain conditions, such as chronic venous congestion, pulmonary hypertension, and chronic obstructive disease of the pulmonary airways.

The production of such detailed pulmonary angiograms was found in our animal experiments to require a meticulous control of injection pressure in order to avoid artefacts or tissue damage. Trials to study the effect of pharmacodynamic substances upon the vascular pattern in the periphery of the lung have been discouraging. Furthermore, appropriate positioning of the catheter tip in voluntarily chosen areas of the vascular bed may be laborious and time consuming. The practical value of the procedure in clinical diagnosis is therefore considered to be limited.

Blood Diversion to the Upper Lobes not due to a Rise in Pulmonary Venous Pressure

G. SIMON The dilated upper lobe vessels seen in mitral stenosis or left ventricular failure with a rise in pulmonary venous pressure is well known. Examples are shown of such diversion in persons with lung disease but a normal pulmonary venous pressure.

1. Lower lobe disease such as lower lobe bronchiectasis or lower lobe emphysema.

2. Cases of chronic bronchitis with uneven blood gas mixing in the lower zones, but no emphysema.

PULMONARY ARTERY SLING

R. J. M. MCCORMACK A rare anomaly causing obstructive dyspnoea and stridor in infancy is an abnormal left pulmonary artery which passes around the right side of the lower trachea and thence between the trachea and the oesophagus to the left lung, referred to as a pulmonary artery sling. The infant presents with episodes of respiratory obstruction not associated with feeding and the chest radiograph shows obstructive emphysema of the right lung and a small indentation on the right lateral wall of the lower trachea. The lateral view of the barium swallow is almost diagnostic and the diagnosis is confirmed by pulmonary angiography. Death in early childhood is the rule unless surgical correction is achieved. Two recent examples of the condition are described along with their surgical management. The lesion was first recognized at necropsy in 1897, first diagnosed in life in 1953, and first treated successfully by surgery in 1954. Some 38 cases have been reported in the literature and these are briefly reviewed.