

## Proceedings of the Thoracic Society

The Summer Meeting of the Thoracic Society was held on 4 and 5 July, 1969 at the University of Keele, Staffordshire, together with members of the Swedish Thoracic Society. There were 14 short papers, and three symposia. Summaries follow.

### VENTILATORY CAPACITY IN RELATION TO EXERCISE

#### The Assessment of Breathlessness

J. E. COTES Breathlessness is one of a number of symptoms which may limit exercise; it usually does so when the ventilation during exercise approaches a maximal value which is determined by interaction between the drive to respiration and the mechanical properties of the lung. Assessment is based in the first instance on the clinical interview and simple measurements of lung function. Depending on the likely cause these may need to be supplemented by additional tests.

#### Flow-volume Curves and Breathing Pattern during Exercise in Patients with Obstructive Lung Disease

GUNNAR GRIMBY and JIRI STICKSA For a subject at one point in time the maximum inspiratory or expiratory flow rate is related to the lung volume; the relationship is described by the maximum flow-volume curve. For derivation of the curve the rate of air flow is measured with a pneumotachograph. The volume is measured at rest with a body plethysmograph and during exercise with a spirometer supplemented by magnetometers which record the outside dimensions of the thoracic cage.

The flow-volume curves for spontaneous breathing during exercise have been compared with the maximum flow-volume curves in 12 patients with lung disease and in control subjects exercising with comparable ventilations. In the patients with airway obstruction the flow rate may reach its limiting value at rest. When the limitation is predominantly during expiration a higher flow rate during exercise may then be attained by expanding the mid position of the thorax. However, once the maximum expiratory flow-volume curve is reached, further respiratory effort increases the work of breathing but does not materially increase the rate of air flow. The technique provides a means of assessing the contribution of ventilation to the limitation of exercise.

#### Exercise-induced Airway Constriction

BO G. SIMONSSON, B.-E. SKOOGH and B. EKSTRÖM-JODAL In asthmatic patients bronchoconstriction after exercise may be due to (1) a reflex from hyper-active airway mechano-receptors, (2) a change in level of autonomic activity, (3) a humoral agent, (4) a change in blood gases or pH.

In order to distinguish between these alternatives we have studied the airway conductance (*i.e.*, the reciprocal of airway resistance) at different lung volumes and also

the arterial blood gases in different circumstances including forced breathing, hyper-ventilation, and exercise on a bicycle ergometer, before and after pharmacological blockade of different kinds. The results are reported.

#### Effort Tolerance and Exercise Responses in Men with Chronic Diffuse Airways Obstruction

R. H. T. EDWARDS, G. JONES, and N. L. JONES Using bloodless techniques we have studied the responses to exercise of a group of 50 males with chronic diffuse airways obstruction, selected from a population being studied in the Bronchitis Clinic at the Royal Postgraduate Medical School. Repeated assessments of clinical state and pulmonary function had been made prior to the exercise studies. Two types of exercise were performed by each subject in the upright position on a cycle ergometer:

(a) Progressively increasing work, the load being increased by 100 kpm/min. each minute until the subject was unable to continue, heart rate and ventilation being monitored continuously.

(b) Steady-state sub-maximal exercise with measurement of heart rate, ventilation, and gas exchange. In these studies the oxygenated mixed venous PCO<sub>2</sub> was measured by re-breathing and the increase in blood lactate was estimated using a CO<sub>2</sub> balance technique.

Exercise responses in these subjects are compared with those of normal controls. The clinical value of exercise testing and the extent to which particular responses can be predicted using a standardized questionnaire and simple pulmonary function tests are discussed.

### THE EFFECT OF SITTING AND GRADED EXERCISE ON THE DISTRIBUTION OF PULMONARY BLOOD FLOW

B. BAKE, J. BJURE, and J. WIDIMSKY The distribution of pulmonary blood flow before, during, and after graded exercise was studied in 13 healthy male volunteers. <sup>133</sup>Xe was injected intravenously and the counting activity was measured with 10 scintillation detectors in the sitting position at total lung capacity. At rest, the unevenness in distribution of perfusion increased with time, the apical regions receiving a progressively smaller proportion of the pulmonary blood flow and the basal regions a progressively greater proportion. The results have shown the perfusion gradient decreasing with increasing amount of work, but even perfusion was not reached in most of the subjects in spite of a heart rate between 156 and 180/minute.