acid for which there is a transport defect may be accumulated when presented as a dipeptide.

12. RESPIRATORY FAILURE AND ISOPRENALINE

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Adverse effects of isoprenaline (INA) were investigated in anaesthetized dogs and cats. Small intravenous doses caused tachycardia and hypotension which tended to be less under hypoxic conditions. Large doses occasionally killed hypoxic dogs by cardiac arrest but cats survived and became resistant to INA although inversion of the T wave and extrasystoles occurred. In dogs breathing naturally against a moderate tracheal obstruction to simulate the increased respiratory effort of status asthmaticus, INA regularly caused death through respiratory failure. In the absence of INA the obstruction was tolerated provided arterial Po_2 remained above 40 mmHg. Repeated small doses of INA given during well tolerated obstruction ($Po_2 > 55$ mmHg) led to a progressive fall of arterial Po_2 terminating in respiratory arrest. The electrocardiogram and blood pressure were relatively normal when breathing stopped. Arterial Po_2 is critical for the maintenance of respiration and INA is more likely to precipitate respiratory failure than cardiac arrest during obstructed breathing.

13. EFFECT OF SPEED OF INSPIRATION ON GAS DISTRIBUTION IN LUNGS OF NORMAL SUBJECTS AND PATIENTS WITH BRONCHITIS

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Seated subjects stopped ventilation briefly at end expiration (functional residual capacity, FRC) while a 5 ml bolus of ^{133}Xenon was injected into tubing close to the mouth. They then inspired air at different flow rates and the distribution of radioactivity in the lungs was measured with a scanning technique during a period of breath-holding at maximal inspiration. When corrected for regional volume, the radioactivity for any lung zone reflected its ventilation at an overall lung volume slightly above FRC. For slow inspirations (< 0·3 l/sec) the distribution of the Xenon bolus principally depends on the static compliance of lung regions, but for fast inspirations (> 3 l/sec), distribution is influenced more by regional airway resistances.

In seven normal subjects, the dependent zones were better ventilated relative to the apex during slow inspirations, but apical ventilation was greater than basal for fast inspirations. The flow rate at which apical ventilation first exceeded basal was 1·0–1·5 l/sec. The volume history of the lungs prior to the bolus injection at FRC had no effect on the slow/fast difference. In five patients with clinical bronchitis but normal FEV_1, dependent zone ventilation was much reduced on a slow inspiration compared with normals, but a further reduction of dependent zone ventilation did not occur at fast flow rates.

Our results suggest that in normal subjects, differences in airway resistance between lung zones make the distribution of gas dependent on the speed of inspiration. The higher basal resistance is probably related to the reduced expansion and lung recoil of this zone.

14. THE EFFECTS OF DECREASED THORACIC COMPLIANCE ON THE VENTILATORY RESPONSE TO CO_2

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It is well recognized that increased respiratory resistance, whether experimental or pathological, depresses the ventilatory response to CO_2. There have been few studies of the effects of decreased thoracic compliance on the CO_2 response curve. We have used the rebreathing technique to assess the effects of decreased thoracic compliance on the ventilatory response to CO_2. We have studied the response of patients with 'restrictive' ventilatory defects and also that of normal subjects with added elastic loads. We have assessed the response in terms of ventilation and of mechanical work of breathing. In normal subjects, in all but one experiment, the addition of elastic loads did not produce a depression of the slope of the ventilation/Pco_2 relationship, as is seen with added resistances, but produced striking changes in the pattern of breathing. In patients, the ventilatory response was less than in normal subjects. Changes in the mechanical work/Pco_2 relationship closely followed those in ventilation. The mechanisms underlying these changes will be discussed.

15. THE OXYGEN AFFINITY OF HAEMOGLOBIN IN CHRONIC RENAL FAILURE

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The anaemia of chronic renal failure which persists during the course of maintenance haemodialysis is resistant to therapy. This may, in part, be compensated by a shift in the oxygen dissociation curve of haemoglobin.