Alveolar partial pressures of carbon dioxide and oxygen measured by a helium washout technique

The estimation of arterial carbon dioxide pressure (PaCO₂) by Professor J. J. Jorgonoulou and colleagues (1990;45:520–4) assumes the equivalence of Bohr-Enghoff deadspace1 with the heliox deadspace by multiple breath washout (the ‘ventilatory deadspace’) of Cumming and Guyatt2. In a letter to Clinical Science following their previous paper1 I pointed out the fallacy of this assumption.3

I note that in their Thorax paper the authors mention pulmonary embolism as a cause of discrepancy and took steps to exclude this in their patients. Any kind of ventilation-perfusion (V/Q) mismatch, however, unless due solely to ventilation-volume (V/V) mismatch, will introduce such a discrepancy, and their patients with chronic bronchitis and asthma must be presumed liable to such V/Q non-uniformity. This doubtless accounts for much of the rather wide scatter in their figure 2. The 95% confidence interval about regression line is about ± 1.5 kPa (11.5 mm Hg). Another difficulty is that the ventilatory deadspace for helium increases, during washout, with breath number if V/V mismatching is present. The choice of first breath deadspace by Professor J. J. Jorgonoulou and colleagues is quite arbitrary.

This criticism is not merely about inaccuracy. The rebreathing method for oxygenated mixed venous carbon dioxide tension (PvCO₂) is not accurate, as all methods are. But the target is the intended one. The authors shoot at a physiologically different target on the pretext that it often coincides with the one they wish to hit.

There are other statements in this paper with which I do not agree. Right to left shunts, unless enormous, will not affect the relation between the two deadspaces at rest. Membrane diffusion effects will, in theory, but in practice the effect would never be measurable. The ventilatory deadspaces for helium and SF₆ are not equal; they differ systematically and very significantly,4 though this fact has no bearing on the question of whether helium and carbon dioxide deadspaces are equivalent.

EA HARRIS
Green Lane Hospital, Auckland, New Zealand

We also showed that the two compartment phenomenon, when there is doubt, can easily be recognized with a partial volume lung function manoeuvre.5

M C PAUL BRAINT
CAREL M ROOS
Pulmonary Department,
Academic Medical Centre,
University of Amsterdam,
1105 AZ Amsterdam-ZO,
The Netherlands


I greatly enjoyed the article by Dr A D Gascoigne and others (August 1990;45: 637–8) on the biphasic spirogram, which the authors thought had not been described previously. They will find an earlier example in a book edited by Tim Clark.1

DAVID DENISON
National Heart and Lung Institute, London SW3 6LY


AUTHORS’ REPLY We thank Drs Braat and Roos and Professor Denison for drawing our attention to further examples of maximum flow-volume curves in individuals with stenosis of a mainstem bronchus; we acknowledged in our report that such appearances had been described previously. In most lung function laboratories, however, flow-volume curves are not obtained routinely from all patients and the main aim of our paper was to draw attention to the shape of the forced expiratory spirogram—that is, the volume-time curve in unilateral bronchial narrowing. Although this shape can be predicted on theoretical grounds, we are not aware that examples have been published previously and we hope that our report will alert the observer to the possible implication of such a pattern. We speculated that a similar appearance might be seen in unilateral emphysema and it is helpful to note that references to the volume-time curve from one such patient support this contention.

A D GASCOIGNE
G J GIBSON
Freeman Hospital, Newcastle upon Tyne NE7 7DN

The biphasic spirogram: a clue to unilateral narrowing of a mainstem bronchus

Dr A D Gascoigne and his colleagues (August 1990;45:637–8) confirm our findings of the two compartment phenomenon, caused by unilateral airflow obstruction and manifested as end inspiratory (and end expiratory) slowing of the maximum inspiratory flow–volume curve. The phenomenon was first described by Williams et al6 in a patient with severe stenosis of the left main bronchus. We described two patients; one with almost complete obstruction of the left main bronchus caused by bronchial carcinoma and the other with unilateral lung emphysema (MacLeod’s syndrome), as suggested by Dr Gascoigne and colleagues.

Jet and ultrasonic nebuliser output: use of a new method for direct measurement of aerosol output

We thank Dr JH Dennis and colleagues (October 1990;45:328–32) for highlighting the considerable limitations in using the weight loss of a nebuliser as an index of the amount of solute (for example a drug) released in an aerosol. We agree that it is necessary to measure the amount of aerosol which is leaving the nebuliser directly and have used such a technique where the sampling filters were weighed after drying to determine the weight of solute nebulised.7