Quantitated scintillation scanning for the measurement of lung perfusion

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A method using quantitated lung scans is described for the accurate proportioning of lung perfusion. The results obtained by this method have been compared directly with those obtained from bronchspirometry, and a good correlation has been obtained \( r = 0.93 \).

The measurement of lung perfusion by bronchspirometry was first described by Björkman in 1934. The method is cumbersome and unpleasant for the patient, since it involves intratracheal intubation. Nevertheless, it is still a standard method for the measurement of individual lung perfusion. In 1964, Wagner, Sabiston, McAfee, Tow, and Stern described their preliminary findings with a new radioisotope lung scanning procedure. They injected macroaggregates of \(^{131}I\) labelled human serum albumin into a peripheral vein, localized the accumulation of radioactivity in the lung with a Scintiscanner, and postulated that the concentration of radioactively labelled micro-emboli in the various parts of the lung was directly related to pulmonary blood flow.

In this study we have compared the blood flow in each lung, as determined by bronchspirometry, with the individual lung perfusion, as determined by a quantitative Scintiscanning procedure.

MATERIALS AND METHODS

Twenty patients suffering from carcinoma of the bronchus or bullous emphysema were studied.

Bronchspirometry was carried out with a double lumen Carlen's catheter connected to Godart Pulmotest spirometers filled with oxygen. The patients were sedated with haloperidol and the catheter was passed under local anaesthesia (one amethocaine lozenge followed by crico-thyroid injection of 10% cocaine and a laryngeal spray with 4% lignocaine).

Lung scans were performed using a Picker Magna Scanner V, with a 265 hole, 5 in. focus collimator. Human serum albumin, labelled with approximately 300 \(\mu\)Ci \(^{131}I\), was macroaggregated by heating at its isoelectric point. Scans were made in both the prone and supine positions immediately after injection of the macroaggregates.

The quantity of radioactivity in each lung was measured by scaling the amplified scintillation counter pulse output. The number of counts accumulated in successive 4-cm. horizontal strips was recorded, and activity profiles were constructed by plotting the counts accumulated in each 4-cm. strip on the ordinate against the mid-position of the strip in centimetres from the spine of the first thoracic vertebra on the abscissa (Fig. 1). Activity profiles were constructed for each lung in both the prone and supine positions. The sum of the areas under the activity profiles of the right lung were expressed as a percentage of the sum of the areas under the activity profiles of both lungs. This percentage represents the proportion of the dose of \(^{131}I\) macroaggregated albumin which accumulates in the right lung.
RESULTS

The percentage of the dose of $^{131}$I macro-aggregated albumin which accumulated in the right lung ranged from 10% to 83%. The percentage oxygen uptake per minute in the right lung ranged from 20% to 86%. Figure 2 shows the comparison between the results obtained for oxygen uptake and the percentage of the dose of $^{131}$I macro-aggregated albumin which accumulated in the right lung ($r = +0.93$).

![Graph showing comparison between proportion of total lung perfusion in right lung obtained by quantitative lung scanning and bronchospirometry ($r = +0.93$).](image)

**FIG. 2.** Comparison between proportion of total lung perfusion in right lung obtained by quantitative lung scanning and bronchospirometry ($r = +0.93$).

**REFERENCES**


Dollery, C. T., and Gillam, P. M. S. (1963). The distribution of blood and gas within the lungs measured by scanning after administration of $^{133}$Xe. Thorax, 18, 316.


