Letter to the Editor

Radioaerosol Delivery Systems

In a recent *Journal* article, Wollmer et al. (*1*) assessed a commercial radioaerosol delivery system by comparing ^{113m}In aerosol inhalation images to those obtained by ^{81m}Kr gas and concluded that the system was suitable for clinical use. Whereas their work appears applicable to patients with chronic obstructive pulmonary disease, several technical points need to be emphasized before clinicians and technologists attempt to use the described system for the assessment of ventilation in patients suspected of pulmonary embolism.

The authors stated that a settling bag could be eliminated and the scanning procedure simplified because the nebulizer in their system produced smaller particles than in a previous system in which they employed a 50-liter bag for settling out the larger particles. Their patients, however, had to inhale the aerosol for 10 min to obtain an initial count rate of ~ 90,000 counts per minute that was deemed necessary for lung imaging.

Since patients suspected of pulmonary embolism often come to the clinic gasping for air (a study at Duke University Medical Center of 1,000 patients with pulmonary embolism found that 77% presented with dyspnea and 38% with tachypnea (*2*)), they are able to tolerate only very short inhalation times. In our post-perfusion aerosol studies, the 2 min required to inhale 5 mCi (~ 1 million counts per minute) ^{99m}Tc-DTPA is frequently too long, and intermittent aerosol administrations become necessary (*3*).

A 3-liter bag that we use as a reservoir only (the nebulizer is internally baffled to produce the smaller optimum size particles) is sometimes depleted of its aerosol volume. Therefore, it is not surprising that Wollmer et al. (*1*) found only a 5% increased difference when adding a smaller 0.75-liter bag to their system. In our studies we found an increase in efficiency of ~ 300% when a 3-liter reservoir bag was added to the system. I suggest that a user of any aerosol inhalation system which does not have a reservoir of at least 3 liters add one and compare the difference. This is essential with patient populations that are able to cooperate minimally.

Another consideration not mentioned by the authors is the shielding requirements needed when administering ^{113m}In aerosol with its gamma photon energy of 393 keV. This is crucial if the aerosol administration system needs to be brought up close to patients in bed (as pulmonary embolism suspects frequently are). The administration time is 10 min. The shielding provided with commercial administration systems for ^{99m}Tc aerosols may be inadequate for the ^{113m}In aerosols.

Whereas the authors' work is meritorious, one should be aware of the possible difficulties when extrapolating their technique to patients suspected of pulmonary embolism.

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REFERENCES

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2. Wolfe WG, Sabiston DC. Clinical presentation of pulmonary embolism. In *Pulmonary Embolism.* Philadelphia: WB Saunders Co, 1980:64. (Ebert PA, ed. *Major Problems in Clinical Surgery; Vol XXV.)*

3. Elam DA, Llaurado JG. Clinical usefulness of pre- and post-perfusion aerosol studies in patients suspected of pulmonary embolism. *Clin Nucl Med* 1985;10:P25.

Reply

Mr. Elam's letter shows a gratifying interest in our work on aerosol ventilation scintigraphy. In a recent article (*1*) as well as in a previous study of a settling bag system (*2*), we have chosen to evaluate the aerosol technique in patients with abnormal ventilation. This is of fundamental importance because it is well known that the greatest difficulties in aerosol ventilation scintigraphy are encountered in this group (*3*).

The rationale for using ^{113m}In was that its energy (393 keV) is sufficiently high to be separated from ^{99m}Tc, allowing ventilation scintigraphy to be performed after perfusion scintigraphy, and that the isotope is available from a generator.

In the context of aerosol ventilation scintigraphy, the term "efficiency" is, unfortunately, often used loosely. The volume of aerosol produced by an air jet nebulizer is generally 10 liters/min, which is similar to the minute ventilation at rest. The best way to use this aerosol is to ascertain that the patient inhales the whole volume of aerosol. This is accomplished with the 0.75-liter reservoir used in our modified UltraVent system. The activity deposited in the lungs was measured as a fraction of the activity nebulized. For the original system, this was 20%, which is identical to the result found with a 50-liter settling bag system (*2*). When the reservoir bag is added to the UltraVent system, the fraction of nebulized activity deposited in the lungs increases to 25%. If we compare instead the count rate achieved after a given period of inhalation with and without a reservoir, the difference is 25%. In regards to Mr. Elam's letter, it is not clear how "efficiency" is defined,