



Letter to editor

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Dear Sir,

We are grateful for the opportunity to respond to Norman LaFrance and France Fournier concerning questions about how to perform the ventilation study in a V/P SPECT setting.

The main message of the guideline is that V/P SPECT is the recommended method for diagnosis of pulmonary embolism (PE). Furthermore, V/P SPECT is as well useful for other diagnoses such as COPD, pneumonia, and left heart failure [1]. Studies based on both ^{99m}Tc-DTPA aerosol and ^{99m}Tc-labelled carbon particles are referred to in our argumentation. We used the name TechnegasTM, the only one commercially available ^{99m}Tc-labelled carbon agent.

When there is no bronchial obstruction, the diagnosis of PE is not depending on the type of aerosol or gas. However, among patients sent for a V/P SPECT, a considerable number have bronchial obstruction. COPD is a clinical risk factor for PE and it is important to detect PE also in these.

The 2009 guideline stated that “Technegas[®] greatly reduces the problem of central deposition often encountered with ^{99m}Tc-DTPA. Technegas[®] facilitates interpretation, particularly in COPD” [2]. The Canadian 2019 guideline states the same [3]. The fact that COPD lessens the diagnostic value for PE of ^{99m}Tc-DTPA ventilation SPECT is since more than 20 years recognized by clinicians and experts in nuclear medicine and reported in reviews about the topic.

It is true that only one study comparing DTPA aerosol and Technegas[®] is referred to in the updated EANM 2019 guideline [1]. The reason is that it is the only study we know that has performed such a comparison [4]. It is furthermore unique with its cross over design and shows that Technegas[®] favourably causes less central deposition, particularly in patients with obstructive lung diseases. The study demonstrates

that obstructive lung disease does not importantly reduce the diagnostic capacity of V/P SPECT if Technegas[®] is used. The results could be foreseen from aerodynamic laws. Using a respiratory tract model and various ranges of aerosol median particle sizes, the deposited thoracic fraction, as a measure for peripheral aerosol penetration, dropped from 89% for 0.15- μ m particles to 78% for 0.25- μ m and to 35% for 1.0- μ m particles [5]. Current advanced radio-aerosol generators have a median particle size around 0.65 μ m, which is suboptimal compared with Technegas[®] with a median particle size of 0.06–0.1 μ m. Additional studies from independent groups would be welcome. Such additional studies could provide further insight in the usefulness of V/P SPECT in the diagnosis of obstructive lung diseases with different aerosols. A reasonable hypothesis could be that a DTPA liquid aerosol with relatively large particle size might show greater sensitivity for diagnosis of obstructive diseases.

Norman LaFrance and France Fournier cite a study where 30 ¹³³Xenon ventilation images and 24 ⁸¹Krypton ventilation images were compared with DTPA aerosol ventilation images in patients suspected for PE [6]. There were no patients with known COPD. The concordance between DTPA aerosol and xenon was 64%, and the concordance between DTPA and Kr was 85%.

The guideline refers to studies demonstrating the usefulness of a liquid aerosol like DTPA for studies of alveolo-capillary permeability. Any form of alveolitis can thereby be detected. This is not possible with Technegas[®]. The drawback related to that smokers have increased permeability is in many countries reduced thanks to fewer smokers in the population.

Summary

1. The guideline emphasizes that V/P SPECT is indispensable in the diagnosis of PE with one or other radiopharmaceutical for ventilation. This is highlighted by common contraindications of the alternative computed tomography of the pulmonary artery (CTPA). It appears that there is room for further progress in the field, e.g. by development and clinical studies of aerosol nebulizers yielding sub-micron liquid or solvable particles at an attractive cost.

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2. In addition to the referred study [4], one can out from aerodynamic laws and clinical experience foresee that Technegas® favourably causes less central deposition in the airways and that this is particularly the case in patients with obstructive lung diseases. In such case, Technegas® ventilation SPECT enhances the value of V/P SPECT as the recommended method for diagnosis of PE.
3. The guideline refers to studies demonstrating the usefulness of a liquid aerosol like DTPA for studies of alveolo-capillary permeability.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Human and animal rights This article does not contain any studies with human participants or animals.

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