

## Bridging the gap: Communicating the results of ventilation: perfusion scans to clinicians

Pulmonary embolism (PE) is a prevalent condition worldwide, with an annual incidence of 1 in 1 000 people. Mortality rates vary from 2% to 17% at 3 months, depending on underlying causes and comorbidities. Long-term physiological and psychological sequelae affect up to 50% of patients, with chronic thromboembolic pulmonary hypertension being the most severe. Undiagnosed PE or PE with delayed diagnosis is associated with significant morbidity and mortality.<sup>[1]</sup> However, deciding who to investigate can be challenging, especially in the public sector, where the required imaging techniques are not always readily available. Additionally, treatment is prolonged with the potential for harm.<sup>[2]</sup>

The ventilation: perfusion (V/Q) scan is a commonly performed study in nuclear medicine, and has been used in the evaluation of PE since 1964. It involves two parts: the ventilation component using a radiolabelled aerosol or radioactive gas, and a perfusion component using radiolabelled macroaggregated albumin. Pulmonary emboli are characterised by defects on the perfusion study that correspond to vascular anatomy and exhibit relatively preserved ventilation (mismatch). Several systems for the interpretation of V/Q scans exist, most of which predate the widespread availability of single-photon emission computed tomography (SPECT) techniques. Depending on the number and size of mismatched V/Q defects and the chest radiograph appearance, some of these interpretative systems classify scan results into different likelihood categories of PE, ranging from 'very low probability' to 'high probability', with corresponding numerical values of certainty. Proponents of such systems point out that they are standardised and validated, while critics argue that they are confusing, that assigning probabilities of a diagnosis purely on a test result ignores fundamental Bayesian principles by not accounting for pre-test probability, and that they make insufficient allowance for the application of gestalt. The European Association of Nuclear Medicine, for example, has recommended for some time that V/Q scans performed for suspected acute PE be reported as either *positive* or *negative* for PE, or (in a small minority of cases) *non-diagnostic*.<sup>[3,4]</sup> V/Q SPECT's high sensitivity and specificity make it well suited to ruling out and ruling in a diagnosis of acute PE, and the study also has an important role in quantifying embolic burden, which is prognostic of outcome and may affect management decisions. Regardless of the reporting system employed, it is crucial for clinicians ordering and acting on the test results to understand how they are generated and what they mean.<sup>[5]</sup>

Computed tomography pulmonary angiography (CTPA) is considered by many as the current reference standard for diagnosing acute PE. It offers numerous advantages in the diagnosis of PE, being more readily available than the V/Q scan and faster to perform. CTPA also has higher utility than V/Q in identifying alternative diagnoses when PE is not the cause of a patient's symptoms, although V/Q SPECT-CT shows promise in this regard. CTPA's benefits come at the cost of increased ionising radiation dose (especially to female breast tissue in pregnant or lactating women) and the need for contrast material. The primary advantages of the V/Q scan are that it can

be performed in situations where it is preferable to limit radiation dose, and where allergy or renal dysfunction contraindicate the use of intravenous contrast.<sup>[5,6]</sup>

Invasive pulmonary angiography, magnetic resonance angiography and echocardiography are additional imaging modalities that may have niche applications in the evaluation of acute PE.<sup>[6]</sup>

In this edition of the *AJTCCM*, Ismail *et al.*<sup>[7]</sup> present the findings of their research on the communication gap between nuclear medicine physicians and clinicians in interpreting V/Q scan reports and its effects on patient management. The authors note that historically there has been a wide variation in the interpretation of V/Q scan reports by both clinicians and nuclear medicine physicians. The group conducted a cross-sectional study using a questionnaire and included 162 participants across three departments most likely to request a V/Q scan. Respondents were able to correctly interpret phrases conveying high and low probabilities of PE. However, most clinicians in the study indicated that they would request alternative investigations for PE in the event of a normal V/Q scan (which has a high negative predictive value) when the pre-test probability is high. The authors speculate whether this discrepancy indicates mistrust in the test or lack of understanding of the negative predictive value of the test. The multiple-choice nature of the instrument used in this study may not have fully interrogated respondents' knowledge.

The study presented some interesting findings regarding the preferences of respondents for the terms recommended in guidelines such as the Modified Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED II) system that make use of probabilistic reporting.<sup>[8]</sup> However, it is important to note that the study was conducted in a single academic complex, which limits the generalisability of the results. Furthermore, the findings are contrary to those of other studies, which raises questions about their implications outside of the study setting.

Worryingly, the study revealed that few clinicians ever contacted the nuclear medicine department when the findings of a report were not clearly understood. This highlights a clear gap in communication and opportunities for improvement, which could prevent errors in patient care and enhance clinician education.

To address this issue, it may be desirable for nuclear medicine physicians to contact requesting clinicians to discuss inconclusive results. Furthermore, reports could include additional instruction from guidelines as an educational opportunity. This would help promote better communication between nuclear medicine physicians and clinicians, which would ultimately benefit patient care.

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