

CASE REPORT

Movahed's sign in chronic thromboembolic pulmonary embolism

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Abstract

A 63-year-old lady presented with breath lessness of over five weeks. Lung perfusion scan illustrated bilateral mismatched perfusion defects consistent with multiple pulmonary emboli. Six months later, the patient presented with dyspnoea and was assessed for ischaemic heart disease with a myocardial perfusion SPECT scan. The scan images did not show any evidence of ischaemia or infarction. However, the scan showed prominent right ventricular uptake and a D-shaped left ventricle (Movahed's sign). Repeat perfusion lung scan demonstrated persistent bilateral pumonary embolism. Echocardiogram confirmed marked right heart enlargement, significant pulmonary hyper tension with pulmonary artery pressure in excess of 80 mmHg. This case illustrates diagnostic value of left ventricular shape on a myocardial perfusion scan.

Key words: *D-shaped left ventricle, Movahed's sign, pulmonary embolism, pulmonary hypertension, right ventricle hypertrophy*

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Introduction

Single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) is one of the most frequently performed nuclear medicine procedures. Its applications include diagnosis, prognosis and risk stratification for coronary artery disease. Myocardial perfusion SPECT studies are primarily performed for the assessment of the left ventricular perfusion and function. Observations and findings regarding the right ventricle (RV) are often limited due to the thin myocardial mass of the RV. However, there are findings on SPECT that correlate with RV dysfunction and need to be reported. Chronic thromboembolic disease is one of the main causes of severe pulmonary hypertension and right heart failure [1]. This case illustrates the significance of RV findings on SPECT and the importance of recognition of Movahed's sign [2, 3].

Case Report

A 63-year-old lady presented with breath lessness of five weeks, precipitated by a long flight. The patient's past history included hypertension, hypothyroidism, hysterectomy for fibroids and she was on hormone replacement therapy (HRT). Her ECG showed T-wave inversion in the infero-anterior chest leads with RBBB. The D-dimers level was high but Troponin-T level was normal. She was

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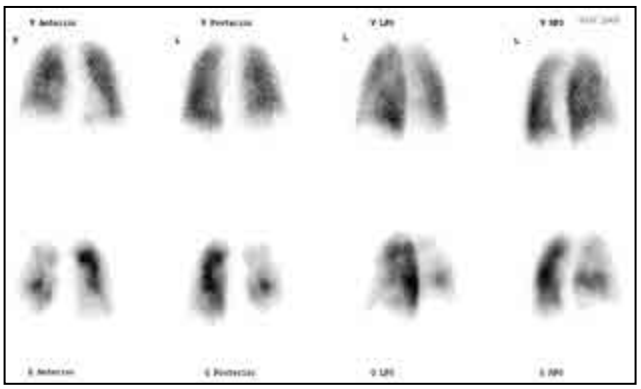

Figure 1 *^{99m}Tc-technegas ventilation (top row) and ^{99m}Tc-MAA perfusion scan (bottom row) showing bilateral multiple pulmonary emboli*

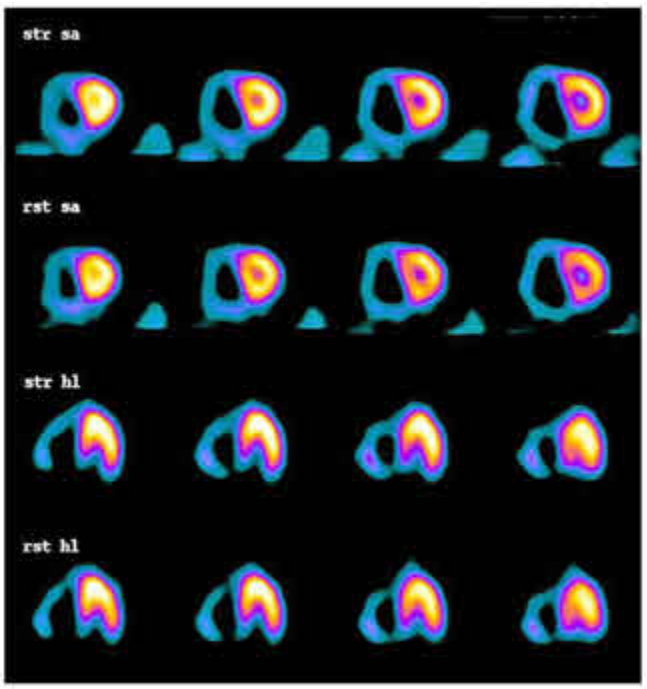

Figure 2 *^{99m}Tc-SestaMIBI myocardial perfusion scan showing normal LV perfusion, a D-shaped LV and increased uptake in the RV wall*

referred to the nuclear medicine deparment with high clinical suspicion of acute pulmonary embolism (PE). Ventilation-perfusion (VQ) lung scan was performed using ^{99m}Tc-technegas for ventilation and ^{99m}Tc-macroaggregated albumin (MAA) for perfusion. The VQ scan showed bilateral mismatched perfusion defects consistent with a high probability of PE. The patient was commenced on anticoagulation for 6 months.

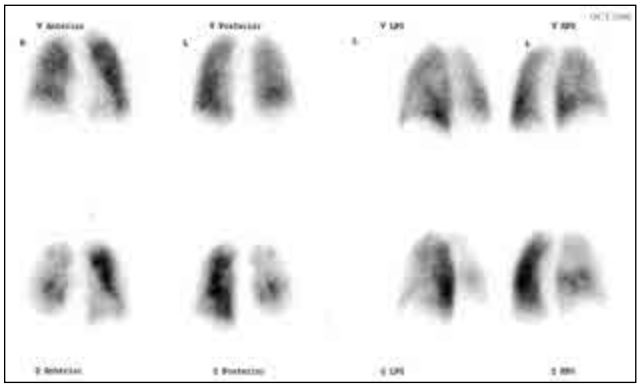

Figure 3 *Follow-up ^{99m}Tc-technegas ventilation (top row) and ^{99m}Tc-MAA perfusion scan (bottom row) showing chronic bilateral pulmonary embolism*

Six months later, the patient was referred again to the nuclear medicine department for a myocardial perfusion scan to investigate possible ischaemic heart disease. The patient's breathlessness had continued despite the anticoagulation therapy. Her baseline echocardiogram was essentially normal with an ejection fraction of 60%. There was a degree of tricuspid regurgitation probably related to a rise in pulmonary artery pressure secondary to the multiple pulmonary emboli. Her dyspnoea had improved by 80% with Frusemide, even without clinical signs of left ventricular failure. As the patient was on hormone replacement therapy, which is assumed to be associated with a three-fold increased risk of venous thrombosis, this was gradually tapered off. Patient managed 3 minutes of treadmill exercise test, which was limited by shortness of breath. However, she achieved 80% of her maximum predicted heart rate.

A stress myocardial perfusion scan was performed using a 2-day protocol with a standard pharmacological stress with adenosine (156 ml infusion per hour for 6 minutes). There were no significant ECG changes during stress. The non-gated myocardial perfusion scan images showed normal perfusion in the LV walls with no

evidence of ischaemia or infarction seen. However, the LV cavity was seen to be D-shaped due to a flattened septum. This scintigraphic appearance of the LV on cardiac SPECT has been recognized in the literature as Movahed's sign where septal flattening is suggestive of raised right ventricle pressure secondary to pulmonary hypertension. The right ventricular wall showed prominent tracer uptake suggestive of hypertrophy. A repeat follow-up VQ lung scan demonstrated persistent bilateral pulmonary embolism with no significant change since the initial diagnostic scan. A repeat echocardiogram confirmed marked right heart enlargement, significant pulmonary hypertension with a calculated pulmonary artery pressure in excess of 80 mmHg. These findings confirmed chronic thromboembolic pulmonary hypertension.

Discussion

A straightening of the interventricular septum and a D-shaped left ventricle on short-axis, are helpful echocardiographic signs for diagnosing RV volume and/or pressure overload [4]. Recognition of similar features on myocardial perfusion SPECT have been reported in literature as Movahed's sign [2,3]. The right ventricle (RV) is routinely faintly visualized on gated cardiac SPECT studies primarily because of the relatively smaller RV myocardial mass and lower coronary flow to the RV. An increase in the RV mass or workload causes higher tracer uptake in the RV wall secondary to increase in RV wall thickness and higher coronary flow. Furthermore, increased RV volume or pressure load results in displacement of the septum towards the left ventricle causing septal flattening and a D-shaped configuration of the LV, i.e. the Movahed's sign [5, 6]. Recognition of the RV dysfunction is important as it has been associated with increased morbidity and mortality in patients with congenital heart disease, valvular disease, coronary heart disease, pulmonary hypertension and heart failure [7, 8]. In a prospective study Pengo et al. found chronic thromboembolic pulmonary hypertension to be relatively common with 4% of patients developing it within two years of first symptomatic PE [9]. Myocardial perfusion SPECT is one of the most frequently performed nuclear medicine procedures. There has been a consistent effort on the part of the various professional societies to introduce and adapt a standardized cardiac reporting pattern. Whereas LV findings remains the prime focus, it is recommended that abnormal RV findings should be mentioned in an MPI report as illustrated in this case [10].

Conclusion

D-shaped left ventricle is representative of high right ventricle pressure and warrants recognition on myocardial perfusion imaging.

References

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