

## **Validation of Three-Dimensional Analysis Method for Calculation of the LV Mass and Ejection Fraction Using Tc-99m Sestamibi Gated-SPECT Perfusion Imaging: Comparison Between 4D-MSPECT and Magnetic Resonance Imaging.**

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**Objectives:** Gated single photon emission computed perfusion tomography (g-SPECT) has been used to calculate LV ejection fraction (EF), end-diastolic and systolic volumes (EDV and ESV), and appears to correlate well with other conventional methods. Limited data exist describing the comparative accuracy between g-SPECT and other methods used to assess LV mass (MS). One limitation to development of g-SPECT for measurement of LV mass has been the lack of clinically validated automatic processing software. The aim of this study was to analyze the concordance between LV mass, volumes and ejection fraction derived by g-SPECT using the 4D-MSPECT software and cardiac MRI.

**Methods:** MRI and g-SPECT, rest imaging were performed in 21 patients with ischemic cardiomyopathy, and 5 normal controls. Both examinations were carried out within one week in all cases. EF, EDV, ESV and LV mass were calculated from MR using previously validated ARGUS software and g-SPECT using 4D-MSPECT software. Results were compared using linear regression and a correlation coefficient analysis.

**Results:** Data from 26 MRI studies were compared with corresponding SPECT data. Excellent correlation was observed for each parameter measured. LVEF calculated by both methods showed excellent correlation (slope 0.95,  $p < 0.0001$ ; intercept 1.66%;  $R^2 = 0.94$ ) over a broad range (EF mean 34.9%, range 12-74%). 4D-MSPECT showed good correlation with MRI in terms of LV mass calculation (slope = 1.01,  $p < 0.0001$ ; intercept = -11.11g;  $R^2 = 0.82$ ). For EDV measurements, 4D-MSPECT showed good correlation ( $R^2 = 0.90$ ) over a broad range (83-395ml) of volumes. As previously noted, there was a tendency to overestimate EDV true volume using g-SPECT in patients with large perfusion defects and higher volumes. Linear correlation revealed a slope of 1.27 and intercept of 11.84ml, depicting this proportional bias toward overestimation. At lower volumes in the non-ischemic controls, this bias was undetectable. ESV also showed excellent correlation overall, again with a proportional bias toward overestimation but closer correlation (slope 1.21,  $p = 0.0002$ ; intercept 0.68ml;  $R^2 = 0.96$ ).

**Conclusions:** Gated-SPECT using the 4D-MSPECT program was significantly correlated to MRI in the calculation of LV ejection fraction, EDV, ESV and LV mass across a broad range of LV dimensions.

**Keywords:** Single photon emission computed tomography (SPECT), Gated SPECT quantitative analysis | Magnetic resonance imaging (MRI).