

Accuracy and Reproducibility of 3D-MSPECT for Estimating Left Ventricular Ejection Fraction in Patients with Severe Perfusion Abnormalities.

EP Ficaró, RA Quaife, JN Kritzman, JR Corbett.

University of Michigan Health System, Ann Arbor, MI; University of Colorado Health Sciences Center, Denver, CO.

Objective: The measurement of LV ejection fractions (LVEF) from gated SPECT studies has become a routine part of perfusion imaging. Hearts with large areas of severely impaired perfusion and/or myocardial infarction (MI) can be problematic for some commercial programs. A new surface generator was developed for 3D-MSPECT designed specifically to address this problem. The purpose of this study was to determine the accuracy and reproducibility of 3D-MSPECT for estimating LVEFs in a population including a large percentage of patients with MI and large severe perfusion defects.

Methods: For this study, 90 patients, 55 with MI, underwent single plane contrast ventriculography (CVG) and LVEF determinations by standard technique. Each of these patients also underwent gated (16 frames) stress perfusion tomographic imaging with Tc-99m-Sestamibi within 90 days of the CVG study. Images were reconstructed using filtered backprojection, spatially and temporally filtered and resliced along the axis of the heart to provide short-axis (SA) slices throughout the heart volume. The SA images were then processed using 3D-MSPECT to estimate ventricular chamber volumes for each gating interval. LVEFs values were tabulated from 3D-MSPECT running in auto-mode and in manual mode (n=3 operators). In manual mode, the operator is permitted to refine the basal limits at ED and ES.

Results: Regression analysis was performed for each 3D-MSPECT EF dataset with the EF values obtained from CVG. Correlation coefficients were 0.81 for auto-mode and 0.82, 0.84 and 0.92 for the 3 operators. Mean RMSE values were 7.2 for auto-mode and 7.2, 6.2 and 5.2 for manual mode. Inter-operator reproducibility curves compared to auto-mode demonstrated near unity slopes (0.95, 0.95, 0.93) with correlation coefficients of 0.97 for all.

Conclusions: Left ventricular ejection fraction determinations from 3D-MSPECT in a population made up largely of patients with large severe perfusion defects demonstrated very good correlations with contrast ventriculography. The reproducibility of these measurements in auto-mode and by 3 observers in manual mode were excellent approaching the line of identity.