Dependence of Estimated Left Ventricular Ejection Fraction Due to the Reconstruction Arc Length and Algorithm for Myocardial Gated SPECT.

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Objective: The objective of this study was to investigate the effects of the reconstruction algorithm and orbit length on the left ventricular ejection fractions estimated with the quantitative software program 3D-MSPECT using myocardial perfusion SPECT data.

Methods: Fifty-one patients were imaged with a simultaneous gated transmission-emission tomographic system. Each of these patients had a bi-plane contrast ventriculogram study performed within 90 days of the tomographic study. The myocardial perfusion data was acquired over 16 gating frames, in a 64x64 matrix with 6.3mm pixels over 360 degrees for a 16 minute duration. Attenuation corrected (AC) gated emission images were reconstructed over arcs of 360 and 180 degrees (RAO-LPO) using algorithms developed at the University of Michigan. Uncorrected (NC) images were also reconstructed over arcs of 360 and 180 degrees using conventional filtered backprojection with a ramp filter. Both AC and NC transverse images were filtered with a Butterworth filter of order 4.0 and cutoff 0.20 and were resliced to provide short axis (SA) data sets. The SA data was input to 3D-MSPECT which computed the left ventricular EF and volumes over the cardiac cycle.

Results: The correlation between each of the data sets was excellent (>0.90). The NC 180 degree data correlated best with the CVG estimates (r=0.84). The EF estimates were more highly correlated with reconstruction arc compared to the reconstruction algorithm; the NC and AC estimates were significantly different ($p<0.05$), while the 360 vs. 180 estimates for both AC and NC were not. From Bland-Altman analysis, the 360 degree data was approx 2% lower than the 180 degree data for both AC and NC, and the AC data was approx 5% higher than the NC data for the same reconstruction arc.

Conclusion: Based on these results, 3D-MSPECT EFs values from 180 or 360 degree data can be effectively compared with minimal error. The dependence on the reconstruction algorithm is greater and will have to be investigated further for each algorithm to determine the possible bias resulting estimates from the different reconstruction algorithms.

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