

Effect of Attenuation Corrected Myocardial Perfusion SPECT on Left Ventricular Ejection Fraction Estimates.

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Objective: The objective of this study was to investigate the effects of reconstruction arc length and algorithm on left ventricular ejection fraction (EF) determinations with 3D-MSPECT using gated SPECT myocardial perfusion data.

Methods: Fifty-one patients were imaged with a simultaneous gated transmission-emission tomographic system. Each patient had biplane contrast ventriculography (CVG) performed within 90 days of the SPECT study. The tomographic data was acquired over 16 frames/cycle, 64x64 matrix, 6.3mm pixels, over 360 degrees for 16 minutes duration. Attenuation corrected (AC) emission images were reconstructed over 360 and 180(RAO-LPO) degree arcs using algorithms previously described. Uncorrected (NC) images were reconstructed (recon) over the same arcs using filtered backprojection. Both AC and NC images were filtered and resliced to provide short axis (SA) data sets. The SA data were input to 3D-MSPECT which computed left ventricular EF and volumes over the cardiac cycle. For comparison, EF values were also computed with the QGS program.

Results: The mean EF from the NC180 data was (59±14)%. Each of the data sets were highly correlated to each other ($r>0.90$). The NC180 data correlated best with the CVG EFs ($r=0.84$). The EF estimates were more highly correlated with the recon arc compared to the recon algorithm; the NC and AC EFs were significantly different ($p<0.05$), while the 360 and 180 EFs for AC and NC were not. From Bland-Altman analysis, the 360 data was approx 3% lower than the 180 data for both AC and NC, and the AC data was approx 5% higher than the NC data for the same recon arc. QGS demonstrated similar correlation and bias behavior, but its failure rate to locate the LV increased for non-NC180 degree data (NC180: 1, NC360:2, AC180:6, AC360:8). 3D-MSPECT did not fail.

Conclusion: The NC180 EFs correlated best with CVG estimates likely due to better contrast and a smaller scatter component compared to 360 NC and AC data. The 3D-MSPECT EFs values from 180 and 360 data can be effectively compared serially. The dependence on the recon algorithm is greater and will have to be investigated further to determine the EF bias between algorithms.