Normal LV Ejection Fraction Limits Using 4D-MSPECT: Comparisons of Gated Perfusion and Gated Blood Pool SPECT Data with Planar Blood Pool Imaging.

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Objective: The objective of this study was to estimate the difference in left ventricular ejection fractions (LVEF) measured in normals studied with gated perfusion and blood pool (GBP) SPECT quantified using 4D-MSPECT. A comparison with conventional planar blood pool processing was also conducted in the same patient population.

Methods: The study consisted of 45 pts (32M, 62±14yrs) who had undergone gated myocardial perfusion SPECT, GBP SPECT and planar GBP imaging and who did not visually present any ventricular wall motion abnormalities. Planar GBP LVEFs were measured using standard methods from background subtracted end-diastolic and end-systolic ROIs. LV functional analyses of gated perfusion and GBP SPECT data were performed using the 4D-MSPECT quantitative software package. The surface algorithm, previously validated for perfusion SPECT, was adapted to delineate the GBP LV surface utilizing a combination of gradient and morphologic operations with 2-dimensional weighted splines providing smooth contours throughout the cardiac cycle. In estimating the LVEF for each of the data sets, the basal plane was NOT fixed during the R-R cycle. Linear regressions were performed to compare the estimated EFs from the three image data sets. Mean LVEFs were estimated for each of the three image data sets and statistical differences were estimated using a paired Student's t-test.

Results: The mean LVEF values were (70 ± 7) % for perfusion SPECT, (72 ± 7) % for GBP SPECT, and (68 ± 8) % for planar BP. The linear regression analyses from the estimated LVEF data were as follows:

GBP SPECT vs. GBP Planar: $y = 1.05 * x - 0.24$, $r = 0.95$
GBP SPECT vs. Perf SPECT: $y = 0.97 * x + 3.6$, $r = 0.98$

Conclusion: The surface algorithm utilized by the 4D-MSPECT quantitative software package performed very well for both GBP and perfusion SPECT imaging as compared to planar GBP imaging and from the comparison of GBP and perfusion SPECT studies. Mean LVEF values from planar blood pool, GBP SPECT and perfusion SPECT were comparable. While the differences were small (2-4%) they should be known when serial comparisons are required.

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