

Development and Clinical Validation of Normal Tc-99m Sestamibi Database: Comparison of 3D-MSPECT to CEqual.

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Objective: The purpose of this study was to develop and validate a normal database for quantitative perfusion imaging with Tc-99m Sestamibi using the normal database generator of 3D-MSPECT and to compare it to a previously validated program, CEqual.

Methods: Gender specific normal databases (180° and 360° reconstructions of same acquisitions) were created from 30 low-likelihood normal males and 30 females using the normal database generator of 3D-MSPECT. Following automatic rendering of the endocardial and epicardial LV surfaces, myocardial activity is sampled using a cylindrical spherical coordinate system where each polarmap ring is equidistantly sampled along the mid-myocardial surface from base to apex. Using ROC analysis regional thresholds in SD below the normal mean were optimized. Clinical validation was performed using data from 317 patients, low likelihood normal ($\leq 5\%$) (n=114), angiographically normal (n=36), angiographic coronary stenoses ($\geq 50\%$) (n=167). A rest Tl-201/stress Tc-99m sestamibi protocol was performed. Patients with prior MI, LBBB and CABG were excluded. There were no exclusions based on body habitus or bra size. The mean age of the normals was 49 ± 16 and the mean age of the patients was 57 ± 13 years. All studies were analyzed using 3D-MSPECT (180° and 360°) and CEqual (180°).

Results: Normalcy rates were significantly higher for 3D-MSPECT, 58% 180°, 76% 360°, as compared to CEqual 34% ($p < 0.001$). The low CEqual normalcy value can be attributed to breast attenuation that is not accurately represented in the CEqual database. Sensitivities (81%, 83%, 77%), specificities (42%, 42%, 42%) and accuracies (74%, 75%, 71%) for the identification of patients with CHD were comparable for the three methods respectively. Sensitivities, specificities and accuracies for individual vessel stenoses were comparable for 180° and 360° data analyzed with 3D-MSPECT in comparison to CEqual data.

Conclusions: Databases created and optimized with the normal database generator of 3D-MSPECT provide increased normalcy rates and comparable sensitivities, specificities and accuracies compared to CEqual for our patient population.