Abstract: P312

Quantitative imaging biomarkers of cardiac sympathetic innervation and perfusion using C-11-meta-hydroxyephedrine and N-13-ammonia PET in ischemic cardiomyopathy

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Background: Cardiac sympathetic nervous system dysfunction is a predictor of sudden cardiac arrest in heart failure patients with ischemic cardiomyopathy. Qualitative markers of cardiac PET tracer uptake have typically been used to assess cardiac function in these patients, however there may be added value in quantification for subsequent clinical trials.

Purpose: The primary objective of the study was to compare quantitative vs qualitative PET imaging biomarkers for the assessment of sympathetic denervation and perfusion in the PAREPET cohort (JACC 2014;63(2):141). The secondary objective of this study was to evaluate the inter-rater reliability of the regional HED and perfusion defects to determine the minimum detectable change.

Methods: N=100 dynamic HED and NH3 PET scans were re-analysed from heart-failure patients with documented ischemic cardiomyopathy (LVEF =35%) eligible for primary-prevention ICDs in the PAREPET trial. Two blinded observers used an automated analysis software to measure HED volumes of distribution (DV), NH3 myocardial blood flow (MBF) and regional defect scores (%LV) <75% of the maximum value. The original PAREPET scores were used as the standard for comparison of results. Intraclass correlation coefficients (ICC) and Bland-Altman coefficient-of-repeatability were used to compare the scores and determine inter-observer reliability.

Results: The average HED percent defect score from the PARAPET trial was 27.4%, while the average in this study was 29.5%, with a difference of 2.1% ± 3.1% (p<0.05). The inter-rater reliability of HED analysis using automated analysis software was excellent (ICC=95%) with an average difference of 1.4% ± 3.1% (p<0.05) and coefficient-of-repeatability of ±6%. During the comparison of HED uptake values, the average HED percent defect score was 30.9%, whereas the average HED distribution volume measured defects of 37.8%. The quantitative variable of HED distribution volumes was significantly larger than the qualitative percent defect scores by 6.9% ± 4.1% (p<0.05). Measuring perfusion, the average NH3 percent defect score was 20.5%, which increased to an average of 28.9% when measuring the quantitative MBF. This difference of 8.8% ± 7.5% was statistically significant (p<0.05). Both the quantitative markers, HED distribution volumes and NH3 MBF, were significantly larger than the qualitative defect scores.

Conclusion: Inter-rater reliability of HED analysis using the automated analysis software was excellent. Quantitative measures of innervation and perfusion showed larger and more severe regional defects than qualitative scoring. This may indicate greater sensitivity to predict downstream clinical events. This requires validation in prospective outcomes studies.
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