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Non Invasive Imaging

NONINVASIVE FRACTIONAL FLOW RESERVE DERIVED FROM QUANTITATIVE PERFUSION POSITRON EMISSION TOMOGRAPHY

Poster Contributions
Hall C
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Session Title: Cardiac Positron Emission Tomography: Current and Newer Applications
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Background: Quantitative myocardial perfusion imaging with positron emission tomography (PET) is increasingly utilized for the diagnosis of coronary artery disease (CAD). Recently, thresholds for hyperemic myocardial blood flow (MBF) and flow reserve were established, taking fractional flow reserve (FFR) as a reference standard. In contrast to FFR, perfusion PET is not lesion specific but a composite measurement of the entire coronary tree yielding potential physiological disconcordancy. Quantitative perfusion imaging additionally allows to noninvasively calculate FFR. This so called relative flow reserve (RFR) is defined as the ratio of hyperemic MBF in the stenotic area to hyperemic MBF in a contralateral normal perfused area. The aim of the present study was to validate RFR against FFR and to compare its diagnostic accuracy with hyperemic MBF.

Methods and Results: From a cohort of 319 patients without previously documented CAD who underwent H2150 cardiac PET and invasive coronary angiography, 92 patients with single (n = 64) or two vessel (n = 28) disease were included (n = 120 arteries). Intermediate lesions (diameter stenosis 30 - 90%, n = 98) were interrogated by FFR. Fifty-one (43%) vessels were deemed hemodynamically significant (> 90% stenosis or FFR ≤ 0.80). Hyperemic MBF and RFR were lower for vessels with a hemodynamically significant lesion (1.99 ± 0.81 vs. 2.88 ± 1.22 mL·min-1·g-1, $p < 0.001$, and 0.68 ± 0.23 vs. 0.94 ± 0.15, $p < 0.001$, respectively). The correlation between RFR and FFR was moderate ($r = 0.54$, $p<0.01$). ROC curve analysis showed a comparable area under the curve for hyperemic MBF and RFR (0.76 vs. 0.82, $p = 0.33$) to diagnose CAD. The optimal cutoff value for RFR was 0.78 with a diagnostic accuracy of 79%, whereas hyperemic MBF showed a diagnostic accuracy of 74% (optimal cutoff value of 2.35 mL·min-1·g-1).

Conclusions: Noninvasive estimation of FFR with quantitative perfusion PET by calculating RFR is feasible, yet diagnostic accuracy is comparable to hyperemic MBF assessment alone.