Non Invasive Imaging (Echocardiography, Nuclear, PET, MR and CT)

RELATIONSHIP BETWEEN QUANTITATIVE ADVERSE PLAQUE FEATURES FROM CORONARY CT ANGIOGRAPHY AND DOWNSTREAM IMPAIRED MYOCARDIAL FLOW RESERVE

Poster Contributions
Poster Hall B1
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Background: We investigated the relationship of quantitative plaque features from coronary CT Angiography (CTA) and coronary vascular dysfunction by impaired myocardial flow reserve (MFR) by 13N-Ammonia Positron Emission Tomography (PET).

Methods: Fifty-one patients (32 men, 62.4±9.5 years) underwent combined rest-stress 13N-ammonia PET and CTA scans by hybrid PET/CT. Regional MFR was measured from PET. From CTA, 153 arteries were evaluated by semi-automated software, computing arterial non-calcified plaque (NCP), low-density NCP (NCP<30 HU), calcified and total plaque volumes, and corresponding plaque burden (plaque volume x 100%/vessel volume), stenosis, remodeling index, contrast density difference (maximum difference in luminal attenuation per unit area in the lesion), and plaque length. Quantitative stenosis, plaque burden and myocardial mass were combined by boosted ensemble machine-learning algorithm into a composite risk score to predict impaired MFR (MFR≤2.0) by PET, in each artery.

Results: Seventeen patients (33%) had impaired regional MFR in at least one territory, (41/153 vessels). Patients with impaired regional MFR had higher arterial NCP (209.3 vs 100 mm3), low-density NCP (45.2 vs 23.5 mm3) and total plaque volumes (253.8 vs 117.9 mm3, p<0.02) and corresponding burden. In multivariable analysis, NCP burden was the most significant predictor of impaired MFR (Odds Ratio 1.35, p=0.003). For prediction of impaired MFR with 10-fold cross-validation, receiver-operating- characteristics-area-under-the-curve for the composite score was 0.83 (95%CI:0.79-0.91), greater than for quantitative stenosis (0.66, 95%CI:0.57-0.76, p = 0.005).

Conclusion: Compared to stenosis, arterial NCP burden and a composite score combining quantitative stenosis and plaque burden from CTA significantly improves identification of downstream regional vascular dysfunction.