Incremental value of regional coronary calcium and myocardial perfusion by 82Rb PET/CT in predicting cardiac outcome over coronary angiography, in patients with suspected coronary artery disease

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Introduction: Cardiac PET/CT is commonly used for risk stratification of patients with suspected coronary artery disease (CAD).
Purpose: To evaluate regional CAC amount, myocardial perfusion and vascular function by Rubidium-82 (Rb82) PET/CT in predicting cardiac outcome over angiography in patients with suspected CAD.
Methods: We evaluated 238 patients referred to CAC scanning and 82Rb PET/CT. Patients had invasive coronary angiography (ICA) within 6 months. Significant CAD was defined as =50% stenosis. Regional CAC score was categorized into <300 and =300. Regional ischemic total perfusion defect (ITPD) was categorized into <5% and =5%. Regional coronary flow reserve (CFR) was considered reduced when <2. Endpoints were cardiac death, non-fatal myocardial infarction and revascularization.

Results: Follow-up was available in 224 (92%) patients. Patients who underwent revascularization within 6 months were excluded. During a mean follow-up of 34±18 months, 29 (15%) events occurred in 206 patients. Of the 618 vessels analyzed, 47 (8%) reported an event. The vessels with events, compared to those without, showed higher CAC (4.6±2.4 vs 2.3±2.6), lower hyperemic MBF (1.4±0.7 vs 2.1±0.8) and lower CFR (1.5±0.5 vs 2.3±0.8) values (all p<0.001). In 409 (66%) vessels no significant stenosis was observed. Differently, the presence of CAD was reported in 199 (32%) vessels: 99 (16%) <75%, and 100 (16%) =75%. Event rate increased with increasing CAD severity (1% vs 14% vs 27%, p for trend <0.001), and it was significantly higher in vessels with CAC =300 (23% vs 4%), ITPD=5% (27% vs 6%) and in those with CFR<2 (15% vs 3%) (all p<0.001). At univariable analysis, CAD, CAC =300, ITPD=5% and a CFR<2 were significant predictors of events (all p<0.001). At multivariable analysis only CAD, CAC=300 and CFR<2 were independent predictors of events (all p<0.01). At incremental analysis, the addition of regional CFR to a model including ICA and regional CAC, significantly increased the global chi-square from 102 to 115 (p <0.005). Among vessels with CAD and CAC <300, event rate was higher in vessels with CFR<2 compared to those without (17% vs 3%, p<0.05). In vessels with CAC =300, event rate was higher in those showing reduced CFR (45% vs 11%, p<0.05). Kaplan-Meyer survival analysis in vessels with CAD, showed that those with CAC score<300 and a preserved CFR has an excellent prognosis. On the contrary, the worst prognosis was observed in vessels with both CAC=300 and CFR<2 (p<0.001).

Conclusion: Regional coronary atherosclerosis and vascular function have independent prognostic value in predicting the occurrence of cardiac event. In vessels with significant stenosis, the rate of cardiac events is higher in the presence of a reduced regional CFR, in particular in vessels with higher CAC score values. On the contrary, vessels with CAD but lower CAC score values and preserved CFR, have an excellent prognosis despite the presence of significant stenosis.