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Meeting abstract

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1010 Plaque burden as a determinant of coronary endothelial function

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Introduction

Normal coronary endothelial function(CEF) results in both epicardial coronary artery lumen dilation and increased coronary flow due to downsteam microvascular vasodilation during cold pressor testing (CPT) or intracoronary injection of acetylcholine,. We have previously developed noninvasive MRI methods to assess both components of CEF using CPT and have shown that presence of risk factors blunts or abolishes increased flow during CPT.

Purpose

We hypothesized that, in contrast, plaque burden predominantly affects epicardial coronary artery CEF. Thus, the ratio of epicardial lumen dilation to flow increase should reflect the relative contribution of plaque burden and risk factors to coronary endothelial dysfunction in a given individual and show an inverse relationship to plaque burden expressed as CT coronary calcium score (CAC).

Methods

We assessed both components of CEF noninvasively using MRI to image left anterior descending(LAD) lumen area and flow at rest and after 90 sec. of CPT. The LAD was localized using navigator coronary angiography and a cross-section of the proximal LAD imaged using breathhold T2 weighted turbo spin echo imaging(lumen, TR: 1977, TE: 69, matrix: 119 × 256 × 5 mm, FOV: 137 × 256, pixel size 1.2 × 0.7 × 5 mm). Segmented phase contrast TurboFLASH CMR velocimetry was used to assess flow (VENC: 100 cm/s, TR: 55, TE: 3.2, matrix: 116 × 256 × 6 mm, pixel size: 1.5 × 0.9 × 6 mm). CT calcium score imaging was performed using the MESA protocol adapted for a Siemens 64 slice scanner and scored in Argus. %ΔLumen, %ΔFlow and their ratio were compared to LAD CAC using Spearman correlation and subgroups with LAD CAC ≥ 100 and LAD CAC < 100 compared using unpaired t test.

Results

There were 21 subjects(mean age 59 ± 10 yrs, 6 female, LAD CAC 0–1005). None had findings suggestive of clinical coronary artery disease. Risk factors (hypertension, smoking, diabetes and hyperlipidemia) were present in 14, while 7 were normal and had no risk factors. There was an inverse relationship between LAD CAC and %ΔLumen ($r = -.43$, $p = 0.05$) but no relationship between LAD CAC and %ΔFlow. The ratio %Lumen/%Flow also showed an inverse relationship to LAD CAC ($r = -.55$, $p < 0.008$). The mean ratio %Lumen/%Flow was +0.33 ± 0.63 in subjects with LAD CAC < 100 and -0.08 ± 0.24 in those with LAD CAC ≥ 100 ($p = 0.07$).

Conclusion

Local plaque burden impairs coronary endothelial function in the epicardial LAD but is not closely associated with microvascular CEF. Assessment of both epicardial and microvascular CEF and the ratio of the two noninva-

sively with MRI may depict both the relative contribution of plaque burden and systemic risk factors to coronary endothelial dysfunction and the distribution of endothelial dysfunction within the LAD bed.