

Poster presentation

The impact of coronary calcium score and cardiac risk factors on coronary endothelial function

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Introduction

Coronary endothelial function (CEF) is a prognostic marker that worsens with progression of coronary atherosclerosis. In the past, invasive angiography combined with intra-coronary acetylcholine injection or the cold pressor test (CPT) was required to assess CEF.

Purpose

We developed CMR methods for assessment of left anterior descending coronary artery (LAD) endothelial function (CEF) and examined its relationship to plaque burden and atherosclerotic risk factors.

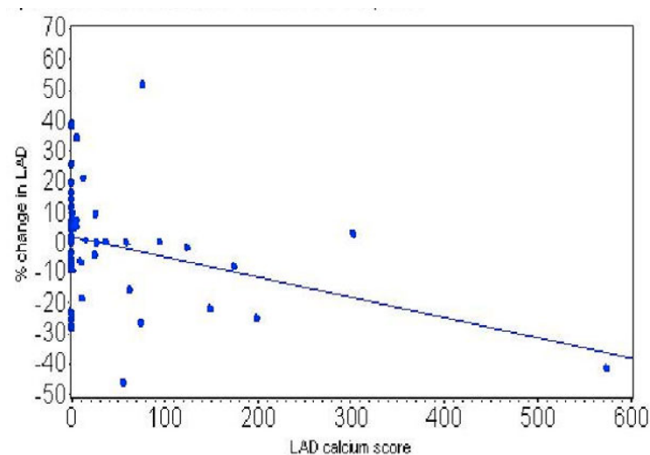
Methods

Following navigator coronary MRA scout images, the LAD lumen was imaged in short axis before and during the cold pressor test (CPT) in normal controls and subjects with one or more atherosclerotic risk factors using either supine breath-hold double inversion T2 weighted spin echo imaging (38 subjects, 1.5 T Siemens Sonata) or prone breath-hold SSFP retrospectively gated cine imaging with a 4 element phased array carotid coil (39 subjects, 1.5 T Siemens Avanto). The % change in LAD lumen area with CPT was calculated. CT calcium scores were available or obtained by protocol in each subject and those undergoing prone imaging also had coronary CT angiography to exclude coronary stenoses. Linear associations between continuous variables were measured by Pearson and Spearman (non-parametric) correlation coef-

ficients. ROC analysis was also performed. A p-value < 0.05 was deemed statistically significant.

Results

Of 77 subjects, 48 (62%) were male, 22 (29%) normal controls. Calcium score was zero in 34 (44%) subjects and 61 (79%) subjects had a calcium score >0 and/or at least one risk factor while 35 subjects with risk factors had been treated.



$r = -0.33, p = 0.019.$

Figure 1
Association between LAD calcium and CPT response.

Figure 2 ROC analysis of total calcium score vs LAD response to CPT.

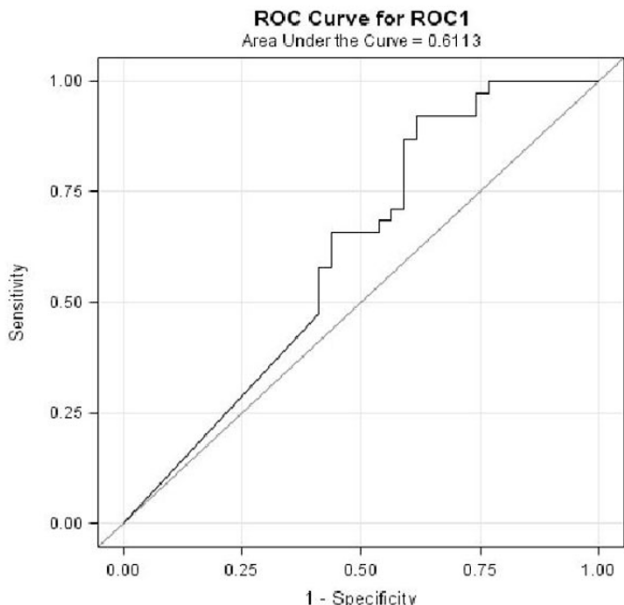


Figure 2
ROC analysis of total calcium score vs LAD response to CPT.

Among subjects with LAD calcium score >0 or at least one risk factor, an inverse linear relationship was seen between %LAD area with CPT and LAD calcium score ($r = -0.33$, $p = 0.019$) (Fig 1). Spearman non-parametric correlation (to minimize effects of extreme values) also showed an inverse correlation between %LAD CEF and total calcium score ($r = -0.28$, $p < 0.03$). ROC analysis showed that total calcium score was predictive of LAD response to CPT. Area under the curve is 0.61, $p = 0.0016$. (Fig 2) There was no relationship between risk factor presence alone and CPT response.

Conclusion

In subjects with atherosclerotic risk factors or a positive CT calcium score, coronary endothelial function in the proximal LAD is inversely related to the LAD plaque burden. Thus local, as well as systemic factors determine the severity of endothelial dysfunction in coronary atherosclerosis.

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