

Meeting abstract

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## 2138 Early atherosclerosis in the carotid and coronary territories: a cardiovascular magnetic resonance and multidetector computed tomography analysis

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from 11<sup>th</sup> Annual SCMR Scientific Sessions  
Los Angeles, CA, USA. 1–3 February 2008

Published: 22 October 2008

*Journal of Cardiovascular Magnetic Resonance* 2008, **10**(Suppl 1):A407 doi:10.1186/1532-429X-10-S1-A407

This abstract is available from: <http://jcmr-online.com/content/10/S1/A407>

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### Introduction

Framingham risk score (FRS), carotid intima-media thickness (IMT) and coronary artery calcium scoring (CAC) are indicators of atherosclerotic disease and predictors of cardiovascular events. However these techniques have technical and practical limitations; ultrasound-based carotid IMT is operator-dependent and assesses only vessel wall segments while coronary calcification is not reliably associated with atheroma burden in early disease. High-resolution carotid artery cardiovascular magnetic resonance (CMR) has intrinsic benefits that offer the potential to assess the entire vessel wall, more accurately reflecting underlying changes.

### Purpose

Our objectives were to assess the reproducibility of novel markers of carotid atherosclerosis using CMR and to determine their relationship with existing markers of cardiovascular risk.

### Methods

A cohort of 147 asymptomatic individuals (110 male, age  $53 \pm 11$  years) underwent comprehensive cardiovascular risk assessment including physician-estimated Framingham Risk Score (FRS), CAC scoring using a Siemens SOMATOM Sensation 16-slice multidetector computed tomography system, and CMR using a 1.5 T Siemens

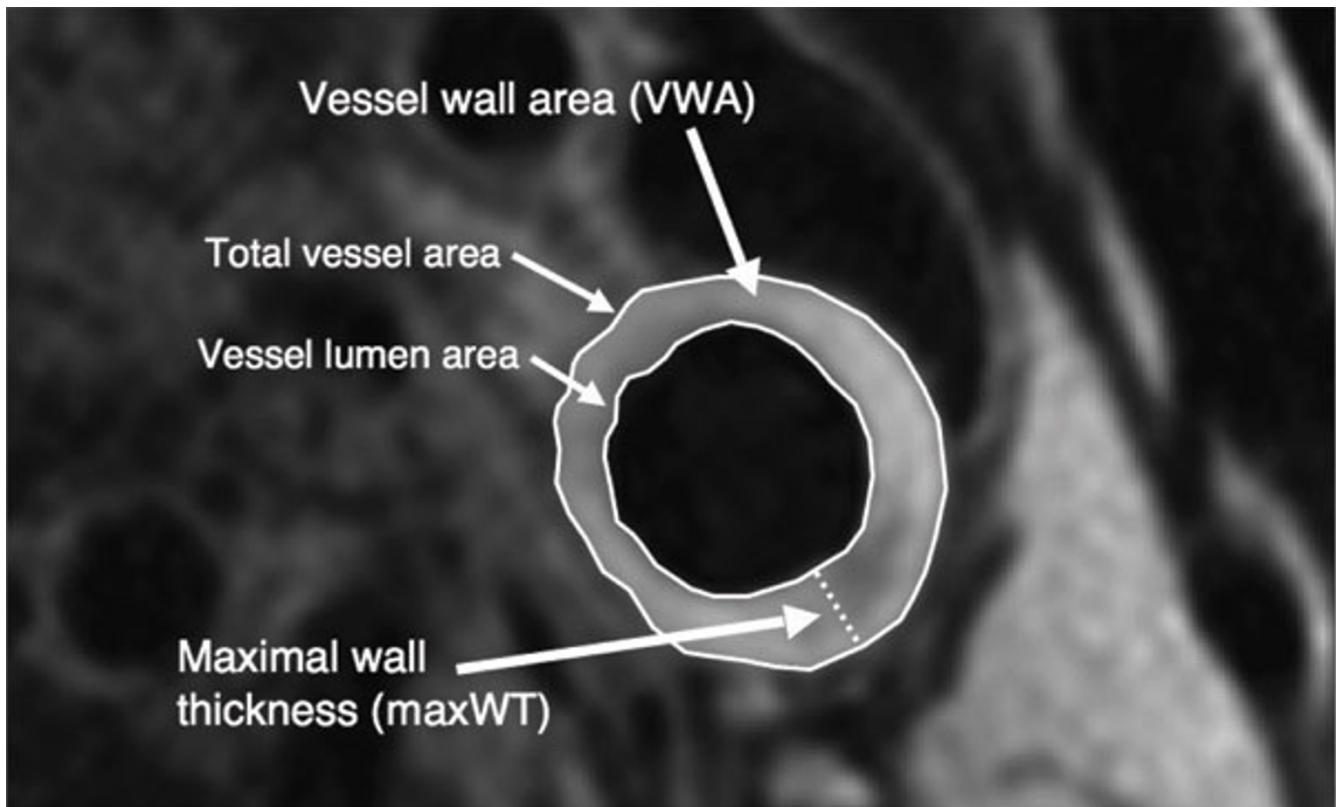
Sonata system using a custom carotid coil. T1-weighted MR images of common and internal carotid arteries (CCA, ICA) were used to manually measure CCA IMT and semi-automatically measure novel carotid artery indices (Figure 1): vessel wall area (VWA), maximal wall thickness (maxWT), and percentage atheroma volume (PAV = VWA as a percentage of total vessel area). The relationship of our novel carotid artery parameters with existing markers of cardiovascular risk were assessed using Spearman's rank-order correlation coefficient and the Mann-Whitney U test (SPSS Inc, Chicago, IL). A random selection of patient images ( $n = 14$ ) were retraced for inter- and intra-observer reproducibility (percentage coefficient of variation, %CV).

### Results

Mean FRS was  $10.8 \pm 8.2\%$ . MRI indices (VWA, maxWT, PAV) were significantly associated with IMT ( $r = 0.569$ ,  $r = 0.588$ ,  $r = 0.575$ ; all  $P < 0.001$ ), but not with CAC. VWA and maxWT, but not PAV were associated with FRS ( $r = 0.254$ ,  $P = 0.004$ ;  $r = 0.255$ ,  $P = 0.011$ ). Intra-observer and inter-observer %CV for MRI indices were 2.9% and 3.8% respectively.

### Conclusion

Our novel carotid indices are highly reproducible and significantly associated with established indicators of carotid



**Figure 1**  
Carotid artery measurements.

atheroma and cardiovascular risk (IMT and FRS). The lack of association with CAC may reflect a disproportionate relationship between the degree of calcification and atheroma in the carotid and coronary arteries. Follow-up of this cohort for cardiovascular outcomes data is likely to provide more direct information about risk, which will add to our understanding of atherosclerosis at different arterial sites and the role of CMR in predicting cardiovascular events.

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