

Whole body cardiovascular magnetic resonance imaging to stratify symptomatic and asymptomatic atherosclerotic burden in patients with isolated cardiovascular disease

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Background

Due to the systemic nature of atherosclerosis, an investigation to quantify and stratify disease burden across the entire body is desirable. The aim of this study was to use whole body cardiovascular magnetic resonance imaging (WB CVMR) to assess the heart and arterial network in a single examination, and quantify cardiovascular disease in participants with isolated coronary artery disease (CAD), cerebrovascular disease (CeVD) or peripheral arterial disease (PAD).

Methods

64 patients with a history of symptomatic single site vascular disease (38 CAD, 9 CeVD, 17 PAD) underwent whole body angiogram and cardiac MR in a single 45 minute exam in a 3T scanner. The arterial tree was split into 31 segments and each scored according to the degree of stenosis. From this a standardised atheroma score (SAS) was calculated. CMR assessment included structural and functional analysis of left ventricle utilising short axis multislice and late gadolinium enhancement images.

Results

The WB-MRA study detected asymptomatic atherosclerotic disease with greater than 50% stenosis in 37% of CAD, 33% of CeVD and 47% of PAD patients. Unrecognised myocardial infarcts were observed in 29% of PAD patients. Impaired left ventricular systolic function was present in 13%. SAS was significantly higher in PAD patients (24.8 ± 9.9) compared to CAD (7.0 ± 6.2) or CeVD patients (7.8 ± 8.3) (ANOVA $p < 0.001$). There were no significant differences in the SAS between the CAD and CeVD groups. Standardised atheroma score positively correlated with left ventricular mass ($r = 0.53$ $P = < 0.001$), stroke volume ($r = 0.32$ $P = 0.011$), end-diastolic volume ($r = 0.38$ $P = 0.002$).

Conclusions

WB CVMR is an effective systemic method for the stratification of cardiovascular disease by grading stenosis and quantifying atherosclerotic burden in the arterial network, alongside detection of the presence of infarction and ventricular dysfunction. The high prevalence of asymptomatic disease demonstrates the importance of a systematic approach to the assessment of cardiovascular disease, with potential applications including screening, staging disease and stratifying patients for disease modifying therapies.

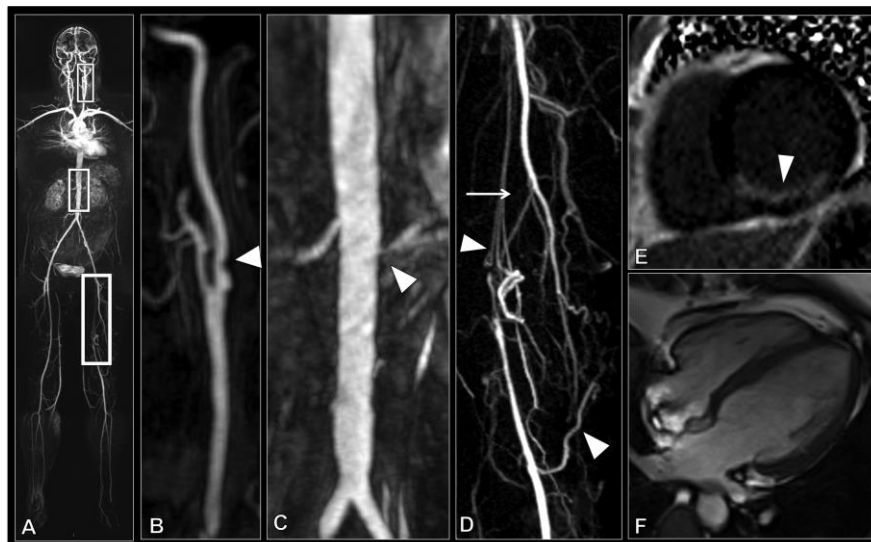


Figure 1: Whole body angiogram of a peripheral arterial disease patient (A) showing: >50% stenosis of the internal carotid artery (B); >70% stenosis of the left renal artery (C); long segment occlusion of the left superficial femoral artery with collateral formation (D); unrecognised inferior myocardial infarct (E); and normal dimensions of the atria and ventricles (F).