Enhancing the identification of significant coronary artery disease by carotid artery ultrasound and MRI in intermediate risk patient populations: Study recruitment phase

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Background
Cardiovascular disease is a leading cause of death with atherosclerosis being a well known mechanism of disease. Atherosclerotic plaque originates at regions of reduced flow and shear stress, especially at the bifurcation of the carotid artery. It follows that carotid atherosclerotic plaque can be used to identify coronary artery disease(CAD) especially at its earliest stages. Vulnerable plaque in the carotid has been previously identified using carotid ultrasound and carotid MRI.

Stress echocardiography is being utilized to evaluate the functional consequence of atherosclerotic plaque on cardiac wall motion abnormalities in intermediate patient populations. Unfortunately, this is associated with moderate sensitivity and poor specificity. We hypothesize the addition of carotid plaque analysis with ultrasound and MRI in addition to conventional stress echocardiography will further enhance the predictability of clinically significant cardiovascular disease in at risk patient populations.

Methods
A prospective cohort, single centre with a predicted 100 sample size. Primary end point will evaluate predictability of MACE at 6 and 12 months using % change in test sensitivity and negative predictive value when adding carotid plaque vulnerability by US and MRI. Secondary end point will compare correlation of carotid plaque identified by US and MRI using pearson correlation. Outpatient participants over 18 referred for clinically-indicated cardiac stress test will be included. Participants excluded: if known CAD, active ACS, pregnant, carotid endarterectomy, hypersensitivity to DEFINITY dye or MRI contraindications.

Routine stress echocardiography will proceed as per standard protocol with simultaneous carotid US image acquisition using IntelliPlaque and DEFINITY. 50 patients will be offered followup carotid MRI. High risk plaque by US defined as elevated calcium(≥ 0.01%), fat(≥9.27%),IPN score(≥1.25) and by MRI if plaque wall thickness >1.5mm with either the presence of lipid core, fibrous cap or erosive plaque. High-risk plaque will be correlated with MACE using sensitivity, specificity, NPV and PPV, likelihood ratios with 95% confidence intervals. Correlation of plaque by carotid ultrasound and MRI will be analyzed using Pearson's r coefficient. Statistical significance < 0.05.

Results
This study is currently at the study recruitment phase. We have currently recruited 82 of target 100 participants at Kingston Health Sciences Echocardiography Laboratory. Common reasons for study exclusion include: inadequate time for consent, previous history of CAD or simply patients not interested in participating.

Discussion

The addition of identifying vulnerable plaque by carotid ultrasound or MRI, alongside conventional stress test in at risk patients could ultimately enhance the prognostic ability of high-risk atherosclerotic disease to reduce mortality and morbidity within the Canadian population.