Total Atherosclerotic burden by Whole Body Magnetic Resonance Angiography predicts future Major Adverse Cardiovascular Events

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Atherosclerosis is a common and well known cause of death. It is important to identify those in need of preventive treatment. This is currently done using traditional risk factors. More recently tests of asymptomatic atherosclerosis such as evaluation of the carotid intima media thickness (CIMT), ankle/brachial index (ABI) and ultrasound evaluation of the presence of plaque have been suggested to improve the risk stratification.[1][2] Whole body magnetic resonance angiography (WBMRA) has been suggested as a method of visualizing the total atherosclerotic burden and is currently in use as a screening modality in some commercial organizations[3]. To our knowledge no prior studies have assessed the prognostic value of the atherosclerotic findings. Using WBMRA we have proposed the Total Atherosclerotic Score (TAS), evaluating all major arteries except the intracranial and coronary arteries, as a way of estimating systemic atherosclerosis.

The purpose was to investigate the relationship between TAS and future major adverse cardiovascular events (MACE) and compare this with traditional risk factors using the Framingham Risk Score (FRS).

In the PIVUS-study (Prospective Investigation of the Vasculature in Uppsala Seniors) 305 subjects underwent WBMRA at the age of 70 years, in addition to assessment of traditional risk factors, ABI, CIMT and presence of carotid plaques. In each subject TAS was evaluated by dividing the arterial tree into 26 vessel segments which were categorized into five territories (the carotids, aorta, renal arteries, pelvic and upper legs, and lower legs)[4]. Vessel lumen was scored according to no wall irregularities (0), stenosis less than 50% (1), and stenosis of 50% or more – including occlusion – (2). The points for each territory was summed up and divided by the maximum receivable sum and multiplied by 100, meaning that the maximum receivable sum for each territory becomes 100 and the maximum TAS-value is 500.
After a mean follow up time of 4.8 years (4-8 years) the medical charts were evaluated to assess MACE, defined as myocardial infarction, cardiac death, stroke and/or revascularization with CABG or PCI.

Out of 305 subjects 25 had a MACE during the follow-up. The mean TAS-value in subjects experiencing MACE was higher than in the remaining subjects; 48.2 and 25.9 respectively (p=0.0006). The FRS was higher in the MACE-group than the remaining subjects; 13.1 and 11 respectively (p=0.0021). In a logistic regression model with MACE as the dependent variable TAS (p=0.026) and FRS (p=0.037), independently of each other, predicted MACE. Other variables; ABI, CIMT and presence of carotid plaque measured with ultrasound, did not have any predictive power.

In conclusion, WBMRA with the evaluation of TAS predicted future cardiovascular events, independently of major cardiovascular risk factors, ABI and carotid atherosclerosis, indicating a rationale for investigating multiple arterial beds for improved risk stratification.

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