

## A total atherosclerotic score for whole body MRA is related to traditional cardiovascular risk factors, IMT and manifest cardiovascular disease

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**Purpose:** The aim of this study was to create a scoring system for whole body magnetic resonance angiography (WBMRA) that allows estimation of atherosclerotic induced luminal narrowing in the arterial tree from the carotid arteries to the lower leg arteries, as one weighted index, the total atherosclerotic score (TAS), and determine whether the traditional cardiovascular (CV) risk factors included in the Framingham risk score (FRS), intima media thickness (IMT) and manifest CV disease were related to TAS in an elderly population.

**Materials and methods:** 306 subjects aged 70 were recruited from the general population and underwent WBMRA in a clinical 1.5 T scanner (Gyrosan Intera, Philips Medical system). 3D sequences were acquired after administration of one i.v. injection of 40 ml gadodiamide (Omniscan, GE Healthcare). The arterial tree was divided into 5 territories (carotid, aorta, renal, upper and lower leg) comprising 26 vessel segments, and assessed according to its degree of stenosis or occlusion. A total atherosclerotic score (TAS) was created for each individual by summing the scores for all territories. The IMT were measured in the far wall of the common carotid artery with ultrasound. The IMT of both sides were measured and a average value were calculated. The subjects were also grouped according to the presence of cardiovascular (CV) disease or not (CV disease defined as MI, stroke, intermittent claudication, diabetes mellitus, CHF, or CABG/PCI).

**Results:** FRS correlated to TAS ( $r=0.30$ ,  $p<0.0001$ ), as well as to the atherosclerotic score for the 5 individual territories. Of the parameters included in the FRS, male gender ( $p<0.0001$ ), systolic blood pressure ( $p=0.0002$ ), cigarette pack-years ( $p=0.0008$ ) and HDL cholesterol ( $p=0.008$ ) contributed to the significance, while blood glucose and LDL cholesterol did not. The IMT were correlated to TAS ( $p<0.0001$ ). The group with CV disease had a significantly higher mean TAS value (38.8) than the group without CV disease (23.3) ( $p=0.0006$ ).

**Conclusion:** A scoring system for whole-body MRA was created. The significant relation towards traditional CV risk factors, intima media thickness and manifest CV disease indicates that the proposed scoring system could be of value for assessing atherosclerotic induced luminal narrowing.

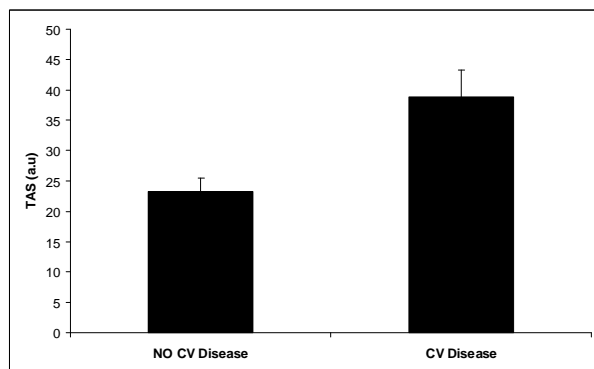


Figure 1

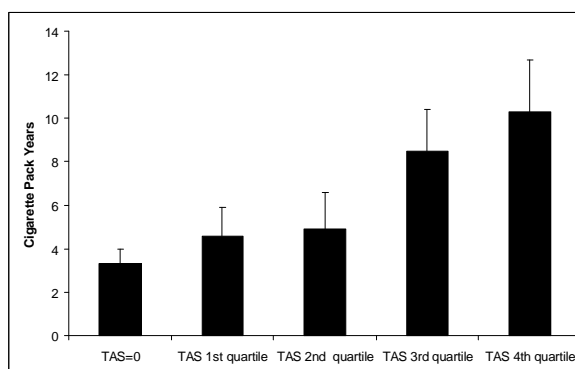


Figure 2

Figure 1

The subjects ( $n=244$  due to missing values) were divided according to the presence of cardiovascular disease. The group with CV disease had a significantly higher average TAS value (mean TAS value 38.8, SE 2.1,  $n=61$ ) than the group without CV disease (mean TAS value 23.3, SE 4.5,  $n=183$ ). The Y-axis denotes the TAS value.

Figure 2

An example of a traditional CV risk factor is cigarette pack years (y-axis). On the x-axis is TAS, divided into 5 groups, the first group with TAS value zero, the remainder divided in quartiles.