Non Invasive MRI vessel wall evaluation in asymtomatic patients: Comparison of three MRI based parameters in aorta and common carotid arteries

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Background: Non-invasive MRI evaluation of arterial vessel walls has been used to compare patient groups and to monitor subclinical disease. Different quantitative parameters have been used for such evaluations, but their reliability in large analyses has yet to be determined. In this study, we compare the variation in measurement of three parameters in a large data set.

Methods: The thoracic descending aorta (Ao) and common carotid arteries (CC) of 162 patients with medium to high Framingham risk scores for atherosclerosis were imaged with high-resolution black-blood MRI on a 1.5T MR system. Patients and image analysis details are shown in Table 1. The lumen and outer wall boundaries of every MR image were manually traced by a trained observer using VesselMass software. Only the highest quality PDW image at each anatomical location was traced. Right and left CC data were combined. Three parameters, the average walls area (WA), average wall thickness (WT) and the average ratio of the wall area/ total vessel area, the atherosclerotic disease index (ADI) were calculated for each patient. To compare reliability, the coefficient of variation for each vessel parameter was calculated in each study. The coefficients of variation were compared using ANOVA with tests for multiple comparisons.

Results: Pooled parameters for all studies were as follows: WA (CC) = 0.21 ± 0.06 cm^2, WT (CC) = 0.83 ± 0.18 mm, ADI (CC) = 0.34 ± 0.05, WA (Ao) = 0.92 ± 0.35 cm^2, WT (Ao) =1.29 ± 0.32 mm, ADI (Ao) =0.21 ± 0.03. Analysis showed that the ADI had the lowest coefficient of variation in the data from both vessels, followed by WT and WA (Figure 1) (CC mean coefficient of variation (%) = 14 < 18 < 22, DF=456, MSE=0.005, critical value=3.325; Ao mean coefficient of variation (%)= 17 < 19 < 20, DF=474, MSE=0.003, critical value=3.325).

Conclusion: Future studies using MRI vessel wall evaluation to compare groups of patients and in progression/regression studies may be able to increase reliability of data and subsequent analysis by using the ADI.

Table 1: Patient and imaging details

Total number of Patients	162
Average age	52 ± 22
Male	62%
Female	38%
Studies with traceable CC images	157
Studies with traceable Ao images	160
Total number Ao images analyzed	3853
Total number CC images analyzed	3352
Average number Ao images analyzed per study	24 ± 9
Average number CC images analyzed per study	21 ± 12

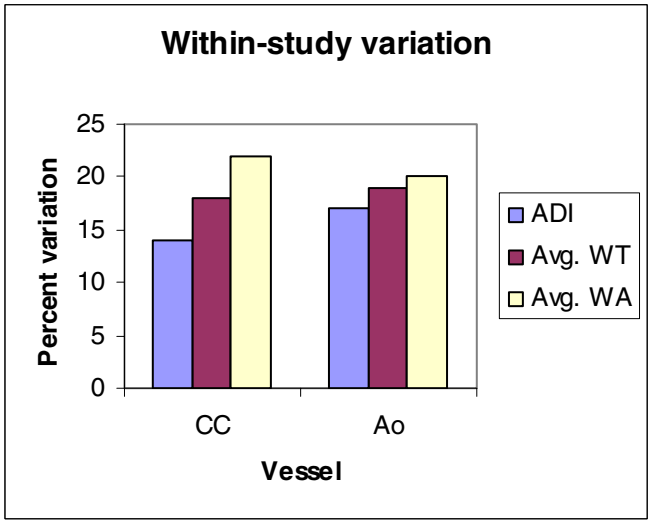

Figure 1: Coefficients of variation of the 3 MR parameters