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Poster presentation

Correlates of aortic compliance and brachial artery flow mediated vasodilatation in normal subjects

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Introduction

Vascular endothelial dysfunction appears in early atherosclerosis and is associated with adverse cardiovascular outcomes, while decreased aortic compliance (AC) is associated with aging, systolic hypertension and left ventricular diastolic dysfunction. It is believed that diabetes, hypertension, hyperlipidemia and obesity contribute to endothelial dysfunction, often measured using brachial artery flow mediated vasodilation (F). However, the determinants of AC and its relationship to abnormal F are not well understood.

Purpose

We developed techniques to non-invasively quantify both AC and F in a single MR study and used this approach to examine their concordance and correlates in normal and hyperlipidemic subjects.

Methods

Fifty one volunteers (26 females, 24 hyperlipidemics (11(46%) treated), age: 48.0 ± 4.3 yrs, body mass index (BMI) <28, LVEF:56.9 ± 5.7%), with informed consent were screened to exclude diabetes, hypertension, clinical cardiovascular disease and significant valvular dysfunction. Aortic pulse wave velocity (PWV) was assessed using through-plane phase-contrast gradient echo CMR imaging of ascending and descending aorta at the pulmonary artery level with VENC of 1.5 m/sec and AC derived: AC = $1/(\rho * PWV^2)$. F was assessed using steady-state free precession bright blood imaging at rest and serially after blood pressure (BP) cuff deflation. A trained image analyst blinded to clinical variables manually planimetered lumen areas using commercial software (Circle CVI) with subpixel quantitation. F was calculated as maximal % brachial lumen area increase. Pearson's correlation coefficient was used to examine associations between C and F and their relationship to age, BMI, BP and cholesterol levels. Multivariate regressions were used to confirm univariate findings.

Results

(Table 1 and 2) AC had a significant inverse correlation to age and BMI in the entire population while the AC-age relationship was also present in all sub-groups. The AC-BMI relationship was seen in hyperlipidemic subjects, and in males but not in normals or females. Only males demonstrated an association between AC and BP, as well as total and LDL cholesterol levels. In the population as a

Table 1

Variable	n	Mean ± Std deviation
Age (years)	51	55.3 ± 14.7
BMI	51	23.6 ± 2.6
Total Cholesterol mg/dl	35	210.7 ± 39.9
LDL mg/dl	35	132.1 ± 35.2
LVEF %	51	56.8 ± 5.8
Systolic BP mm Hg	51	122.9 ± 20.4
Diastolic BP mm Hg	51	75.9 ± 10.2
Compliance (AC) $10^{-5/Pa}$	51	3.8 ± 3.9

Table 2: Pearson's Correlation Coefficients for Aortic Compliance (AC)

		Age	BMI	F	Total Cholesterol	LDL
Total Population (n = 51)	r =	-0.48	-0.4	0.07	0.31	0.23
	p =	0.0005	0.0037	0.62	0.08	0.19
Females (n = 26)	r =	-0.57	-0.35	0.19	0.25	0.21
	p =	0.002	0.08	0.37	0.34	0.42
Males (n = 25)	r =	-0.47	-0.49	-0.15	0.59	0.61
	p =	0.02	0.02	0.49	0.02	0.01
Hyperlipidemics (n = 24)	r =	-0.45	-0.54	-0.0007	0.4	0.28
	p =	0.03	0.008	1.0	0.08	0.24

whole and in females, BP and cholesterol levels had no association with AC or F. Further, F had no correlation with age, BMI, BP, cholesterol levels or AC.

Conclusion

In normal and hyperlipidemic non-obese subjects, age is the most consistent correlate of reduced aortic compliance, while BMI, lipid levels and BP are significant correlates of reduced aortic compliance only in males. Brachial F appeared unrelated to age, gender, BP, lipid status and aortic compliance in this population. Larger studies are needed to further evaluate gender differences in aortic compliance.