

Carotid Strain Does Not Explain Sex Differences in Blood Pressure

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Objective: Women have a lower incidence of cardiovascular morbidity and mortality prior to menopause when compared to age-matched men. Specifically, on the vascular level, carotid arterial stiffness increases with age in both sexes, but with greater changes in older postmenopausal women. Arterial stiffness is a well-established predictor of future risk of CVD, and 2-dimensional ultrasound imaging of vascular deformation (Strain) using speckle tracking directly characterizes the elastic properties of the carotid arterial wall. The purpose of this study was to determine if sex differences exist for strain in the common carotid artery.

Methods: Twenty-eight healthy men and women (12/16; Range = 19-77 yrs) had 2-dimensional ultrasound images of the carotid artery taken. These images were obtained using an optimal circumferential view, and carotid strain (CS) and CS time to peak (TPK) were analyzed via speckle tracking software. Women were tested in the early follicular phase of menstrual cycle if they were premenopausal. Brachial (bSBP, bDBP, bMAP) and carotid (carSBP, carDBP, carMAP) pressure measurements were obtained in the supine position at rest using applanation tonometry.

Results: Females exhibited significantly lower resting blood pressure (bSBP, bDBP, bMAP, carMAP), radial displacement (RD) TPK, and CS TPK (p<0.05). Strain and strain-rate were not different between sexes, even after controlling for age.

Conclusion: Women had lower resting blood pressures and a greater CS and RD TPK parameters compared to males. However, there were no sex differences in CS measurements. Therefore, elastic properties of the carotid artery do not account for the pressure difference demonstrated between sexes.

Variables	Males (n=12)	Females (n=16)
Age (yrs)	46 ± 21	46 ± 19
BMI (kg/m ²)	27.2 ± 4.3	25.3 ± 4.3
bSBP (mmHg) *	125 ± 12	111 ± 14
bDBP (mmHg) *	72 ± 7	66 ± 8
bMAP (mmHg) *	90 ± 8	81 ± 9
carSBP (mmHg)	117 ± 14	105 ± 19
carDBP (mmHg) *	73 ± 7	67 ± 8
carMAP (mmHg) *	92 ± 9	83 ± 10
Beta Stiffness Index	7.3 ± 3.3	6.8 ± 3.7
CS (PK%)	5.24 ± 3.22	5.58 ± 3.78
CS Time to Peak (ms) *	314 ± 36	356 ± 61
CS Rate (PK 1/s)	0.43 ± .25	0.42 ± .28
CS Rate TPK (ms)	170 ± 18	181 ± 25
Radial Displacement (PK mm)	0.19 ± .10	0.18 ± 0.10
Radial Displac. TPK (ms) *	313 ± 35	358 ± 61
Radial Velocity (cm/s)	0.17 ± 0.08	0.15 ± 0.09
Radial Velocity TPK (ms)	170 ± 18	181 ± 24

All Data are mean ± SD, * Gender Difference, p<0.05