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Isometric Exercise-Induced Hemodynamic Load Strongly Predicts Left Ventricular Mass in Hypertension

Background: Although resting hemodynamic load has been extensively investigated as a determinant of left ventricular (LV) hypertrophy, little in known regarding the effect of provocative hemodynamic load on the risk of LV hypertrophy in hypertension.

Methods: We studied 30 pharmacologically treated hypertensive adults. We performed simultaneous carotid applanation tonometry and Doppler echocardiography at rest and during a dynamometer-assisted 40%-maximal voluntary forearm contraction (handgrip) maneuver. Aortic pressure-flow relations were assessed at rest and during handgrip in the time domain. LV mass index (LVMI) was determined with the area-length method. Carotid-femoral pulse wave velocity (CF-PWV) was also measured with arterial tonometry.

Results: CF-PWV was the strongest resting predictor of LVMI and remained an independent predictor after adjustment for age, gender, systemic vascular resistance, wave reflection magnitude, proximal aortic characteristic impedance and total arterial compliance (β=1.92; Standardized β =0.56; *P*=0.002). Ag, gender and resting indices explained 44% of the interindividual variability in LVMI. Although resting central systolic blood pressure (c-SBP) was associated with LVMI (R=0.52; *P*=0.001), when adjusted for each other, c-SBP during handgrip (and not resting c-SBP) independently predicted LVMI. When specific indices of provoked hemodynamic load were examined, total arterial compliance emerged as the strongest predictor of LVMI (Table). A model including indices of provoked hemodynamic load explained 69% of the interindividual variability in LVMI.

Conclusions: Provoked changes in hemodynamic load strongly predict LVMI in hypertension. The magnitude of this association is far greater than for resting hemodynamic load. Our findings suggest that provoked testing is necessary to assess LV load in hypertension and have important clinical and epidemiologic implications.

Model R^2=0.69	**β**	**Standardized β**	***P* Value**
Age (Years)	0.02	0.03	0.84
Female Gender	-1.35	-0.06	0.65
cf-PWV (m/s)	3.05	0.88	<0.001
Systemic vascular resistance (mmHg s ml^{-1})	2.64	0.14	0.49
Zc (mmHg s ml^{-1})	-162	-0.87	0.001
Reflection Magnitude	10.3	0.09	0.57
Total arterial compliance (ml/mmHg)	-16.1	-0.92	<0.001