Metabolic determinants of proximal aortic stiffness among healthy people with abdominal obesity

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Background: Increased proximal aortic stiffness (PAS) is directly associated with cardiovascular risk. Likewise, metabolic syndrome (MS) and abdominal obesity are associated with cardiovascular risk. The direct association between MS determinants and PAS among a healthy population with abdominal obesity remains to be examined.

Purpose: To examine the association between MS determinants and PAS among healthy participants with abdominal obesity.

Methods: We utilized the cross-sectional baseline data of the DIRECT-PLUS study (clinicaltrials.gov NCT03020186), where we recruited healthy participants with abdominal obesity/dyslipidemia. Along with anthropometric measurements and blood tests, all participants underwent magnetic-resonance-imaging from which PAS we assessed by calculating the aortic arch pulse-wave-velocity (from the ascending to the descending aorta). We defined MS according to the NCEP-ATP-III criteria.

Results: Of 282 participants who had a valid PAS estimation [mean-age: 51.0, 88.3% male, mean-body-mass-index: 31.2kg/m2, mean-waist circumference (WC): 109.5cm] 171 (60.9%) had MS. PAS was mainly associated with age ($r = 0.735$, $p < 0.001$). PAS was associated with an increased 10-year Framingham Risk Score ($\beta=0.165$, $p = 0.008$ after adjustment for age and gender). Participants with MS had higher PAS than non-MS participants (6.6m/sec vs. 5.4m/sec, $p = 0.002$ after adjusting for age and gender). PAS increased along with cumulative number of MS criteria (p-of-trend < 0.001). In multivariate models, adjusted for gender, age, and dichotomous-components of the MS, worse PAS remained significantly associated with high-density lipoprotein cholesterol (HDL-c; $\beta=0.{-}116$, $p = 0.007$) and increased blood-pressure ($\beta=0.165$, $p < 0.001$), but not with fasting-glucose, waist-circumference or plasma-triglycerides ($p > 0.05$ for all). In models adjusted for age, gender, and continuous determinants of MS, worse PAS remained associated with mean-arterial pressure ($\beta=0.218$, $p < 0.001$) and HDL-c ($\beta=0.{-}126$, $p = 0.004$).

Conclusions: Among a healthy population with abdominal obesity, reduced HDL-c levels and increased blood pressure might be the more dominant predictors of poor PAS state, out of the MS components.