P4.1: IMPACT OF AGE AND GENDER ON THE DETERMINANTS OF PULSE PRESSURE AND ISOLATED SYSTOLIC HYPERTENSION

C. McEniery, A. Cocks, B. McDonnell, Y. Yasmin, J. Cockcroft, I. Wilkinson


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CAROTID INTIMA-MEDIA THICKNESS IS POSITIVELY ASSOCIATED WITH SUBCHRONIC PERSONAL EXPOSURE TO BLACK CARBON: A STUDY IN A PANEL OF HEALTHY ADULTS

E. Provost a,b, T. Louwies a,b,c, J. Roodt a, E. Dons a, J. Penders a, L. Panis a,b,d, P. De Boever a,b,c, T. Nawrot a,b,c

aHasselt University, Diepenbeek, Belgium
bFlemish Institute for Technological Research (VITO), Mol, Belgium
cZiekenhuis Oost-Limburg (ZOL), Genk, Belgium
dHasselt University, Diepenbeek, Belgium

Background: Research shows an association between particulate air pollution exposure and cardiovascular morbidity and mortality, with atherosclerosis as an implied underlying mechanism. The accurate assessment of personal exposure is a major challenge in epidemiological research since it is strongly related to time-activity patterns. We investigated carotid intima-media thickness (CIMT) in association with subchronic personal exposure to black carbon (BC) in a panel of healthy adults.

Methods: Personal BC exposure of 54 participants (92.3% female; mean age 40.7 years) was measured during one average workweek as a proxy for subchronic exposure. Within this week, the CIMT of each participant was measured ultrasonographically on two separate days. The effect of personal BC exposure on CIMT was estimated using mixed models adjusted for covariates including gender, age, exposure to secondhand smoke and general health indicators.

Results: The analyses showed a strong positive association between CIMT and personally measured BC. An interquartile range (320.8 ng/m³) higher personal BC exposure was associated with a 0.07 μm (95% CI: 0.03 to 0.11 μm) thicker CIMT. Each year increase in age was associated with a 0.02 μm (3.2 to 6.7 μm; p < 0.0001) thicker CIMT, suggesting that an IQR higher personal BC exposure is equivalent to 8 years of ageing.

Conclusion: Based on individually measured BC exposure in a relatively young cohort of healthy nurses, our results suggest a larger impact of BC personal exposure in healthy adults. This finding adds evidence to the impact of the age on the physiological determinants of PP and ISH. Detailed haemodynamic data including blood pressure (BP), SV and aortic pulse wave velocity (aPWV) were available in 5496 individuals (2470 males), aged between 18-92 years. Data were stratified by gender. ISH was defined as SBP ≥140 mmHg and DBP ≥90 mmHg. SV and aPWV were independently associated with PP (p < 0.001 for both) and there was a strong interaction with age, where PP and aPWV increased significantly across the adult age-span (p < 0.001 for both) but SV declined significantly with increasing age (p < 0.001). In younger individuals (<30 years), SV, but not aPWV, was associated with increasing quartiles of PP in both males and females (p < 0.001 for both) and was elevated in subjects with ISH versus normotensives (p < 0.001). However, the opposite pattern was evident in older individuals, with aPWV rather than SV associated with high PP and ISH (p < 0.001 for all comparisons). The haemodynamic mechanisms underlying elevated PP and ISH change across the adult life-span. Moreover, due to the age-related decline in SV, PP may underestimate the true age-related increase in aortic stiffness.

IMPACT OF AGE AND GENDER ON THE DETERMINANTS OF PULSE PRESSURE AND ISOLATED SYSTOLIC HYPERTENSION

C. McEnery a,b, A. Cocks b,c, B. McDonnell c, Y. Yasmin a, J. Cockcroft b,d, I. Wilkinson a

aUniversity of Cambridge, Cambridge, UK
bCardiff University, Cardiff, UK
cCardiff Metropolitan University, Cardiff, UK

Age-related increases in pulse pressure (PP) across the adult age-span, and the development of isolated systolic hypertension (ISH), the extreme form of high PP, are often presumed due to age-related arterial stiffening. However, stroke volume (SV) is a key physiological determinant of PP, but the impact of SV on age-related changes in PP and ISH is unclear. We sought to quantify the impact of the age on the physiological determinants of PP and ISH. Detailed haemodynamic data including blood pressure (BP), SV and aortic pulse wave velocity (aPWV) were available in 5496 individuals (2470 males), aged between 18-92 years. Data were stratified by gender. ISH was defined as SBP ≥140 mmHg and DBP ≥90 mmHg. SV and aPWV were independently associated with PP (p < 0.001 for both) and there was a strong interaction with age, where PP and aPWV increased significantly across the adult age-span (p < 0.001 for both) but SV declined significantly with increasing age (p < 0.001). In younger individuals (<30 years), SV, but not aPWV, was associated with increasing quartiles of PP in both males and females (p < 0.001 for both) and was elevated in subjects with ISH versus normotensives (p < 0.001). However, the opposite pattern was evident in older individuals, with aPWV rather than SV associated with high PP and ISH (p < 0.001 for all comparisons). The haemodynamic mechanisms underlying elevated PP and ISH change across the adult life-span. Moreover, due to the age-related decline in SV, PP may underestimate the true age-related increase in aortic stiffness.