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The Association Between Cardiovagal Baroreceptor Sensitivity and Hippocampal Tissue Integrity in Young and Middle-aged Adults

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Prior research has investigated the association of cardiovagal baroreceptor sensitivity (BRS) with white matter neuronal integrity and cerebral perfusion using magnetic resonance imaging (MRI) techniques such as diffusion tensor imaging (DTI) and arterial spin labeling (ASL); however, less is known about the association with specific regions of gray matter (i.e, hippocampus) involved in memory formation and recall. MR elastography (MRE) has emerged as a constructive tool for assessing the viscoelastic mechanical properties of the brain which are believed to reflect the microstructural integrity of neuronal tissue. **PURPOSE:** To investigate the association between cardiovagal BRS and the viscoelastic properties of the brain, with a sub goal of examining how advanced age affects this association. We hypothesized that there would be a positive relation between cardiovagal BRS and hippocampal (HC) viscoelastic properties that strengthens with age, indicating a greater influence of blood pressure control on HC microstructural integrity. **METHODS:** Ten young (Yng, *25 ± 2 years*) and ten middle-aged adults (MA, *55 ± 3 years*) laid in supine position for 10 minutes while arterial blood pressure (ABP) and heart rate (HR) were measured. R-R intervals and systolic blood pressures were plotted within a linear regression to calculate the spontaneous baroreflex slope. Subjects went in an MRI scanner to measure hippocampal viscoelastic properties using MRE. **RESULTS:** As expected, we observed a lower cBRS in the middle-aged group compared with young (MA: 12.51±4.41 vs. Yng: 25.21±8.77 ms/mmHg, $p \leq 0.05$). There were no significant differences in HC stiffness or damping ratio when comparing between age groups (MA: 3.06±0.32 kPa vs. Yng: 3.02±0.09 kPa, $p=0.69$; MA: 0.2±0.02 vs. Yng: 0.2±0.03, $p=0.56$). However, a multiple linear regression with age included as a categorical covariate revealed a trend towards a stronger association between HC stiffness and cBRS in the middle-aged compared to the young group (p=0.07). **CONCLUSION:** In contrast to our hypothesis, preserved BRS was associated with lower HC stiffness in the middle-aged group; however, the physiological importance of this finding needs to be more completely explored. Our findings indicate that the association between short-term blood pressure regulation via cardiovagal BRS may be more closely linked to HC tissue integrity with advancing age. These mechanisms should be explored in a larger cohort including older individuals. **SIGNIFICANCE /NOVELTY:** Previous studies have yet to determine whether cardiovagal BRS and hippocampal (HC) viscoelastic properties are correlated. Our findings show that as an individual ages, short-term blood pressure regulation via cardiovagal baroreceptors is more strongly associated with maintaining HC tissue integrity.