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7.4: HIGHER CAROTID STRAIN IN INDIVIDUALS WITH DOWN SYNDROME AT REST AND DURING HYPOVOLEMIC SYMPATHOEXCITATION

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7.3 ASSESSMENT OF BLOOD PRESSURE AND HEART RATE VARIABILITY IN MULTIPLE SCLEROSIS

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Background: Reported cardiovascular autonomic dysfunction (CAD) prevalence in Multiple Sclerosis (MS) varies between studies. As CAD lowers quality of life and may contribute to sudden death in MS, early CAD detection may assist treatment and risk identification.

Methods: In 23 MS patients and age and gender matched controls (38±12 years, 15 female), continuous electrocardiogram and finger blood pressure were non-invasively acquired during 5 minutes supine rest. Baroreceptor sensitivity (BRS) was quantified through sequence and coherence analysis. Heart rate variability (HRV) was analysed in the standard manner and systolic blood pressure variability (SBPV) quantified in the very low (0.0033-0.04 Hz), low (0.04-0.15 Hz) and high (0.15-0.5 Hz) frequency ranges.

Results: HRV did not differ between the groups. BRS in the high frequency band was lower in MS than control (22±13 and 39±25 ms/mmHg, $p=0.007$) as was normalised low frequency SBPV (0.70±0.19 and 0.82±0.14, $p=0.006$). Normalised high frequency SBPV was greater in MS subjects (0.31±0.19 and 0.18±0.14, $p=0.006$). Differences in high frequency SBPV indicate differences in respiratory feedback (not directly measured in this study) and in the low frequency range, differences in baroreceptor and/or chemoreceptor cardiovascular control. High frequency coherence in BRS analysis likely indicates reduced BRS control (as suggested by no difference in BRS by the sequence technique), but also respiration derived control of the sinus node.

Conclusions: These results indicate that MS subjects have altered degree of cardiovascular autonomic control compared to healthy subjects and the effect of the respiratory pathway warrants further investigation.

7.4 HIGHER CAROTID STRAIN IN INDIVIDUALS WITH DOWN SYNDROME AT REST AND DURING HYPOVOLEMIC SYMPATHOEXCITATION

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Background: Arterial stiffness and large artery function are independent risk factors for cardiovascular disease. (1) Individuals with Down Syndrome (DS) have autonomic dysfunction and known to have lower incidence of cardiovascular disease. (2) Limited literatures showed no difference in arterial stiffness in DS compared to a healthy, non-DS population using a longitudinal view of the carotid artery. (3,4) However, it is unknown if individuals with DS exhibit different circumferential strain compared to individuals without DS at rest or during a sympathoexcitation stimulus.

Purpose: To examine the differences in the carotid artery strain and its responsiveness to sympathoexcitation by hypovolemic lower body negative pressure (LBNP) in individuals with and without DS.

Methods: Twenty four volunteers (DS = 11, 23 yrs Control = 13, 23 yrs) participated in this study. Circumferential strain was measured by ultrasonography B-mode and radial strain from the longitudinal view was calculated using echo tracking analysis at rest, during and after sympathoexcitatory stimulation by LBNP. Changes in hemodynamics (HR, BP) were recorded continuously.

Results: Compared with controls, individuals with DS have significantly higher strain values at all stages ($p < 0.05$) with no group interaction with hypovolemic sympathoexcitation stimulation. However, there were no differences in β -Stiffness or EP, suggesting that the differences in strain were due to differences in blood pressure.

Conclusions: Our results demonstrate significantly higher strain value, which indicates greater arterial movement in individuals with DS. However, these differences were likely due to higher BP in persons with DS.

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7.5 RETINAL VESSEL RESPONSES TO FLICKERING LIGHT PROVOCATION IN A COHORT OF BLACK AND WHITE TEACHERS: THE SABPA STUDY

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Background: Retinal microvascular function can be assessed using flicker light induced provocation (FLIP). Reduced vessel dilation responses to FLIP are noted in various disease conditions. Comparative studies between ethnic groups are scarce, while the importance of different phases of the vessel responses during and following FLIP are not well studied. We compared retinal vessel dilation, constriction and vessel diameter parameters following FLIP in a cohort of black (n=152) and white (n=178) teachers.

Methods: Retinal vessel responses to FLIP were assessed using the Dynamic Vessel Analyzer (IMEDOS Systems, Jena, Germany). Ambulatory blood pressure (BP), anthropometry and blood sampling were performed.

Results: Black participants displayed a better maximum percentage dilation (artery: 4.1±3.5% vs. 3.5±2.0%, $p<0.015$ vein: 4.2 (2.2-8.7)% vs. 3.7 (1.4-8.0)%, $p=0.014$) in response to FLIP. Time to maximum artery constriction (Max_{Cons}) was longer (52.0 (44.0-66.0)s vs. 44.0 (37.0-54.0)s, $p<0.001$), and end FLIP artery diameter was smaller in the black cohort. In linear regression analysis, artery dilation was generally associated with age, BP, BP medication and artery caliber, and mostly in the black cohort. In the black cohort, artery Max_{Cons} was not associated with selected cardiometabolic variables, but in the white cohort, was related to age, gamma-glutamyltransferase and no BP medication. A smaller artery diameter post FLIP associated with increased C-reactive protein in both ethnicities.

Conclusions: Black and white participants differed in their retinal vessel response to FLIP. Although certain cardiovascular risk markers were associated with these responses, they may not explain all the differences noted between the groups.

7.6 THE DIFFERENCE IN GLUTATHIONE PEROXIDASE ACTIVITY ON ARTERIES OF A BI-ETHNIC POPULATION: THE SABPA STUDY

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Background and objectives: From the literature it is evident that increased oxidative stress is integral in the development of cardiovascular disease. We therefore aimed to compare glutathione peroxidase (GPx) and glutathione reductase (GR) activity between black and white Africans, and to investigate whether the activity of these enzymes are linked with cardiovascular function.

Methods: This sub-study was embedded in the Sympathetic Activity and Ambulatory Blood Pressure in Africans (SABPA) study, included 188 black and 203 white teachers from the Dr Kenneth Kuanda Education District in the North West Province of South Africa. Ambulatory blood pressure (BP) and carotid dorsalis pedis pulse wave velocity (cdPWV) were measured. Biochemical analyses included GPx and GR enzyme activity, serum peroxide and total glutathione levels.

Results: The blacks presented with an unfavourable cardiovascular profile, with systolic- and diastolic BP, pulse pressure and cdPWV being significantly higher ($p\leq 0.006$) when compared to their white counterparts. The black group also displayed significantly higher levels of serum peroxides ($p=0.049$) with concomitant lower GPx activity ($p=0.01$), while their total glutathione levels ($p<0.001$) and GR activity ($p<0.001$) were significantly higher. In single regression analysis, an inverse relationship between GPx activity and cdPWV ($r=-0.16$ $p=0.024$) were indicated, only in the white group. The link between higher GPx activity and lower cdPWV was confirmed to be independent in multiple regression analyses ($R^2=0.39$ $\beta=-0.18$ $p=0.005$), while it was absent in the black group.

Conclusion: An inverse relationship between GPx activity and cdPWV was encountered, suggesting a protective role of higher GPx activity against arterial stiffening in the white group.