



3.4 Micro- and Macro-Vascular Remodeling and Cognitive Function in Hypertension

Antonio Gallo^{1,2,*}, Etienne Charpentier², Thomas Diertenbeck², Antoine Dufay¹, Alban Redheuil^{3,4}, Marie Chupin², Olivier Hanon⁷, Xavier Girerd¹, Nadjia Kachenoura²

¹University Hospital Pitié-Salpêtrière, Paris, France

²Sorbonne Universités, Paris, France

³Institute of Cardiometabolism and Nutrition (ICAN), Paris, France

⁴Pôle Imagerie-Groupe Hospitalier Pitié-Salpêtrière, Assistance Publique-Hôpitaux de Paris, Paris, France

⁵AP-HB, Hôpital Broca, Service de Gériatrie, Paris, France

ABSTRACT

Background: Cerebral microvascular alterations and hypoperfusion have been associated to cognitive disorder and dementia. We hypothesized that there is a direct link between retinal arteriolar remodelling, as assessed non-invasively using adaptive optics, and cognitive cerebral impairment in hypertensive patients.

Methods: Hypertensive patients over 65 years old with or without mild cognitive impairment were recruited. Each patient had a cognitive evaluation with MMSE; a study of retinal vasculature with adaptative optics RTX1[®] Camera to measure WT, internal diameter (ID), wall-to-lumen ratio (WLR) and arterio-venous ratio (AVR); an aortic, cerebral and carotid MRI to study cerebral volumes and white matter hyper-intensities (WMH) and carotid/aortic backward/forward flow (BF/FF) and distensibility. Correlations between retinal and cerebral, carotid and aortic remodelling were analysed.

Results: 51 treated and controlled hypertensive patients, aged of 74 ± 5 years, 67% males, were able to achieve all exams. Among subjects with higher WLR, a significantly lower MMSE was found ($p = 0.04$). Eye-Brain: AVR and arteriolar ID coefficient of variation were inversely related to cerebral volumes ($r = -0.61, p = 0.01$ and $r = -0.58, p = 0.02$). Eye-Carotid: AVR and arteriolar ID coefficient of variation were directly and indirectly correlated with peak BF/FF, respectively ($r = 0.47, p = 0.005$; $r = -0.39, p = 0.02$). Eye-Aorta: WT and AVR were inversely correlated with ascending aorta distensibility ($r = -0.48, p = 0.003$; $r = -0.47, p = 0.007$).

Conclusion: In elderly hypertensives, arteriolar retinal remodelling represents a potential marker of early cerebral atrophy, which might be linked to a cerebral microcirculation remodelling. This hypothesis is supported by the association between retinal vascular remodelling and impaired carotid flow and aortic elastic properties.

© 2019 Association for Research into Arterial Structure and Physiology. Publishing services by Atlantis Press International B.V. This is an open access article distributed under the CC BY-NC 4.0 license (<http://creativecommons.org/licenses/by-nc/4.0/>).