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N. Ribarich, R. Sacconi, A. Servillo and G. Querques

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## Regarding “Altered Blood Flow in the Ophthalmic and Internal Carotid Arteries in Patients with Age-Related Macular Degeneration Measured Using Noncontrast MR Angiography at 7T”

We read with great interest the article by Hibert et al,<sup>1</sup> “Altered Blood Flow in the Ophthalmic and Internal Carotid Arteries in Patients with Age-Related Macular Degeneration Measured Using Noncontrast MR Angiography at 7T.” On the basis of MR imaging of the ophthalmic arteries (OAs) and the internal carotid artery and the study of the difference between patients with age-related macular degeneration (AMD) and healthy controls in terms of flow velocities and volume flows, they suggested that OA volume flow is reduced and flow velocity is increased in patients with AMD, particularly in the late-stage disease.

We have some methodologic concerns, and we would be grateful if the authors could clarify the following important points, which may have led to important misinterpretation.

First, it seems that there was no strict age-matching protocol, as the two cohorts were shown to have a mean difference of 8.5 years of age. Moreover, statistical tests for the difference of means were not reported for this variable. We would therefore, be grateful if the authors could provide significance values for the age comparison between the two groups. We believe that such a difference can be partly to blame for the difference found in volume flows and OA diameter; in fact, it has been shown that flow velocity in this vessel increases with age.<sup>2</sup> Furthermore, whether these patients underwent cardiovascular evaluation was not reported. This omission could mean that controls not only had no AMD but may have also had a lower cardiovascular risk and a lower atherosclerotic burden and, therefore, higher OA diameters and volume flows, leading to a better choroidal perfusion.<sup>3</sup>

In addition, the authors reported that when MR imaging was repeated for a patient, it yielded a difference of 10% with regard to volume flow. Although differences between controls and patients with AMD were higher, up to 46% when patients with late AMD and controls were taken into consideration, a

single measurement cannot conclude that the maximum variability is indeed 10%. This issue is especially true if we consider that flow measurement with phase-contrast MR imaging was shown to have a certain level of intermeasurement variability, increasing with higher-degree stenosis.<sup>4</sup> We believe that further assessment was necessary to conclude that variability in the measurements did not exceed or invalidate the findings of this study.

Furthermore, the authors mentioned a specific analysis of patients who had AMD at different stages between the 2 eyes; however, they also reported 2 patients who had only 1 eye affected by AMD. It would have been interesting to know whether the OA volume flow reduction trend was also observed in the nonaffected eye of such patients with AMD. This evidence, though without statistical significance, would have helped to understand whether vascular changes occur before or after the development of AMD. Moreover, differences in terms of OA volume flow between 2 eyes of the same patient, one affected by AMD and the other one healthy, may suggest the feasibility of OA angioplasty.<sup>5</sup>

Finally, apart from the small number of patients enrolled in this study, which did not jeopardize the significance of the results, the proportion of excluded patients and relative data was remarkable. Most such measurements were discarded due to motion artifacts, making a reliable analysis of flow rates impossible. This issue could have been overcome by repeating the scan in these patients, and it would have also increased the sample size, thus strengthening the findings of the study.

We would be grateful if the authors responded to our letter and addressed our concerns. We believe that the aforementioned points should be further investigated to help shed light on the role of OA flow alterations in AMD pathogenesis.

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 **N. Ribarich**

School of Medicine  
Vita-Salute San Raffaele University  
Milan, Italy

 **R. Sacconi**

School of Medicine  
Vita-Salute San Raffaele University  
Milan, Italy  
Department of Ophthalmology  
Ospedale San Raffaele  
Milan, Italy

 **A. Servillo**

School of Medicine  
Vita-Salute San Raffaele University  
Milan, Italy

 **G. Querques**

School of Medicine  
Vita-Salute San Raffaele University  
Milan, Italy  
Department of Ophthalmology  
Ospedale San Raffaele  
Milan, Italy