Scilight

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Solidifying the link between arrhythmia and dementia

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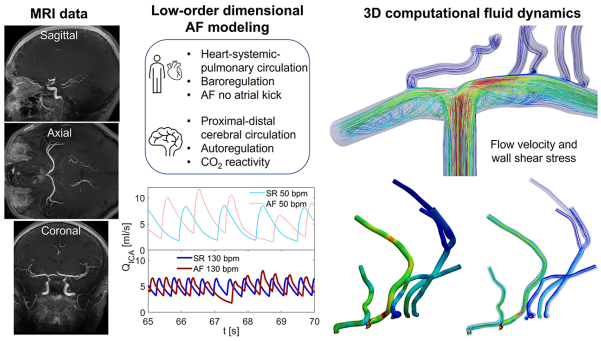
Atrial fibrillation affects blood flow in small arteries that feed the brain, which could lead to strokes and contribute to cognitive decline.



Recent research suggests that atrial fibrillation, the most common cardiac arrhythmia, increases an individual's risk of dementia. This may be because atrial fibrillation changes blood flow in the brain, however, current clinical techniques have not been able to explain this relationship.

Scarsoglio et al. conducted a three-dimensional computational fluid dynamics analysis to examine how blood flows through the brain during atrial fibrillation. They used high-resolution magnetic resonance imaging data to reconstruct the brain's microvasculature geometry.

The authors used their simulations to study blood flow in the lenticulostriate arteries, which supply blood to the brain and are thought to be involved in the onset of dementia. They analyzed blood flow in these small arteries during normal sinus rhythm and atrial fibrillation for heart rates ranging from 50 to 130 bpm.

The authors found atrial fibrillation significantly reduces wall shear stress and flow velocity fields. These results suggest that at higher heart rates, atrial fibrillation increases the risk of clotting and wall swelling in the lenticulostriate arteries. This could lead to stroke and may play a role in the onset of dementia.

"Our research aims to provide scientific evidence to improve clinical atrial fibrillation management and reduce its impact on cognitive decline," said author Stefania Scarsoglio. "A delay of the onset of dementia by just a few years would have huge socioeconomic implications in terms of the patient's quality of life and the burden of health care costs."

Next, the authors want to incorporate individual variations in blood flow due to aging and vascular structure differences in their simulations.

Source: "Cerebral hemodynamics during atrial fibrillation: Computational fluid dynamics analysis of lenticulostriate arteries using 7T high-resolution magnetic resonance imaging," by S. Scarsoglio, A. Saglietto, F. Tripoli, J. J. M. Zwanenburg, G. J. Biessels, G. M. De Ferrari, M. Anselmino, and L. Ridolfi, *Physics of Fluids* (2022). The article can be accessed at https://doi.org/10.1063/5.0129899.