JACC: Advanced imaging technology predicts cardiovascular risk from inflammation detected in arteries

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The results, published in JACC, demonstrate the potential of this technology to generate images of the inflammation associated with systemic atherosclerosis; this information will be useful for the study of early stages of this disease and will help to identify individuals who will benefit from early medical intervention

Using advanced PET/MRI technology, researchers at the *Centro Nacional de Investigaciones Cardiovasculares* (CNIC) have detected arterial inflammation in regions that have yet to develop atherosclerotic plaques. The results from the PESA-CNIC-Santander study are published today in the *Journal of the American College of Cardiology* (JACC). In the new report, the research team used this innovative technology to analyze the inflammatory process in the arteries of a group of people who had already developed atherosclerotic plaques.

The study examined the largest cohort examined by PET/MRI to date. The results show, for the first time, that inflammation is present at early stages of atherosclerosis, above all in regions that have not developed plaques. The study also shows that this arterial atherosclerosis can be an early indication of the later appearance of plaques that underlie cardiovascular disease and events such as heart attack and stroke. The researchers are currently analyzing the role of arterial inflammation in this process; this information will help to establish early diagnosis and develop new anti-inflammatory therapies for this disease.

Although atherosclerosis is known to be a chronic inflammatory disease, the prevalence and distribution of inflammation at early disease stages was unknown. PESA-CNIC-Santander is a prospective study led by Dr. Valentín Fuster that uses innovative imaging technologies to analyze more than 4000 middle-aged participants and evaluate the presence and development of atherosclerosis at subclinical stages—before symptoms appear.

The results published today in JACC were generated using advanced PET/MRI technology in 755 asymptomatic participants in the PESA-CNIC-Santander study. The average age of the participants was 49 years, and they all had atherosclerotic plaques detected by 2D/3D ultrasound or accumulation of calcium in the arteries.

Vascular inflammation

In the words of Leticia Fernández-Friera, study co-author and a cardiologist at the CNIC and HM Montepríncipe University Hospital, the main goal of the study “was to characterize vascular inflammation in people with known subclinical atherosclerosis by examining three territories: the carotid arteries, which supply blood to the head; the aorta, the body’s largest artery; and the iliofemoral arteries, which supply blood to the legs.”

Dr. Valentín Fuster, CNIC Director and lead investigator on the project, emphasized the power of modern diagnostic imaging technology, which “has revealed that inflammation is present in only 10% of established plaques.” Study coauthor Javier Sanz explained that “the atherosclerotic plaques showing signs of inflammation are large, have a high cholesterol content, and tend to be located in the femoral arteries at the arterial bifurcations.” Nevertheless, “most inflammation identified in the arteries of this PESA study subpopulation are located in vessel regions free of atherosclerotic plaques.”

Risk factors

Sanz went on to explain that the study data show inflammation in the arteries of “almost half of the participants, occurring more frequently in the femoral arteries.” Fernández-Friera added, “inflammation was associated with the presence of more risk factors; obesity and smoking in particular were independent predictors of the presence of arterial inflammation.”

Dr. Fuster emphasized that these findings demonstrate the power of this technology to produce live images of inflammation related to systemic atherosclerosis, thus enabling the study of this disease in early stages and the identification of individuals likely to benefit from early medical intervention. “Future studies should investigate whether inflammation precedes the development of the plaque and assess how the quantification of inflammation might contribute to the evaluation of cardiovascular risk.”

- Fernández-Friera, L., Fuster, V., López-Melgar, B., Oliva, B., Sánchez-González, J., Macías, A., . . . Sanz, J. (2019). Vascular Inflammation in Subclinical Atherosclerosis Detected by Hybrid PET/MRI. Journal of the American College of Cardiology, 73(12), 1371-1382. doi:10.1016/j.jacc.2018.12.075

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