

Cardiac imaging breakthrough helps determine diminished blood flow to the heart

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Research presented at SNM's 57th Annual Meeting is challenging the typical paradigm used to determine whether heart patients will benefit from invasive procedures like stent-placement or open-heart surgery. Current medical practice favors treating patients with coronary atherosclerosis (or hardening of the artery walls due to plaque build-up) with such procedures if a coronary artery is shown to be blocked by 70 percent or more in order to reduce symptoms and potentially prevent heart attack. However, a group of cardiac investigators are now finding that in addition to the degree of blockage, composition of the plaque causing the blockage also has significant impact on coronary artery blood flow. This may help explain why two people with similarly blocked coronary arteries can experience vastly different symptoms.

"If we can determine certain characteristics of the coronary artery plaque, we can predict whether a patient's symptoms are due to limitation of blood flow to the heart," said Haim Shmilovich, M.D., principal author of the study and a [cardiac CT/MRI](#) fellow-cardiologist at the Cedars-Sinai Medical Center, Los Angeles, Calif. "With further studies, our findings may change treatment planning for patients with severe but stable coronary artery disease by helping us determine which patients could be treated just as effectively with medications and lifestyle changes, thereby avoiding unnecessary invasive angioplasty and bypass surgery."

Shmilovich and colleagues used two imaging procedures: coronary CT angiography (CCTA)—which reveals the composition of coronary artery

plaque and the degree of blockage it causes—and myocardial perfusion imaging (MPI)—which measures relative blood flow to different regions of the heart. The investigators found that clinicians can more accurately determine a patient's risk of having reduced blood flow to the [heart muscle](#) by identifying three plaque characteristics: the presence of a fatty core, signs of spotty calcifications and enlargement of the arterial wall from "positive remodeling," which means the body has responded to arterial damage by altering the structure of the artery. Either individually or combined, the presence of these characteristics in diseased arteries can predict diminished blood flow to the heart muscle, which could lead to symptoms, including heart attack.

For this study, 34 patients without known [coronary artery disease](#) were imaged using CCTA and MPI to determine the presence of adverse plaque characteristics (APCs) and blood flow. Length of time between scans was limited to six months without any interval change in patients' symptoms or treatment. All patients had severe (70 to 89 percent) blockage in the beginning or middle section of a major coronary artery on CCTA. APC evaluation on CCTA was performed by a blinded third-party expert, and MPI evaluation was conducted through automated computer-based validated analysis. Results indicated that slightly more than 38 percent of all patients had significant ischemia, i.e., significantly limited blood flow to the heart muscle, when imaged with MPI. In the arteries with plaques that showed a fatty core, significant ischemia of the heart muscle portion nourished by the affected artery occurred at a much higher and statistically significant frequency (80 percent) than those without a fatty core (21 percent). Finding multiple APCs in a plaque was also associated with higher degrees of significant ischemia.

According to 2010 data from the American Heart Association, more than 81 million Americans—or more than one in three—have some form of cardiovascular disease. Major modifiable risk factors for heart disease include high blood-cholesterol levels, hypertension, diabetes,

smoking and sedentary lifestyle.

Provided by Society of Nuclear Medicine

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