

Researchers develop novel imaging approach with potential to identify patients with CAD

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Coronary artery disease (CAD) - caused by plaque buildup in the artery walls that constricts the flow of blood to the heart—is the most common form of heart disease and the leading cause of death for both men and women in the United States. Non-invasive imaging such as cardiovascular magnetic resonance imaging is often used to diagnose coronary heart disease. However, current techniques are cumbersome, costly and expose patients to adverse health risks.

Researchers at Beth Israel Deaconess Medical Center (BIDMC) have developed a novel imaging approach that has the potential to identify patients with coronary disease without administration of drugs or [contrast dye](#) and within a short 15 minute exam protocol. Described in the *Journal of the American College of Cardiology: Cardiovascular Imaging*, the technique involves measuring changes in blood flow in the myocardium—the heart's muscular tissue—after [physical exercise](#) by measuring magnetic properties of the tissue, thereby eliminating the need for any contrast media or pharmacological stress agents.

"Current stress cardiac imaging requires administration of gadolinium contrast agent," said corresponding author Reza Nezafat, Ph.D., scientific director of the Cardiovascular Magnetic Resonance Center at BIDMC and a Professor of Medicine at Harvard Medical School.

"However, recent data have shown that gadolinium deposits in the brain and other organs. We aimed to develop a non-invasive imaging technique that eliminates the need for any contrast administration to measure changes in the blood flow in the myocardium."

To do that, researchers in the Cardiovascular Magnetic Resonance (MR) Center at BIDMC developed a technique that measures changes in the magnetic property of tissue without gadolinium contrast agent as they performed exercise stress tests.

First, healthy subjects underwent a series of baseline imaging scans. Next, lying on their backs at the opening of an MRI machine, the healthy adults pedaled an exercise bicycle to increase their heart rate. Within 30 seconds of pedaling, participants underwent an MRI scan that measured changes in tissue properties of myocardium to quantify changes in the [blood flow](#) in the myocardium.

Next, the researchers tested participants with known or suspected [coronary artery disease](#) with a similar imaging protocol. Taken together, images from the two groups revealed that magnetic properties of myocardium change differently in areas impacted by coronary atherosclerosis than in normal areas and that these differences can be quantified using this technique.

"In this proof-of-concept study, we demonstrated that a quantitative cardiac MR approach that measures tissue properties of heart muscles, combined with an exercise protocol using an MRI-compatible ergometer in an MRI suite might have the potential to assess flow-limiting coronary artery stenosis in patients with suspected CAD without the need for gadolinium contrast injection or pharmacological stress agents," Nezevat said. "Larger studies are warranted to confirm the clinical performance of our quantitative cardiac MR approach with exercise stress as an alternative to the currently common method of non-invasive assessment of coronary artery [disease](#)."

Provided by Beth Israel Deaconess Medical Center

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