

Technique for cardiovascular diagnostics shows promise

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A new technique developed at Sweden's KTH Royal Institute of Technology shows promise for early diagnosis and treatment of cardiovascular disease.

Hardening of the arteries, or [atherosclerosis](#), is a common disorder that occurs when fat, cholesterol, and other substances build up in the walls of arteries and form hard structures called plaques. The condition can lead to heart attacks and strokes.

To diagnose atherosclerosis, doctors today rely on ultrasonic grayscale images to visually assess vascular function and how very large arteries move. The less mobility, the more developed the case of atherosclerosis.

But it is an indirect measurement. Better diagnoses can be made when the stiffness of the blood vessels can be analysed, explains Elira Maksuti, a researcher at the Department of Medical Imaging Technology at KTH.

"You need a doctor who is an expert and has extensive experience in order to get a good diagnosis," she says.

But by combining the technologies of shear wave elastography and ultrasound, Maksuti and researcher Erik Widmanh, have developed an inexpensive and non-invasive method not only for checking the stiffness of blood vessels, but for analysing the type of plaque present in the artery.

Maksuit says their method not only offers a potentially more effective way to diagnose atherosclerosis, but the ultrasound technology that it relies on is less expensive – and safer – than other imaging alternatives, such as [magnetic resonance imaging](#) (MRI) or computed tomography (CT).

The technique was tested on [artificial blood vessels](#), or "phantom" vessels, which allowed the researchers to experiment with not only [vascular stiffness](#), but also pressure and flow.

Maksuti says that with the success of tests on these phantoms, the next step is testing the technique with blood vessels from pigs. "These tests also look very promising," she says.

"We see two major future applications before us," she says. "The first is to determine when a patient's [blood vessels](#) are becoming rigid, that is, when the atherosclerosis process begins.

"The second application is to be able to diagnose the type of calcification – or plaque – present in the blood vessel." Not all plaque is the same: it ranges from hard to soft. If the plaque is soft and has a thin, hard shell, it is more likely to come loose inside the blood vessel.

It's a difficult distinction to determine. But the information is critical in deciding whether to open the artery surgically. "Today it is rather a matter of guessing. A doctor cannot know," she says. And to complicate matters, such operations can also generate strokes.

Provided by KTH Royal Institute of Technology

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