

New imaging technique reveals fatty hearts

A simple imaging technique developed by UT Southwestern Medical Centre researchers has revealed fat build-up in the hearts of pre-diabetic people long before symptoms of heart disease or diabetes appear.

The technique detects fat accumulation in cells of the beating heart in a way no other clinical method can, the researchers said, and may provide a way to screen patients for early signs of heart disease in diabetes.

“Hearts beat; people breathe; and magnetic resonance imaging is very sensitive to motion, so we had to find a way to electronically ‘freeze’ the image of the heart,” said Dr. Lidia Szczepaniak, assistant professor of internal medicine at UT Southwestern and senior author of a study appearing in the Sept. 4 issue of *Circulation*.

“We wanted a non-invasive method to study the beating human heart,” Dr. Szczepaniak said.

Dr. Szczepaniak and her colleagues developed a technique that captures the signal from a beating heart as a person lies on an ordinary magnet used for MRI scanning.

The researchers knew that fat builds up in the hearts of people with heart failure or non-insulin-dependent diabetes (type 2) from earlier studies involving patients undergoing heart transplants, but they didn't know if this fatty build-up occurred before or after the diabetic conditions developed.

“There is currently no way to clinically evaluate the fatty heart,” Dr. Szczepaniak said. “Using this technique, which analyzes magnetic signals, we might be able to determine if people are prone to heart disease very early before the disease progresses. This method might also allow us to measure the effectiveness of medical treatments targeted toward lowering fat in the heart.”

In the new study, the UT Southwestern researchers used an ordinary MRI system, but added the newly developed computer software to convert the signals from a moving heart into a single image.

They looked at lean and obese people with normal blood sugar, obese people beginning to show abnormal sugar metabolism, and obese people with full-blown type 2 diabetes.

Their most important finding, Dr. Szczepaniak said, was that fat build-up in the heart develops before the onset of diabetes. They also found that the amount of fat in the heart of people with abnormal sugar metabolism was significantly higher than those with normal blood sugar, whether obese or lean.

The amount of fat in the heart was unrelated to the amount of fat in the bloodstream or liver, indicating that measuring any of those factors could not predict accumulation of fat in the heart. Fat in the heart did correspond to the amount of fat in the stomach region, however.

The researchers recruited some participants from the Dallas Heart Study — a multi-ethnic, population-based study of more than 6,000 patients in Dallas County designed to examine cardiovascular disease.

Detecting fat in heart cells is especially important because once a heart cell dies, it is not replaced by a new one, as happens in many other tissues, said Dr. Roger Unger, professor of internal medicine at UT Southwestern and a co-author of the paper. “When you lose a heart cell, that's it — you can't get it back.”

Some researchers, including those at UT Southwestern, believe that as a person becomes overweight, fat accumulates in normal fat cells, but eventually fat cells can't store fat any more. Eventually the excess of fat kills other cells — a hypothesis supported by a recent study by Dr. Unger in mice.

“Dr. Szczepaniak is translating our rodent studies into humans, and that is a huge technological breakthrough,” Dr. Unger said.

But Dr. Unger also cautioned that no sophisticated test can replace common sense in fighting obesity: “You don't need a fancy test to tell a patient not to eat too much.”

Other UT Southwestern researchers involved in the study were Dr. Jonathan McGavock, former postdoctoral fellow in internal medicine; Dr. Ildiko Lingvay, assistant professor of internal medicine; Dr. Ivana Zib, former medical fellow; Tommy Tillery, magnetic resonance imaging technician; Naomi Salas, former research assistant; Dr. Benjamin Levine, professor of internal medicine; Dr. Philip Raskin, professor of internal medicine; and Dr. Ronald Victor, professor of internal medicine.

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