Using Electrocardiography To Detect Problems with Cardiac Resynchronization Devices

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The full report is titled "An Electrocardiogram-Based Algorithm To Detect Loss of Left Ventricular Capture during Cardiac Resynchronization Therapy." It is in the 21 June 2005 issue of *Annals of Internal Medicine* (volume 142, pages 968-973). The authors are P. Ammann, C. Sticherling, D. Kalusche, J. Eckstein, A. Bernheim, B. Schaer, and S. Osswald.

What is the problem and what is known about it so far?

In heart failure, the heart does not pump blood as well as it should and fluid builds up in the lungs. The symptoms of heart failure include difficulty breathing, decreased ability to exercise, and leg swelling. Although many drugs help patients with heart failure, there is no cure. The condition is disabling and even fatal for many patients. In patients with heart failure, the movement of electrical impulses through the heart is often abnormal. This, in turn, can lead to uncoordinated contraction of the ventricles, the large pumping chambers of the heart. Cardiac resynchronization is a newer heart failure treatment that uses a special type of pacemaker device to synchronize the contraction of the ventricles. Cardiac resynchronization improves outcomes for selected patients with heart failure. When heart failure worsens in patients with a resynchronization device, it might be because the device is not sending electrical signals to both ventricles. This problem is called "loss of capture" and often involves the left ventricle. Unfortunately, detection of loss of left ventricular capture has required that physicians use a special programming machine that is not available in most doctors' offices.

Why did the researchers do this particular study?

To develop a way to detect loss of left ventricular capture using electrocardiography (ECG). The ECG records the electrical impulses of the heart and is available in most doctors' offices.

Who was studied?

54 patients who had cardiac resynchronization devices.

How was the study done?

The researchers performed ECGs in all 54 patients while the devices were working as they should and again after turning off the signal to the wire in the left ventricle. They examined the ECG results to identify a pattern that distinguished between when the devices were working as they should and when the left signal was turned off.

What did the researchers find?

The researchers identified a pattern in the ECG results that separated, with a high degree of accuracy, cases where the device was and was not working as it should.

What were the limitations of the study?

Cardiologists, doctors who specialize in heart disease, evaluated the ECG results in this study. It is not known whether doctors without special training in heart disease would be able to identify the ECG patterns as well as the cardiologists did. In addition, this study evaluated only one type of problem that could occur in a patient with a resynchronization device.

What are the implications of the study?

Doctors can use a simple office ECG to detect loss of left ventricular capture in patients with heart failure and cardiac resynchronization devices.