New Device Can Aid Physicians in Detecting Heart Attacks

8 January 2010

(PhysOrg.com) -- The American Heart Association estimates 700,000 Americans will experience a myocardial infarction, or heart attack, each year. For the most severe cases, patient outcome often depends on the speed with which a patient is diagnosed and transported to a catheterization lab.

In results published in the Annals of Emergency Medicine, a multicenter trial involving University of Cincinnati (UC) research confirms that a new tool can show severe heart attacks in more patients, potentially leading to better diagnoses and faster treatment.

According to UC emergency medicine associate professor Gregory Fermann, MD, the tool, an 80-lead electrocardiogram (ECG/EKG), shows physicians a broader reading of the heart muscle than the traditional 12-lead ECG.

An ECG measures electrical activity in the heart and is crucial in the diagnosis of one type of heart attack, an ST-elevation myocardial infarction (STEMI), says Fermann. In STEMI, the coronary artery is completely blocked off by a blood clot, leading to death of the affected heart muscle.

In the past two years, Fermann has worked with emergency medicine researchers across the country to study the PRIME ECG, an ECG with 80 leads to measure electrical activity.

“The PRIME ECG features an increase in the number of the leads that measure across the patient’s chest,” he says. “A normal 12-lead ECG has leads applied to the front portion of the chest. This technology has 80 leads, some applied to the front, some applied to the back, to give you more of a geospatial map of the entire heart.”

Fermann says the 80-lead ECG also presents the data in a different way, allowing physicians to toggle through each lead like they would a CT-scan. The device is FDA-approved, but, until now, its clinical utility in an emergency department setting had not been studied.

This trial, called Optimal Cardiovascular Diagnostic Evaluation Enabling Faster Treatment of Myocardial Infarction (OCCULT MI), involved 1,830 patients from 11 medical centers across the country. In it, emergency department patients with moderate- to high-risk chest pain were tested with both 12-lead and 80-lead ECGs and were treated according to the standard of care.

The study found the 80-lead ECG allowed for more accurate diagnosis of heart attacks. Specifically, the study found that the 80-lead ECG provided a 27.5 percent increase in the detection of STEMI versus the 12-lead ECG.

It also found that those patients had similar angiographic and clinical outcomes to patients identified with STEMI in the 12-lead ECG.

“Where this device is going to fit in is for somebody who has a suspicious story for a heart attack who may have a normal or non-diagnostic 12-lead ECG,” says Fermann. “Potentially, you could apply this 80-lead ECG, see the changes that were absent on the 12-lead and then act by calling the cardiologist … and getting the patient to the catheterization lab.”

The length of time between a heart attack patient's arrival at the hospital to treatment in the catheterization lab is typically referred to as the "door-to-balloon" time. The American College of Cardiology recommends a door-to-balloon time under 90 minutes; the average time at UC Health University Hospital is 65 minutes.

Analysis of the OCCULT MI trial results found that patients with STEMI detected in 12-lead ECGs had a median door-to-balloon time of 54 minutes, versus 1,002 minutes for patients with STEMI detected in only the 80-lead ECG.

"Since the clinicians were blinded to the results of the 80-lead, the patients with 80-lead only STEMI were treated more like non-STEMI patients and had more of a delay in comparison to their STEMI counterparts," says Fermann. "The study suggests that 80-lead only STEMI patients might benefit from the same timely intervention normally reserved for the 12-lead STEMI patient."

While he cautions that the trial did not measure patient outcomes with either technology, Fermann does think the PRIME-ECG has a future in diagnosing more STEMI patients in the emergency room.

"The next step for the 80-lead ECG is to be adopted in routine clinical practice," he says. "With the trial, I think there is enough data to show that there are value-added features of this technology."

The PRIME ECG is made by Maryland-based Heartscape Technologies, Inc. Fermann has reported no financial interest in Heartscape.

More information:
www.annemergmed.com/article/S0196-0644%2809%2901223-2/abstract

Provided by University of Cincinnati