Magnetocardiography in Coronary Artery Disease with a New System in an Unshielded Setting

BIRGIT HAILER, M.D., ILJIA CHAIKOVSKY, M.D.,* SABINE AUTH-EISERNITZ, M.D., HARALD SCHÄFER, M.D. FRITZ STEINBERG, M.D.,* DIETRICH H.W. GRÖNEMEYER, M.D.†

Department of Medicine, Philippusstift, Essen; *Squid AG, Essen; †Department of Radiology, University Witten/Herdecke, Bochum, Germany

Summary

Background: The noninvasive detection of coronary artery disease (CAD) remains a clinical challenge. Magnetocardiography is a completely noninvasive method that permits the registration of cardiac electrical activity at multiple sites in a plane above the chest cage without the need for electrodes. In contrast to the electrocardiogram (ECG) which suffers from boundary effects and a variety of potential artifacts (electrode placement, etc.) the MCG is unaffected by such impediments as the magnetic field is unaltered by surrounding tissues.

Hypothesis: Magnetocardiography with a newly developed single-channel system in an unshielded setting should be a better qualitative diagnostic tool than the standard ECG for the detection and assessment of CAD.

Methods: In all, 52 patients with angiographically documented CAD and unimpaired ventricular function as well as 55 controls were included in this study. A standard 12-lead ECG was obtained in all subjects. The MCG recordings were taken from 36 positions under resting conditions. From these, current density vector maps were generated during the ST-T interval. Each map was then classified using a classification system with a scale from 0 (normal) to 4 (grossly abnormal).

Results: While the ECG was normal in all subjects, the MCG in the controls was classified as category 0, 1, or 2. However, in patients with abnormal coronary angiograms, mainly maps in categories 3 and 4 were seen (p < 0.05).

Conclusion: A single-channel magnetometer in an unshielded setting reveals significant differences between normals and patients with CAD with normal ECG on the basis of current density reconstruction during the ST segment when measured under resting conditions. This method might be suitable for the noninvasive detection of CAD.

Key words: coronary artery disease, electrocardiography, magnetocardiography, single-channel magnetometer, unshielded setting, current density reconstruction

Address for reprints:

Birgit Hailer, M.D.
Medizinische Klinik II
Philippusstift
Hülsmannstr. 17
45355 Essen, Germany
e-mail: b.hailer@philippusstift.de

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