

Visualization of Infarcted and Ischemic Myocardium by Magnetocardiography

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Abstract

Therapeutic development such as gene therapy using catheter intervention has been introduced in clinical cardiology. The aim of this study is to develop the current density distribution map using Synthetic Aperture Magnetometry (SAM) on magnetocardiography for a visualization of infarcted and ischemic myocardium. In this time, we developed BT net for calculating SAM filter. We analyzed the simulated magnetic field data that was constructed by the voxel (5x5x5mm) using SAM. In clinical analysis, subjects were consisted of 2 stable effort angina, and 4 old myocardial infarction. We used 12 channel SQUID system (vector type) consisted of three dimensional second-order gradiometer for data acquisition. In the shielded room, we obtained the Bz component of the 12 channel simultaneous data for myocardial ischemia and 48 channel simultaneous data for myocardial infarction.

Segments for infarcted myocardium were calculated by the differences of integrated current density of QRS segment among normal control and patients with myocardial infarction. Segments for myocardial ischemia were calculated by the differences of integrated density of ST segment at rest and immediately after exercise. Integrated differential current density distribution by SAM analysis superimposed MR image revealed the infarcted and ischemic region which was concordant with those in cardiac nuclear method (Tc-99m tetrofosmin SPECT and ¹⁸F-FDG PET).

In conclusion, current density distribution map by newly development of SAM analysis using BT net method on magnetocardiography can visualize three-dimensional locations of an infarcted and ischemic myocardium.