

Localization of Epilepsy Spikes With a 40-channel SQUID Gradiometer System

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We localized epileptogenic zones of patients suffering from neocortical epilepsy (NE) by using a home-made 40-channel SQUID gradiometer system for the purpose of resective surgery. Surgery of NE is still a challenging task in neurosurgery while mesial temporal lobe epilepsy has been studied a lot with various modalities such as three-dimensional magnetic resonance imaging (3-D MRI) techniques. Especially in patients with NE who have no lesion or multiple lesions, localization of focus is very difficult. Magnetoencephalogram (MEG) using a multichannel SQUID system is a very useful tool for the study of NE because it measures not a lesion, but neuromagnetic fields from neuroelectric activities with excellent spatiotemporal resolution. Particularly, MEG makes a small error in localizing shallow sources, where most of NE occurs. In this study, we measured interictal MEG spikes from a patient suspected to have a cortical epilepsy on the frontal lobe by using an SQUID gradiometer system. We localized the equivalent current dipoles of the spikes by simulated annealing algorithm and coregistered the localization results with respect to the brain MRI of the patient.

keywords : magnetoencephalography (MEG), superconducting quantum interference device (SQUID), epilepsy, neuromagnetic source localization