

Electromagnetic source imaging in presurgical workup of patients with epilepsy

A prospective study

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Study objective

To assess the diagnostic accuracy and clinical utility of electromagnetic source imaging (EMSI) in presurgical evaluations of patients with epilepsy.

Summary results

EMSI is as accurate as established imaging methods and provides new and useful information in approximately a third of patients.

Classification of evidence

Class IV.

What is known and what this paper adds

Previous studies have shown that EEG source imaging and magnetoencephalography source imaging can both provide accurate localization of the epileptic focus. This study shows that EMSI, which combines both modalities, is accurate and it is useful for optimizing management plans.

Participants and setting

This study prospectively recruited 141 patients with drug-resistant focal epilepsy who consecutively underwent presurgical evaluation at Aarhus University Hospital as part of the Danish Epilepsy Surgery Program between April 2011 and June 2016.

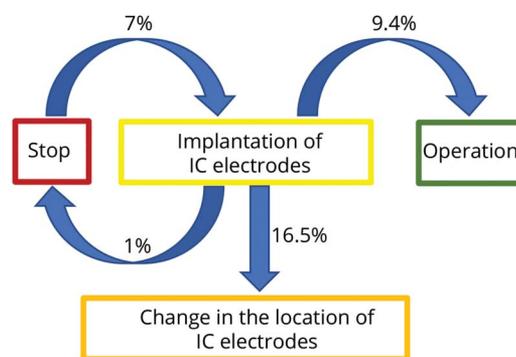
Design, size, and duration

The presurgical evaluations included history-taking, semiology, video-EEG monitoring, MRI, neuropsychological tests, and, in selected patients PET. The participants underwent simultaneous magnetoencephalography and EEG, and this study performed EMSI by analyzing co-registered magnetoencephalography-EEG datasets. The clinical utility of EMSI was assessed based on the percentage of patients for whom the EMSI-derived information prompted a multidisciplinary team to change decisions made before being shown EMSI findings. This study localized the irritative zone (IZ) and seizure onset zone (SOZ) in each patient with EMSI and, as a reference test, with intracranial recordings (ICRs).

Main results and the role of chance

EMSI-derived information prompted changes to management plans in 34% of cases, and these changes were useful in 80%. Depending on the method, EMSI's concordance rate

Figure Schematic of management plan changes following revelation of EMSI-derived information



with ICRs was 53%–89% for IZ-localization and 35%–73% for SOZ-localization. Analysis of the combined EEG and MEG dataset achieved significantly higher diagnostic odds ratio, compared to analyzing each modality separately.

Bias, confounding, and other reasons for caution

Relatively complex cases might have been overrepresented in this study's participant sample. No perfect reference standards for presurgical evaluations exist. The personnel who implanted ICR electrodes were not blinded to EMSI findings, since implantation was in part guided by EMSI.

Generalizability to other populations

This study's single-center nature may limit the generalizability of the results.

Study funding/potential competing interests

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