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Presurgical localization of frontal lobe epilepsy using interictal EEG and MEG, with electrocortical validation. P. OSSENBLOK[1], FR. LEIJTEN[2], E. VELTMAN[1], I. VAN VELZEN[1], G. HUISKAMP[2], A. COLON[1], P. BOON[1,3] ([1]Epilepsy Center Kempenhaeghe, Heeze, [2]University Medical Center, Utrecht, [3]University Hospital Gent, Gent).

Rationale : The localization of frontal lobe epilepsy (FLE) is complex and surgical management, therefore, remains less successful in comparison with temporal lobe epilepsy. This study aims at demonstrating that advanced source analysis of simultaneously recorded interictal EEG and MEG is a useful additional tool for the presurgical localization of FLE.

Methods : Sixteen patients with FLE were participating in this study. Six of these patients were candidates for epilepsy surgery and underwent preoperative subdural recordings (ECoG). Prior to these recordings, the onset and dynamics of the interictal EEG and MEG discharges of each of these patients were studied, using equivalent and dipole source distribution models. On a cortical rendering, the analysis results of the interictal transients were plotted relative to the anatomy obtained from 3D- MRI, thus enabling the systematic assessment of the onset and propagation path underlying the interictal EEG and MEG compared to the interictal ECoG.

Results : Advanced source analysis of the interictal EEG and MEG transients enabled us to delineate the irritative zone and to differentiate this area from the secondary propagation areas. The localization of the irritative zone was in good agreement with the interictal onset area determined on the basis of the subdural recordings for each of the 6 patients, while 4 of these patients who underwent resective surgery were seizure free after their operation. However, independent source analysis of the interictal EEG and MEG discharges revealed distinct propagation patterns underlying these discharges. This probably explains the differences in shape and spatial distribution that occurred in the simultaneously recorded interictal EEG and MEG discharges of most of the patients studied.

Conclusion : The results of this study indicate that advanced source analysis of both interictal EEG and MEG is successful in guiding the intracranial recordings.

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Subdural grid registration : gyri gymnastics. F. S. S. LEIJTEN (Dept. of Clinical Neurophysiology, University Medical Centre Utrecht, The Netherlands on behalf of the Dutch Task Force Epilepsy Surgery).

The goal of epilepsy surgery is the removal of the epileptogenic region with preservation of critical brain functions. The gold standard of both epileptic focus and functional localisation is ictal electrocorticography (ECoG) and direct cortical electrostimulation. In the Netherlands, the preferred technique was the introduction of 5-7 electrode strips over each hemisphere and stereotactically placed intrahippocampal needle electrodes, through frontal burr holes. With the present knowledge of and developments in noninvasive diagnostic tests, the need for this kind of explorative ECoG has subsided substantially. In 1999, local ECoG with large electrode grids was introduced in the Netherlands. This technique allows high-resolution localisation of ictal onset near critical brain areas, such as the main language centres and the sensorimotor cortex. Grid electrodes are placed at 1 cm intervals over 6×8 or 8×8 cm. To place these grids, a large trepanation is needed. This makes complications, especially infection, more likely. Therefore, we developed a 'fast' protocol, in which implantation is followed by explantation and, if possible, cortical resection, after 7-10 days. To achieve this, intensive monitoring with on-line (visual) interpretation of interictal and ictal ECoG is necessary from the first postoperative day. Electrostimulation is initiated as early as possible. In the monitoring unit, both an EEG technician and a nurse specialised in diagnostic testing during seizures are present 24 hours a day. Each seizure is immediately analysed by a clinical neurophysiologist. After delineation of the ictal onset zone and neighbouring brain functions, an operation strategy is formulated. A postoperative CT scan is matched to a preoperative 3D-MRI to allow precise localisation of the electrode positions relative to the cerebral cortex. Thus, the 1 cm resolution of the ECoG can be translated into a resection strategy at the level of the cortical gyri.
