REOPERATION IN FAILED EPILEPSY SURGERY USING MAGNETOENCEPHALOGRAPHY (MEG), NEURONAVIGATION AND INTRAOPERATIVE MAGNETIC RESONANCE TOMOGRAPHY (IOPMRI)

Karl Roessler¹,Julia Shawarba¹, Stefan Rampp¹, Burkhard, Kaspar², Roland Coras³, Ingmar Blümcke³, Hajo Hamer², Michael Buchfelder¹

Neurosurgical Department¹, Neurological Department², Department of Neuropathology³, University Hospital Erlangen, GERMANY, Neurosurgical Clinic, MedUniWien/AKH Wien, Vienna AUSTRIA⁴
DISCLOSURE

No disclosures have are announced!
INTRODUCTION:

Reoperations in patients with failed epilepsy surgery are still challenging although a reasonable good seizure outcome seems possible. Advanced imaging including MEG and intraoperative MR tomography may contribute to a better postoperative seizure outcome in this patient group.

We investigated our collective of epilepsy surgical procedures from 1988 to 2017 where we used magnetoencephalography (MEG) for epileptological reinvestigation and neuronavigation and intraoperative MR imaging for intraoperative guidance during reoperation to investigate the role of these technical adjuncts for the seizure outcome in these patients.
PATIENTS AND METHODS:

Between 1988 and 2016 we found 27 patients, who fulfilled the inclusion criteria. There were 13 female and 14 male with a mean age of 29.4 years at first surgery. The mean seizure history was 14 years and ranged from 1 to 35 years. The mean time between first surgery and reoperation after failure was 3.8 years and ranged from 0-13 years. Additionally to the standard preoperative investigations, 42 magnetoencephalography (MEG) investigations were performed in this patient group for delineating of an epileptic zone preoperatively. In 32/42 MEG investigations (76%), true localizing spikes were found.

Seventeen patients (63%) had intraoperative neuronavigation and MR imaging during reoperation for verification of total resection of the presumable epileptic zone to facilitate complete resection. In these cases with intraoperative MR tomography, also neuro-navigation was used to include the preoperative imaging modalities into the surgical procedure, especially into the eye field of the microscope as color light contours to facilitate resection.
RESULTS:

Histologically, re-operated patients included 7 with unspecific gliosis (25.9%), 6 with gangliogliomas (22.2%), 6 with focal cortical dysplasia (22.2%), 4 with hippocampal sclerosis (14.8%) and 4 other minor pathologies. The postoperative seizure outcome in the investigated patients after a second surgery was 67% Engel Grade I (18/27 patients, follow up time 4.9 years).

The localizing spike activity in the MEG investigations was 76%. Altogether, 78% of patients had a better seizure outcome than after the first surgery, 19% had an equal and 3% a worse outcome. Integration of preoperative MEG and intraoperative MR imaging correlated positively with better seizure outcome.
Patient SD

**Fig. 1A:** Pat. SD suffering from left TLE with daily seizures since 12 years. MRI negative, MEG showed spikes left temporal lateral, which was confirmed by invasive monitoring. Histology revealed a FCD Ila. A few months postoperatively, daily seizures started again. Navigated surgery for residual neocortical temporal tissue after performing a fMRI for speech perception was planned 2 years later (preplanned resection contours).

**Fig. 1B:** Navigated guided resection of residual neocortical temporal tissue during the second resective surgery using the Brain Suite (Navigation+intraoperative MRI). Functional MRI of Wernicke speech area left lower corner as a green contour, which was spared during resection.
Patient SD

Intraoperative MRI during re-surgery. Resection of residual neocortical tissue and anterior Hippocampus.
Tab: 1: 78% of patients had a better seizure outcome after the second surgery (in green)
DISCUSSION:

Inclusion of preoperative MEG investigations and intraoperative neuronavigation and MR imaging seems to improve the seizure outcome in re-surgery for persisting seizures after failed epilepsy surgery. Focal residual lesional cases like gangliogliomas and focal cortical dysplasia were among the main diagnoses after reoperation.
SUMMARY POINTS:

- Reoperation in failed epilepsy patients is an option with a success rate of normally 50-60%.
- Inclusion of preoperative MEG investigations and intraoperative neuronavigation and MR imaging seems to improve the seizure outcome in re-surgery of up to 67% Engel Grade I in our study.
- Focal residual lesional cases like gangliogliomas and focal cortical dysplasia were among the main diagnoses after reoperation.