Focal cortical dysplasia case series

retrospectively evaluated 54 FCD patients operated in Federal Center of Neurosurgery, Tyumen, Russia. The electroencephalogram findings were correlated to the involved brain anatomical areas. Subsequently, we analyzed the main white matter tracts implicated during the epileptogenic spreading in some representative cases. We prepared 10 human hemispheres using Klinger's method and dissected them through the fiber dissection technique.

Results: The clinical results were displayed and the main white matter tracts implicated in the seizure spread were described in 10 patients. Respective FCD foci, interconnections, and ectopic epileptogenic areas in each patient were discussed.

A strong understanding of the main implicated tracts in epileptogenic spread in FCD patient remains cardinal for neurosurgeons dealing with epilepsy. To achieve meaningful seizure freedom, despite the focal lesion resection, the interconnections and tracts should be understood and somehow disconnected to stop the spreading [1)]

2021

Seong et al. retrospectively reviewed data from 719 drug-resistant epilepsy patients who underwent resection surgery and selected cases in which surgical specimens were pathologically confirmed as FCD Type I or II. If the epileptogenic focus and surgical specimens were obtained from brain areas with a normal MRI appearance, they were classified as MR-negative FCD. Surgical outcomes were evaluated at 2 and 5 years, and clinical, neurophysiological, and neuroimaging data of MR-negative FCD were compared to those of MR-positive FCD.

Finally, 47 MR-negative and 34 MR-positive FCD patients were enrolled in the study. The seizure-free rate after surgery (Engel classification I) at postoperative 2 year was 59.5% and 64.7% in the MR-negative and positive FCD groups, respectively ($p = 0.81$). This rate decreased to 57.5% and 44.4% in the MR-negative and positive FCD groups ($p = 0.43$) at postoperative 5 years. MR-negative FCD showed a higher proportion of FCD type I (87.2% vs. 50.0%, $p = 0.001$) than MR-positive FCD. Unilobar cerebral perfusion distribution (odds ratio, OR 5.41) and concordance of interictal epileptiform discharges (OR 5.10) were significantly associated with good surgical outcomes in MR-negative FCD.

In this study, MR-negative and positive FCD patients had a comparable surgical prognosis, suggesting that comprehensive presurgical evaluations, including multimodal neuroimaging studies, are crucial for obtaining excellent surgical outcomes even in epilepsy patients with MR-negative FCD [2)].

2020

Alhilani et al.analyzed iEEG data from 25 children with Focal cortical dysplasia-associated medically refractory epilepsy (MRE) who underwent surgery. They performed electric source imaging (ESI) on ictal onset to localize seizure onset zone (SOZ) (ESI-SOZ) and on interictal discharges to localize irritative zone (IZ) (ESI-IZ). They tested whether resection of ESI-SOZ and ESI-IZ predicted good surgical outcome (Engel 1). They further compared the prediction performance of ESI-SOZ and ESI-IZ

to those of SOZ and IZ defined using conventional methods, i.e. by identifying iEEG-contacts showing ictal onsets (conventional-SOZ) or being the most interictally active (conventional-IZ).

The proximity of ESI-SOZ (p = 0.043, odds-ratio = 3.9) and ESI-IZ (p = 0.011, odds-ratio = 7.04) to resection has higher effect on patients' outcome than proximity of conventional-SOZ (p = 0.17, odds-ratio = 1.7) and conventional-IZ (p = 0.038, odds-ratio = 2.6). Resection of ESI-SOZ and ESI-IZ presented higher discriminative power in predicting outcome (68% and 60%) than conventional-SOZ and conventional-IZ (48% and 53%).

Localizing SOZ and IZ via ESI on iEEG offers higher predictive value compared to conventional-iEEG interpretation.

iEEG-ESI may help surgical planning and facilitate the prognostic assessment of children with FCD-associated MRE [3].

2018

Martinez-Lizana et al. from the Dept. of Epileptology, Institute of Neuropathology Dept. Neurosurgery Freiburg, Epilepsy Center Bielefeld, Dept. of Pediatric Neurology Heidelberg, Dept. of Pediatric Neurology, University of Kiel, Dept. of Pediatric Neurology, Hospital Sant Joan de Deu, Barcelona, Spain, Epilepsy Center Kork, Germany, analyzed a total of 113 patients (71 male; mean age at surgery 10.3 years; range 0-18); 45 had undergone lesionectomy, 42 lobectomy, 18 multi-lobectomy, and eight hemispherotomy. Complete seizure control (Engel Ia) was achieved in 56% after two years, 52% at five years, and 50% at last follow-up (18-204 months). Resections were more extensive in younger patients (40% of the surgeries affecting more than one lobe in patients aged nine years or younger vs. 22% in patients older than nine years). While resections were more limited in older children, their long-term outcome tended to be superior (42% seizure freedom in patients aged nine years or younger vs. 56% in patients older than nine years). The outcome in FCD I was not significantly inferior to that in FCD II.

This data confirm the long-term efficacy of surgery in children with focal cortical dysplasia FCD and epilepsy. An earlier age at surgery within this cohort did not predict a better long-term outcome, but it involved less-tailored surgical approaches. The data suggest that in patients with an unclear extent of the dysplastic area, later resections may offer advantages in terms of the precision of surgical-resection planning [4].

2016

A study included 71 patients who had a presurgical evaluation workup performed due to drug resistant epilepsys, who underwent epilepsy surgery, and who were histopathologically diagnosed with focal cortical dysplasia (FCD). Relationships involving MRI and 18F positron emission tomography (FDG-PET) findings and clinical data from pathological subgroups and patients were assessed.

According to the International League Against Epilepsy (ILAE) classifications of FCD, 28 of the patients were type I and 43 were type II. FCD was visible on the MRI scans of 53 patients, and a majority of this group was classified as type II FCD (n=34). Of these 53 patients, FCD was located in the temporal area of 21 patients, the extratemporal area of 29 patients. Of the patients who exhibited FDG-PET hypometabolism (PET-positive), 23 were classified as temporal, 17 as frontal, 11 showed involvement

of the posterior cortex. The age of seizure onset was younger in PET-positive patients (p=0.032), and histopathological analyses revealed that 23 patients had type I FCD and 30 patients had type II FCD.

PET scans reveal a lesion by showing hypometabolism in patients who have refractory epilepsy and an early age of onset with FCD. The lesions of MRI-negative/PET-positive FCD patients tend to be localized in the temporal lobe and that FCD may be localized in the frontal lobe of MRI-negative/PET-negative patients. However, the histopathological examinations of MRI-positive/PET-positive, MRI-negative/PET-positive, and MRI-negative/PET-negative patients did not exhibit a particular histopathological subtype [5].

Sacino et al retrospectively reviewed the medical records of pediatric patients who underwent Intraoperative magnetic resonance imaging-assisted resection of FCD at the Children's National Health System between January 2014 and April 2015. Data reviewed included demographics, length of surgery, details of iMRI acquisition, postoperative seizure freedom, and complications. Postsurgical seizure outcome was assessed utilizing the Engel Epilepsy Surgery Outcome Scale.

Twelve consecutive pediatric patients (8 females and 4 males) underwent iMRI-guided resection of FCD lesions. The mean age at the time of surgery was 8.8 years ± 1.6 years (range 0.7 to 18.8 years), and the mean duration of follow up was 3.5 months ± 1.0 month. The mean age at seizure onset was 2.8 years ± 1.0 year (range birth to 9.0 years). Two patients had Type 1 FCD, 5 patients had Type 2A FCD, 2 patients had Type 2B FCD, and 3 patients had FCD of undetermined classification. iMRI findings impacted intraoperative surgical decision making in 5 (42%) of the 12 patients, who then underwent further exploration of the resection cavity. At the time of the last postoperative follow-up, 11 (92%) of the 12 patients were seizure free (Engel Class I). No patients underwent reoperation following iMRI-guided surgery.

iMRI-guided resection of FCD in pediatric patients precluded the need for repeat surgery. Furthermore, it resulted in the achievement of complete resection in all the patients, leading to a high rate of postoperative seizure freedom [6].

1)
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