Epilepsy Surgery Due to Gliotic Scar Lesion in a Patient with Disconcordant Electroencephalogram Features

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Abstract

Surgical evaluation should be considered in all patients with refractory focal epilepsy. However, surgical treatment may be neglected in patients with refractory epilepsy associated with scar lesions. This case report presents a 20-year-old woman with refractory seizures who presented with a sequel gliotic lesion in the left frontal region due to intracranial hemorrhage during infancy. The patient's seizures were often hyperkinetic during sleep. She was evaluated as a surgical candidate because she had seizures 3-4 days a week under four antiseizure agents. The electroencephalogram revealed prominent interictal discharges in the contralateral hemisphere. Resective surgery was planned after discussion with the epilepsy surgery council. Frontal lobectomy was performed. The patient has been followed up for 5 months without seizures and motor deficits.

Keywords: Refractory, focal, epilepsy, resective, surgery

INTRODUCTION

Approximately 20-30% of patients with epilepsy are refractory and 5-10% may be candidates for surgery.[1] It has been shown that approximately 60% of patients with drug-resistant focal epilepsy become seizure-free 1 year after epilepsy surgery, and it is known that resective surgery is increasingly accepted as a curative treatment option.[1] Although the most successful outcomes of epilepsy surgery are hippocampal sclerosis, low-grade tumors, and vascular malformations, successful results are also obtained in epilepsy associated with glial scars. However, in clinical practice, surgical options may be neglected for refractory epilepsy associated with scar lesions.[2] Surgical evaluation should be considered in all patients with refractory focal epilepsy and presumed lesion.

Ictal and interictal discharges are usually expected ipsilateral to the lesion in patients with epilepsy. However, even rare, contralateral or bilateral ictal electroencephalogram (EEG) abnormalities can be observed in some patients with early-onset unilateral hemispheric lesions.[3]

In this report, we present the successful surgery of a patient with refractory epilepsy associated with scar tissue who presented with contralateral EEG findings.

CASE PRESENTATION

A 20-year-old female patient was admitted to the outpatient clinic with refractory seizures. She had intracranial hemorrhage due to late hemorrhagic disease in a newborn at the age of 45 days. Between 45 days and 2 years of age, the patient was followed up with phenobarbital because of seizures. After a seizure-free period between 2 and 9 years of age, seizures started again at the age of 9 years. The patient's seizures were often hyperkinetic seizures, such as fear, screaming, getting up, and trying to run in sleep with loss of awareness. The seizures occurred 3-4 nights a week and clustered 4-5 times a night. She had multiple traumatic injuries due to seizures. Motor mental development was normal. Cranial magnetic resonance imaging (MRI) revealed a large cystic encephalomalacia area in the left frontal

lobe (Figure 1). Anti-seizure medications were valproate 1000 mg/day, levetiracetam 2000 mg/day, clobazam 30 mg/day, and lacosamide 400 mg/day. It was learned that she had previously used carbamazepine and lamotrigine but could not continue the treatment due to allergic reactions. The patient was evaluated as a surgical candidate due to refractory epilepsy.

Preoperative evaluation of the patient included interictal-ictal video EEG monitoring, ^{18}F-fluoro-deoxy-glucose (FDG) positron emission tomography (PET)-MRI, neuropsychological testing, functional MRI, and diffusion tensor imaging according to the epilepsy protocol. Ictal EEG recordings did not show lateralizing or localizing features due to muscle artifacts. Interictal EEG showed mild bioelectrical disorganization and spike wave activities prominent in the right frontocentral region (Figure 2). Neuropsychological tests suggested deficits related to the dorsolateral prefrontal cortex. PET-MRI showed hypometabolism in the gliotic sequelae area. Functional MRI showed that speech function was transferred to the right hemisphere, and right hand motor function was in the anatomically expected location (Figure 3a, 3b). Resective surgery was planned. During surgery, the left primary motor cortex was first mapped via intraoperative neuromonitorization. Then, the cortical resection margin was determined so that it would remain posterior to the sequelal gliotic tissue but would not threaten motor functions. Frontal lobectomy was performed via cathodal stimulation during resection to ensure that the area was safely separated from the corticospinal tract border (Figure 4). Language and hand motor functions were not affected by the surgery, including the early postoperative period. Anti-seizure treatment was reduced to 400 mg/day of lacosamide and 20 mg/day. The patient has been seizure-free for 8 months.

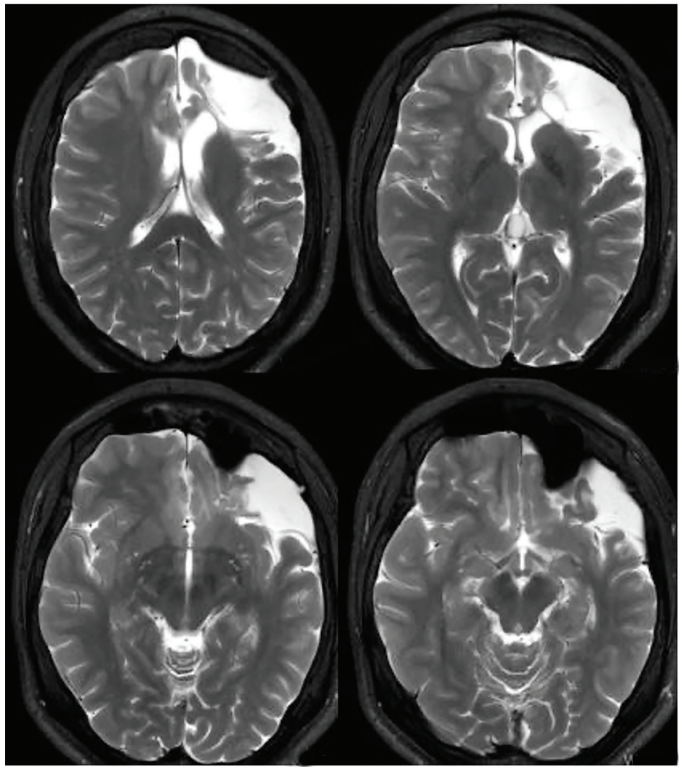

Figure 1. Cranial MRI (axial T2) showing cystic encephalomalacic area in the left frontal lobe
MRI: Magnetic resonance imaging

MAIN POINTS

- Surgical evaluation should be considered in every patient with refractory focal epilepsy with a presumed lesion.
- The contralateral localisation of interictal discharges should not be considered as a contraindication for surgery unless proven with other tests.
- Although the most successful outcomes of epilepsy surgery are hippocampal sclerosis, low grade tumours and vascular malformations, successful outcomes are also obtained in epilepsy associated with glial scars.

DISCUSSION

Surgery for epilepsy remains underutilized in developed countries. The reasons for this may include a lack of knowledge of physicians and patients, cost of treatment, or lack of medical equipment.[1] Especially in patients with glial sequelae secondary to perinatal asphyxia and associated intractable seizures, physicians and the public have limited knowledge about the risks of surgery. However, epilepsy surgery is associated with a reduction in mortality in patients with drug-resistant epilepsy as well as complete elimination or reduction in the frequency of seizures.

Histopathological diagnosis is an important prognostic factor of epilepsy surgery outcomes. In a study evaluating the relative proportion of brain lesions using postoperative histopathological findings obtained from 541 patients undergoing epilepsy surgery; hippocampal sclerosis, low-grade epilepsy-related brain tumors, cortical developmental malformations, glial scars, vascular malformations, and encephalitis-related lesions were evaluated. According to this study, lesions compatible with glial scars were detected in 4.75% of adult patients and 6.06% in children.[4] Although the most successful outcomes of epilepsy surgery are hippocampal sclerosis, low-grade tumors, and vascular malformations, successful results are also obtained in epilepsy associated with glial scars. The rate of reduction in seizure frequency of patients with glial scars after surgery was 62.1% at the end of the 1st year, 59% at the end of the 2nd year, and 56.1% at the end of the 4th and 5th years.[2] However, in clinical practice, the surgical option may be neglected in patients with refractory epilepsies associated with glial scars.

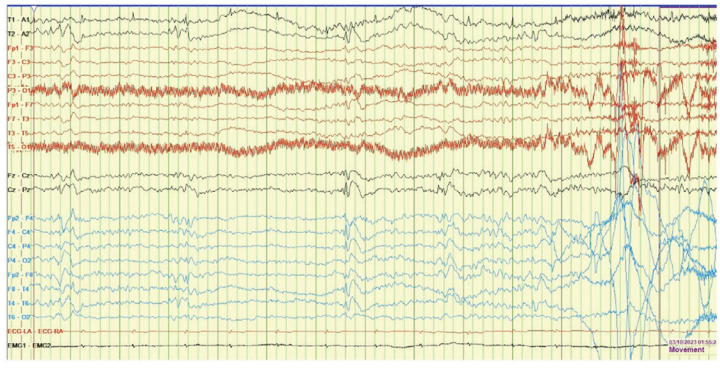

Figure 2. Spike and wave activity in the right hemisphere

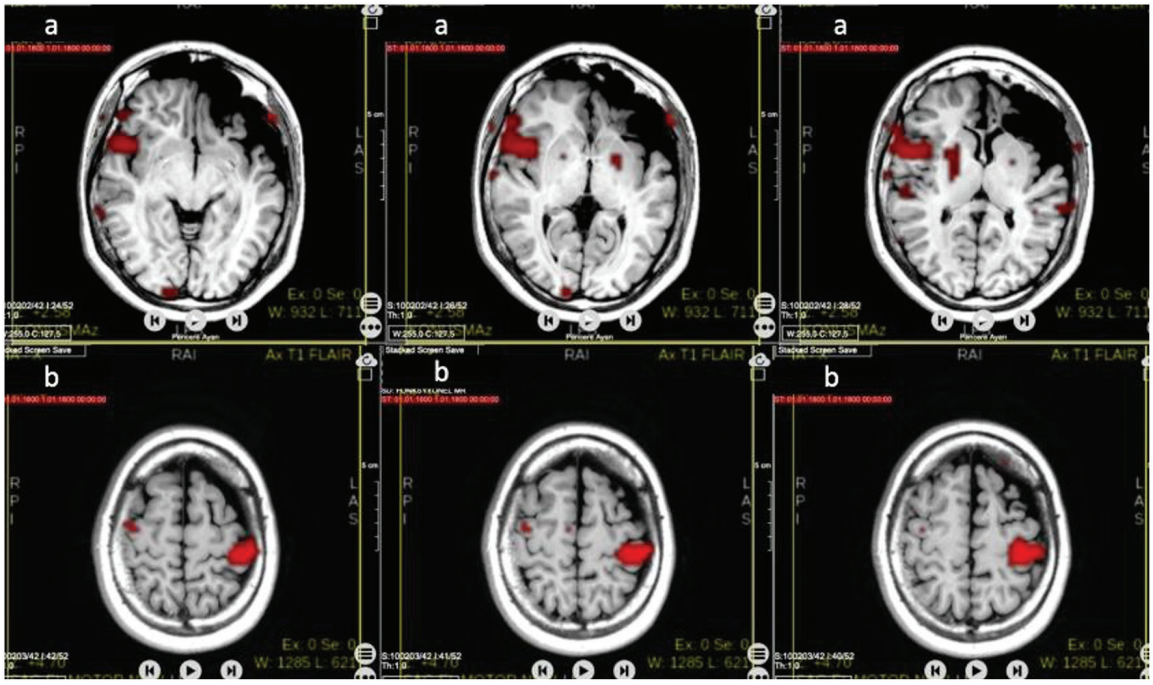

Figure 3. a) Language fMRI and, b) right hand motor function fMRI
MRI: Magnetic resonance imaging

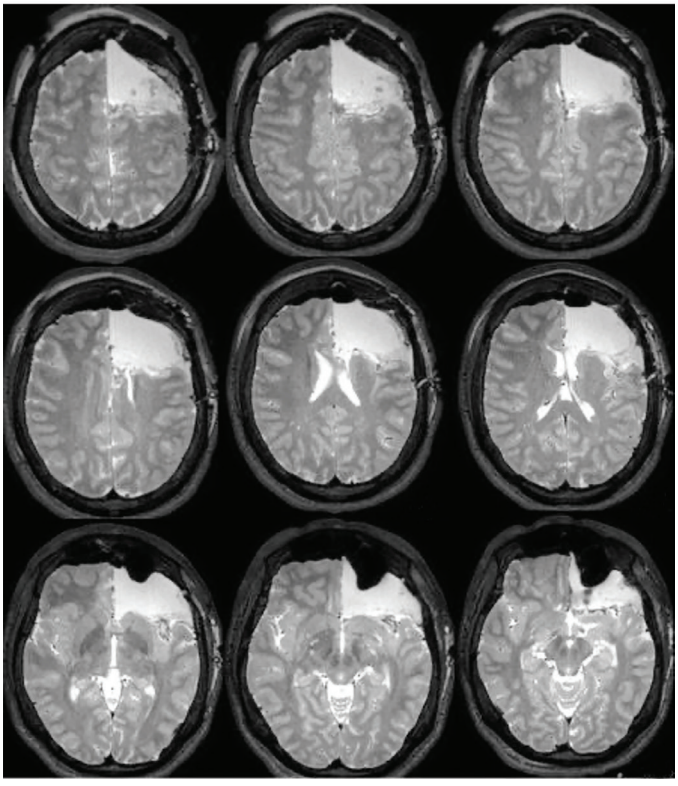

Figure 4. Postoperative MRI (axial T2) after frontal lobectomy
MRI: Magnetic resonance imaging

Surgical outcomes are believed to be worse in extratemporal lobe epilepsy than in temporal lobe epilepsy. However, the outcome may be good, especially in patients who underwent complete resection, as in our case.[5]

In the present case, interictal discharges occurred more frequently and with higher amplitude in the contralateral hemisphere. Contralateral or bilateral ictal EEG abnormalities although rare, can be observed in some patients with early-onset unilateral hemispheric lesions.[1,3] One possible theory is that the damaged hemisphere initiates the seizure discharge but is unable to propagate it unilaterally; therefore, the discharge quickly spreads to the contralateral hemisphere. Another hypothesis is the deep location of the epileptogenic zone in the damaged hemisphere and scalp electrodes, leading to an asymmetric ictal pattern with reduced amplitude on the side of the lesion.[3] Although interictal discharges are in the opposite hemisphere of the lesion, when the epileptic zone is compatible with lesion localization proven by other preoperative evaluation methods, the surgical option should not be ignored.

CONCLUSION

In this case report, we aimed to emphasize the importance of surgery for epilepsy associated with scar tissue. In addition, contralateral localization of interictal discharges should not be considered as a contraindication for surgery unless proven with other tests. Although the lesion was located in the left hemisphere, the patient had no motor deficit in the early period or during the current follow-up period after lobectomy. Resective surgery for the treatment of destructive space-occupying glial scar tissue resulted in a successful outcome with a seizure-free and motor deficit-free clinical outcome.

Ethics

Informed Consent: A written informed consent form was obtained from each patient.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Ö.E.Ç., B.G.A.T., C.İ., M.U., Concept: E.K., B.G.A.T., Design: E.K., B.G.A.T., Data Collection or Processing: Ö.E.Ç., B.G.A.T., E.T., Ç.Ö., Analysis or Interpretation: Ö.E.Ç., C.İ., M.U., Literature Search: Ö.E.Ç., B.G.A.T., Writing: E.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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