

## CASE REPORTS

# Gelastic seizures in a child with frontal lobe epilepsy controlled by topiramate monotherapy

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### Abstract

We report a childhood case of localization-related epilepsy manifesting frequent gelastic seizures, which were successfully treated with topiramate (TPM) monotherapy. The seizures were not associated with feelings of mirth. High-resolution three-tesla magnetic resonance imaging revealed no structural abnormality. Interictal 18F-fluorodeoxyglucose positron emission tomography showed hypometabolism over the entire right hemisphere. Single-photon emission computed tomography imaging, both ictal and interictal, demonstrated no significant findings. Interictal electroencephalography (EEG) showed paroxysms in the right frontal region. Ictal video EEG demonstrated diffuse attenuation, followed by fast activities and spike-wave complexes predominantly over the right hemisphere. At the ictal EEG onset, low amplitude paroxysmal fast activity was recorded over the F8-T4 region. The seizures were considered to have originated from the right frontal lobe. TPM monotherapy resulted in complete cessation of the seizure. We suggest that TPM should be considered as a valuable tool for treating childhood intractable gelastic seizures, which are not due to hypothalamic hamartoma.

### INTRODUCTION

Gelastic seizures, which are characterized by unnatural forced laughing, are quite rare. They are commonly associated with hypothalamic hamartomas.<sup>1</sup> However, the gelastic seizures may also develop in patients without hypothalamic hamartoma.<sup>1-8</sup> Although most cases are symptomatic, idiopathic and cryptogenic cases with no evidence of cortical structural lesions have also been described.<sup>1,7</sup>

In this report, we present an 8-year-old patient without structural lesions, manifesting gelastic seizures. We speculated that the seizures originated within the right frontal lobe. The seizures were suppressed by topiramate (TPM) monotherapy. The objective of this report is twofold: first, to diagnose the seizure origin on the basis of the seizure semiology, electroencephalography (EEG) and imaging, and then to describe the effectiveness of TPM. To our knowledge, this is the first report of the successful treatment of gelastic seizures using TPM.

### CASE REPORT

An 8-year-old boy was referred for episodes of impairment of consciousness that had been occurring for one month. He had no history of convulsions, and no family members had seizure disorders. Results of a neurological examination were normal. The patient had stereotyped seizures that were characterized by a sudden onset of laughing, and his facial expression was symmetrical during the seizure event. Most of the seizures were accompanied by a mild clouding of consciousness, but he could maintain eye contact with his mother and was responsive during these episodes. There were no manifestations of tonic or clonic movements. The seizures had no external triggers, and he had no feelings of mirth just before or during the attacks. He recovered consciousness completely, immediately following the seizure. Ninety percent of the seizures occurred while the patient was awake, and the rest occurred while he was sleeping. These episodes lasted 30 to 70 seconds and occurred with a daily frequency of 5 to 10 times. No other type of seizure was seen.

A scalp EEG showed a marked asymmetry of the background activity, with slow waves in the right hemisphere (Figure 1A), and interictal spike discharges were observed in the right frontal region (F4). A scalp long-term monitoring video EEG was performed for two days, and 15 habitual seizures were captured. An ictal EEG change consisted of a diffuse attenuation followed by fast activities and spike-wave complexes that were dominant in the right hemisphere (Figure 2). Three-tesla magnetic resonance imaging (3T-MRI), including a sequence with a slice thickness of 1.0 mm, revealed no structural abnormality. An interictal 18F-fluorodeoxyglucose positron emission tomography (FDG-PET) showed hypometabolism over the entire right hemisphere. Single-photon emission computed tomography (SPECT) images, both ictal and interictal, demonstrated no significant findings. The Wechsler intelligence scale for children IV (WISC-IV) revealed a mild mental retardation with an intelligence quotient score of 66.

The seizures were resistant to carbamazepine, diazepam, clobazam, and an intravenous injection of fosphenytoin. The seizures gradually increased in frequency up to 70 times a day. Then, we replaced other treatments with TPM. One month after beginning TPM therapy, the seizures ceased at a dosage of 4.6 mg/kg/day. He was completely seizure free for nine months on the TPM monotherapy without any adverse effects.

**DISCUSSION**

In the present case, there was no hypothalamic hamartoma. Gelastic seizures without hypothalamic hamartoma have been described in frontal lobe<sup>2-6,8</sup> and temporal lobe epilepsy.<sup>9</sup> In our case, the ictal EEG change was preceded by F8-T4 fast activity; however, this alone could not differentiate the origin, whether the seizures originated from the frontal or the temporal lobe. Semiological investigations have revealed that the gelastic seizures of temporal lobe epilepsy have a mirthful

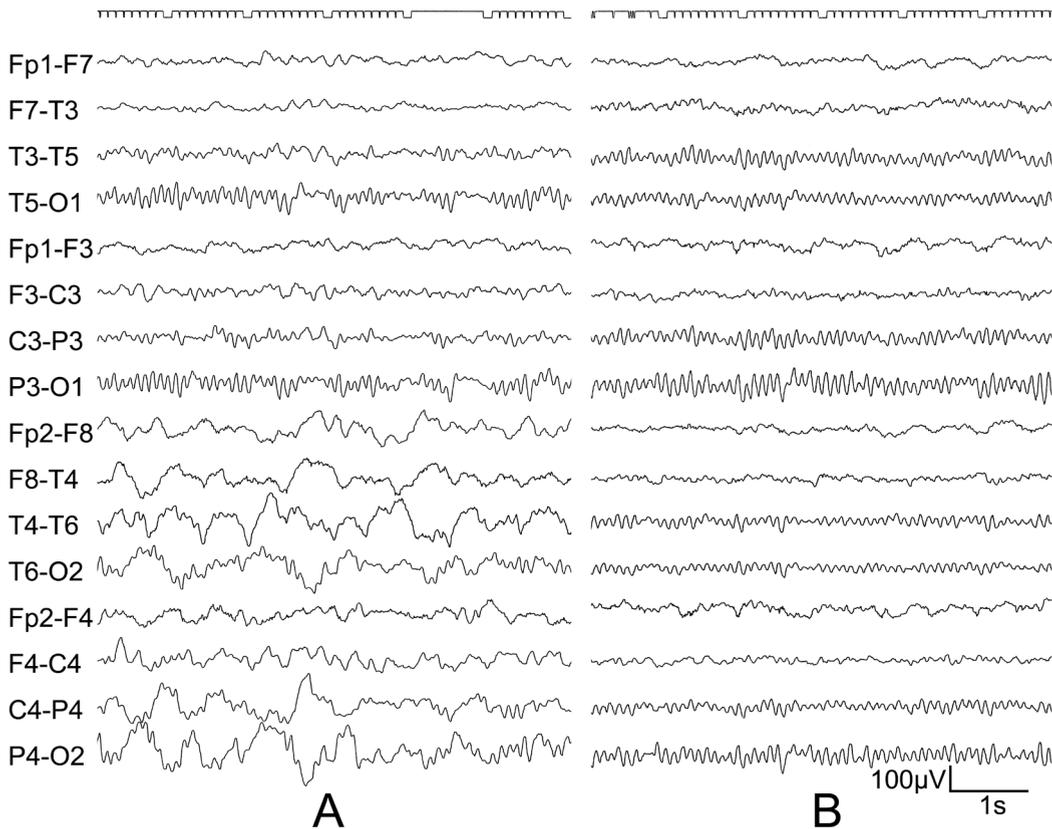


Figure 1. Interictal EEG recordings while the patient was awake. A: EEG recording at the initial visit. The patient was not receiving any medications. Note a marked slowing of the background activity on the right hemisphere. B: EEG recording five months after beginning TPM therapy. The background activities are symmetrical.

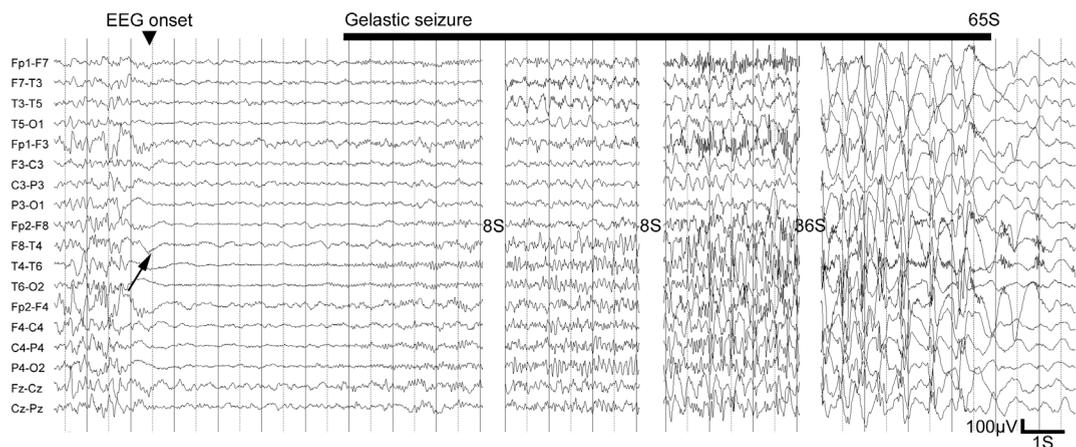


Figure 2. Video EEG recording of the gelastic seizure during sleep. Ictal EEG onset was characterized by a diffuse attenuation (arrow head). Note a low amplitude paroxysmal fast activity localized at F8-T4 (arrow). Four seconds later, mid-voltage fast activities were widely observed in the right hemisphere overlying the left frontal region (Fp1-F7, Fp1-F3). They were then followed by spike and wave complexes, demonstrating a right hemispheric dominance.

quality<sup>9</sup>, whereas those of frontal lobe origin are not associated with feelings of mirth.<sup>2</sup> The laughter in our case was not accompanied by a subjective feeling of mirth, and an interictal EEG showed frontal spikes. These findings suggested that the seizures originated in the frontal lobe in this patient. We also wanted to determine whether the seizures arose from the right or the left hemisphere. Epileptic ictal EEG changes were predominant on the right side, and the FDG-PET demonstrated right hemispheric hypometabolism. The slowing of the right hemispheric background EEG activity should be an important finding. These observations suggest that the seizure originated from the right hemisphere. Thus, we concluded that the gelastic seizures in our patient were derived from the right frontal lobe.

We presented a distinct ictal EEG change. Few authors have described ictal scalp EEGs of gelastic seizures with a frontal lobe origin, and the findings were diverse; some authors found no significant EEG change<sup>5,8</sup>, whereas others reported apparent EEG changes.<sup>3,4</sup> An explanation for the diversity in previous reports is that they may have included a variety of seizure onset zones within the frontal lobe. Several regions have been described as being associated with gelastic seizures within the frontal lobe: the mesial and lateral aspects of the superior frontal gyrus, the cingulate gyrus, and orbitofrontal gyrus.<sup>2,4-6,8</sup> In these investigations, the precise seizure onset zone was identified using SPECT and/or intracranial EEG. In the present case, the SPECT provided no significant

information, and no invasive evaluations such as an electrocorticogram were performed. Thus, the exact focal location of the seizure onset within the right frontal lobe was not identified.

Although gelastic seizures were described as intractable, a few medications were reported to be effective in patients without hypothalamic hamartoma; these medications were carbamazepine, vigabatrin, phenobarbital, clonazepam, valproic acid, levetiracetam and corticosteroids.<sup>1,3,7</sup> There has been no previous report of TPM used to effectively treat gelastic seizures. The recommended maintenance dosage of TPM is 5 to 9 mg/kg/day for children.<sup>10</sup> We treated our patient using a relatively low dosage. The most frequently reported adverse effects in patients treated with TPM are somnolence, anorexia, fatigue, nervousness, concentration/attention/memory difficulties, aggression, and weight loss.<sup>10</sup> Although our patient did not report these symptoms for the first 10 months after beginning TPM therapy, he will be carefully monitored while undergoing treatment with TPM.

Thus, we suggest that TPM should be considered as an option for treating childhood intractable gelastic seizures that are not due to hypothalamic hamartoma.

## DISCLOSURE

Conflict of interest: None

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