Epilepsy & Behavior Case Reports 6 (2016) 52–54

Contents lists available at ScienceDirect

Epilepsy & Behavior Case Reports

journal homepage: www.elsevier.com/locate/ebcr

Case Report

Praxis-induced reflex seizures mainly precipitated by writing due to a parietal focal cortical dysplasia☆

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ARTICLE INFO

Article history:
Received 3 June 2016
Accepted 5 August 2016
Available online 13 August 2016

Keywords:
Reflex
Epilepsy
Praxis
Writing

ABSTRACT

We report the case of a 23-year-old left-handed woman with medically intractable praxis-induced reflex seizures mainly precipitated by writing. Selective resection of subtle end-of-sulcus cortical dysplasia in the right inferior parietal lobule resulted in freedom from seizures. To the best of our knowledge, this is the first case of praxis-induced reflex seizures mainly precipitated by writing in which a focal lesion was found and treated successfully by surgery.

1. Introduction

Reflex seizures refer to seizures triggered immediately or within a short delay, by specific motor, sensory, or cognitive stimuli [1]. Praxis induction, one of the well recognized subtypes, is defined as the precipitation of epileptic seizures or epileptiform EEG discharges by complex, cognition-guided tasks often involving visuomotor coordination and decision-making, such as playing chess, cards, or other games; calculation; manipulation; drawing; and writing [2]. Induction by writing has been associated with both praxis induction and/or primary reading epilepsy [3]. Cumulative work over the years has established that praxis induction is strongly linked with idiopathic generalized epilepsy, particularly juvenile myoclonic epilepsy [3,4]. Here, we describe a case of praxis-induced reflex seizures precipitated mainly by writing associated with a focal epileptogenic lesion rendered seizure-free by lesionectomy.

2. Case report

A 23-year-old left-handed woman with no significant past medical history was referred to our institution because of medically intractable epilepsy. Her family history included a grandfather with posttraumatic epilepsy. The seizures started at age 10. During daytime seizures, the patient would complain of blurred vision, eye-blinking, clumsiness, or loss of control of her left hand to the point where she would sometimes drop objects and experience slight body stiffening and mild hyperventilation. The spells would last ~15 s and recur ~3 times per day (up to 20/day in the past). Over the years, she noticed that most seizures occurred during left-handed tasks requiring visuomotor coordination, such as pouring juice in a glass and cutting food and, particularly, when writing. The patient also reported weekly nocturnal seizures when she performed similar tasks in a dream. She would then wake up and have the impression that her dream was continuing in addition to vertigo, body stiffening, and labored breathing. Brief alteration of consciousness was quite rare, and evolution to a bilateral convulsive seizure occurred only once.

Video-EEG monitoring disclosed frequent right centroparietal interictal epileptiform discharges. Four stereotypical seizures triggered by writing were recorded. Electrically, repetitive preictal polyspike and wave discharges over the right centroparietal leads appeared within 3 s of writing, followed by low-voltage fast activity increasing in amplitude and decreasing in frequency maximum over right more than left centroparietal regions (Fig. 1, Video 1). A fifth seizure, electrophysiologically identical, occurred during sleep without obvious clinical manifestations. Unfortunately, the patient could not recollect the next day if she had been writing in her dreams. MRI revealed blurring and thickening of the gray–white matter junction consistent with focal cortical dysplasia located in the right inferior parietal lobule, within the depth of the intraparietal sulcus at the junction with the postcentral

☆ The present work was not supported by a grant or other funding. It was presented as an oral communication at the 41st Annual Meeting of the Canadian Congress of Neurological Sciences, on June 15, 2006, in Montreal, Canada.

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http://dx.doi.org/10.1016/j.ebcr.2016.08.001

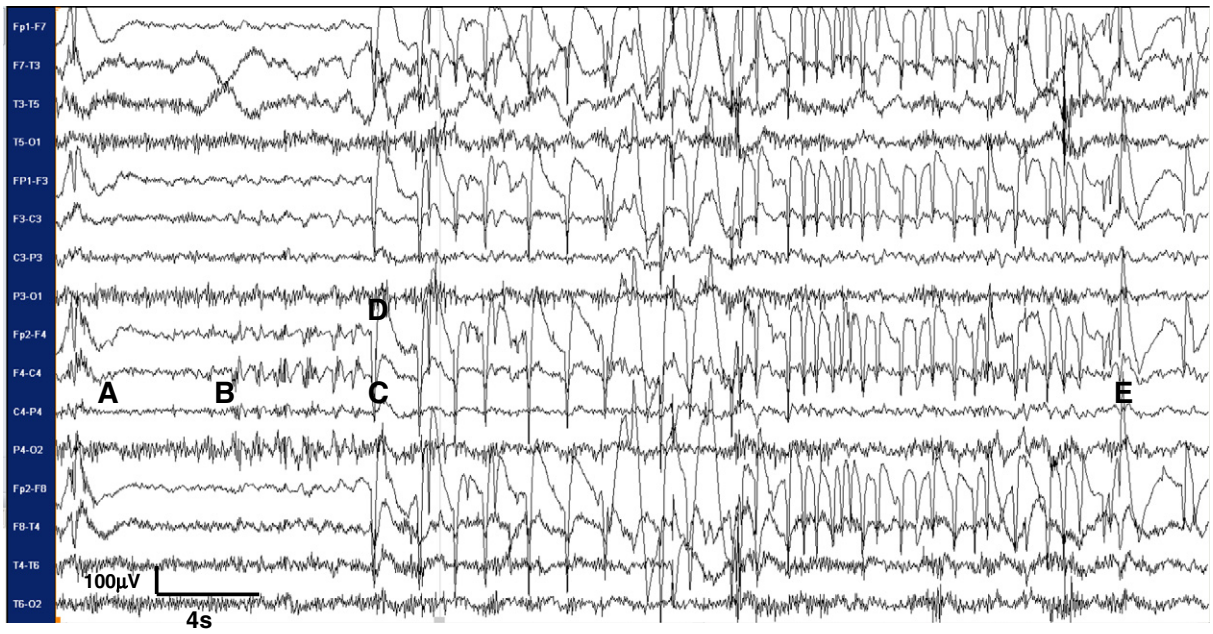

Fig. 1. EEG recording of a writing-induced reflex seizure (low- and high-frequency filters were set at 0.5 and 35 Hz, respectively): A) onset of writing; B) preictal repetitive polyspike and wave discharges over right centroparietal leads; C) transition to the low-voltage, fast activity pattern subsequently increasing in amplitude and decreasing in frequency; D) eye-blinking artifact; E) seizure offset.

sulcus (Fig. 2A/B). Positron emission tomography displayed an area of hypometabolism over the right parietal lobe which seemingly correlated with the localization of the observed cortical dysplasia. Ictal single photon computed tomography was nonlocalizing, revealing multifocal cortical and subcortical areas of hyperperfusion. Neuropsychological evaluation was normal. Functional MRI showed left hemisphere dominance for language.

Because the patient had previously failed 6 antiseizure drug trials (carbamazepine, valproate, lamotrigine, topiramate, clobazam, and vigabatrin) and deemed her seizures to be disabling, she underwent neurosurgical removal of the cortical dysplasia (Fig. 2D). Neuronavigation and electrocorticography were essential to guide the resection (Fig. 2C). No pathology was available since the performed technique of subpial cortectomy was suction-based. The presumed cortical dysplasia was not

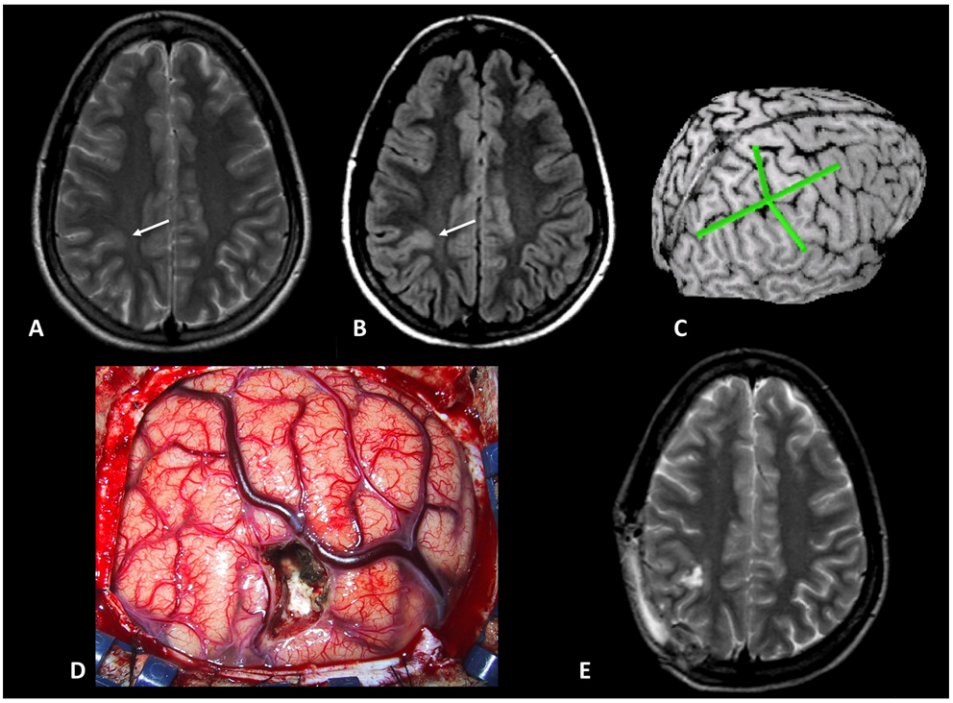

Fig. 2. Preoperative axial T2-weighted (A) and FLAIR (B) images showing thickening and blurring of the gray–white matter junction within the depth of the right intraparietal sulcus (green mark on the corresponding cortical surface in (C)). Intraoperative images (D) after microsurgical resection of the corresponding epileptogenic focus, guided preoperatively by electrocorticography (not shown). Postoperative axial T2-weighted image (E) confirming excision of the focal cortical dysplasia.

seen on postoperative MRI (Fig. 2E). Postoperatively, she experienced clumsiness of her left hand which resolved over a period of 3 weeks. She has been seizure-free for the last nine years without antiseizure medication.

3. Discussion

To the best of our knowledge, this is the first reported case of praxis-induced seizures mainly precipitated by writing and focal cortical dysplasia in the inferior parietal lobule cured by surgery. Until now, most cases of praxis induction have been linked with generalized epilepsy syndromes, particularly juvenile myoclonic epilepsy (JME). In the latter cases, seizures typically consist of single or repetitive arrhythmic myocloni in muscles involved in the precipitating activity, respond well to valproate, and are associated with generalized spike/polyspike and wave complexes present in the EEG [3]. It is hypothesized that these movements activate specific functional subsystems preferentially hyperexcitable and perhaps abnormally coupled with other areas constituting the critical mass needed for seizure induction [2]. This network is often described as a parietofrontotemporal network which encompasses multiple cortical areas including the intraparietal sulcus, the superior parietal sulcus, the inferior parietal lobule, the middle frontal gyrus, the premotor cortex [5], and the inferior frontal cortex [6]. In right-handed individuals, there is a body of evidence suggesting a left lateralization of the network involved in praxis representation. However, recent studies demonstrated some involvement of the right hemisphere in left-handed patients despite the core of their praxis representation network remaining in the left hemisphere [7]. Those areas include the inferior parietal cortex as well as frontal and prefrontal areas [7]. In our patient, the identification of cortical dysplasia in the inferior parietal lobule is not necessarily surprising since most authors associate praxis-induced seizures with parietal lobe activation [8]. Moreover, malformations of cortical development have been reported with other types of reflex seizures, such as those triggered by eating, loud noises, sensory stimulation, and startle [9]. It is therefore conceivable that the observed cortical dysplasia located in the right inferior parietal lobule could act as a predisposing hyperexcitable connectome for praxis-induced epilepsy.

This case also shows the peculiar aspect of nocturnal seizures in which the patient experienced seizures while dreaming of writing. Thinking of writing in graphogenic epilepsy has already been previously described [2,10]. Inoue and Zifkin hypothesized that a biparietal network involved in the process of thinking is sufficient and necessary to trigger a seizure. They proposed a second mechanism in which hyperexcitability of the sensorimotor cortex linked to other areas by corticocortical pathways (allowing recruitment of sufficient critical mass for seizure induction) is necessary for seizure triggering and that this network can be activated by the process of thinking [2].

Kasteleijn-Nolst Trenité emphasized the non-negligible prevalence of reflex seizures in patients with presumed spontaneous seizures [11]. Precise clinical history and investigations are essential to obtain the appropriate diagnosis and offer the appropriate treatment. The fact that our patient had drug-resistant epilepsy and was undergoing evaluation as a surgical candidate may have influenced the acquisition of a more precise history of the seizure semiology and the confirmation of reflex seizures.

Reflex epilepsy is often well controlled with medication. However, few of these cases tend to be drug-resistant when induced by malformations of cortical development [9]. In this particular situation, surgery has been proven successful in carefully selected patients [9]. To our knowledge, this represents the first case of praxis-induced epilepsy mainly precipitated by writing successfully managed with surgical intervention.

4. Conclusion

While most likely a rare occurrence, this case report points out the possibility of identifying focal lesions in patients with praxis-induced seizures mainly precipitated by writing.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.ebcr.2016.08.001.

Acknowledgments

We thank Stéphane Gosselin for his help with the videotaped recordings.

Disclosures

None of the authors has any conflict of interest to disclose.

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