



Perceived self-control of seizures in patients with uncontrolled partial epilepsy

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KEYWORDS

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Partial seizures;
Aura;
Prodrome

Summary Many patients with epilepsy have warning symptoms prior to seizure onset, and some of these individuals report the ability to abort or prevent these seizures. We investigated the clinical characteristics of perceived self-control of seizures in 174 patients with uncontrolled partial epilepsy. The warning symptoms were categorized as premonitory (prodrome) and as initial symptoms of simple partial seizure onset, depending on the relationship between the warning events and the ensuing seizures. About 50% of the patients with simple partial seizure onset and about 70% of those with prodrome or premonitory symptoms reported that they could abort or prevent their seizures by various self-developed techniques. Patients who attempted to abort or prevent their seizures reported success rates as high as 80%. The proportion of patients with secondary generalized seizures was significantly lower in patients who tried to abort their seizures than in those who did not ($p < 0.05$). The ability to prevent seizures was significantly higher in patients with brain lesions on MRI than in those without lesions ($p < 0.05$). These results suggest that spontaneously developed methods are helpful in controlling seizures in some patients with uncontrolled partial epilepsy and that the potential success of self-control methods may be influenced by structural abnormalities on brain MRI.

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Introduction

Many people with epilepsy can recognize the precipitants that put them at higher risk of having a seizure.^{1–4} Some of these individuals consciously try to avoid seizure precipitants in order to reduce their seizure frequency.^{2,4,5} It has been documented that some epileptic patients with warning symptoms, such as aura or prodrome are able to abort or

prevent their seizures by self-developed techniques, such as mental or physical activity.^{2,4–8} Based on Lockard's model⁹ of Group 1 epileptic neurons and group 2 weakly epileptic neurons, it has been hypothesized that mental and emotional states, as well as sensory input, can trigger seizures by facilitating the pathological recruitment of group 2 neurons surrounding the epileptic focus of group 1 neurons.^{10,11} Conversely, physiological inhibition of group 2 neurons by psychological interventions allows patients to abort or prevent their seizures by an act of will, representing the basic mechanism for self-control of seizures.

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Patients with partial epilepsy may experience premonitory or initial symptoms preceding their seizures. Seizure onsets related to these symptoms are clinically important because they allow patients time to take action that may abort or prevent their seizures. There are two types of these symptoms, prodrome and simple partial seizure onset, including aura. The latter usually occur only seconds or minutes before the seizure, making a pharmacological approach to their control inadequate. The former symptoms have longer intervals between event and seizure, allowing more complex antiepileptic interventions, including combinations of pharmacological and self-control methods. Sometimes, isolated or clustered auras that do not evolve to overt seizures may develop several hours before the onset of clinical seizures and provide adequate warning of the actual seizure. In these cases, their clinical significance with regard to seizure control would be equivalent to that of prodrome.

Many studies regarding self-control of seizures have focused on seizure precipitants and the initial symptoms of seizure^{2–7}, but there is little knowledge of the clinical significance of prodromal or premonitory symptoms in forecasting ensuing seizures.⁸ More detailed information would be valuable for understanding the mechanism of seizure genesis and for expanding the possibilities of pharmacological as well as non-pharmacological interventions,^{12–17} especially for individuals with poorly controlled seizures. We, therefore, divided warning symptoms into premonitory and initial symptoms, depending on their relationships with the ensuing seizures, and investigated the clinical characteristics of perceived self-prevention or self-inhibition of seizures.

Methods

All adult patients participating in the study were selected from epilepsy outpatient clinics at Asan Medical Center. Patients were consecutively recruited according to the following criteria: (a) a positive diagnosis of partial epilepsy based on both EEG and clinical symptoms; (b) duration of epilepsy for at least 2 years; and (c) having had more than three seizures in the previous year. Exclusion criteria included: (a) any learning disability (e.g. mental retardation or cognitive dysfunction); (b) any history of neurosurgery for treatment of epilepsy; (c) any psychiatric history; and (d) a history of non-epileptic seizures or any suggestion of pseudoseizures. All patients underwent brain MRI and 21-channel scalp EEG recording with sleep activation, hyperventilation, and photic stimulation.

A face-to-face semi-structured interview was conducted by a single epileptologist (S.A. Lee). The interview included open-ended questions regarding awareness of the initial or premonitory symptoms of seizures and the ability to abort or prevent seizures. Patients were asked if they had experienced any initial symptoms of their seizures, defined as simple partial seizure onset, including aura; if so, they were asked if they could abort their seizures by doing something. Patients were also asked if they experienced any premonitory symptoms, defined as forecasting symptoms occurring at least one hour prior to clinical seizures; if so, they were asked if they could prevent their seizures from occurring by doing something. The premonitory symptoms could be prodrome or isolated aura. Prodrome was defined as nonspecific symptoms, different from the patients' initial aura, but consistently forecasting seizure occurrence at least one hour before. Isolated or repetitive auras not evolving to overt clinical seizures may develop and warn of clinical seizures. In cases, in which, seizures occurred in 'clusters' or 'flurries', we regarded only the first seizure when evaluating self-control of seizures. Patients reporting that they could abort or prevent their seizures by doing something were asked about the degree of effectiveness, which was scored as mild, moderate, or very effective.

Clinical information was obtained from patients and their medical records, including age at onset of epilepsy, duration of epilepsy, classification of seizures and epilepsies, seizure frequency in the previous year, secondary generalized tonic clonic seizures in the previous year, and EEG and MRI findings. Partial seizures were classified according to presumptive seizure focus into temporal and extratemporal lobes and sensorimotor areas.

Patients' awareness of the initial or premonitory symptoms and their perceived self-control of seizures were statistically analyzed with respect to demographic or seizure-related variables, using the Chi-square test on the SPSS-PC programs. The significance level (p) was set at 0.05.

Results

Subject characteristics

Demographic and clinical characteristics of the 174 patients in the study are shown in Table 1. There were 89 men and 85 women, of mean age 34.4 years (range 16–61 years). About 85% of patients had complex partial seizures, with the remaining 15% having simple partial seizures. Based on the location of the presumptive seizure focus, 78 patients

Table 1 Demographic and clinical features of 174 epileptic patients.

Gender (M, F)	89, 85
Age (range), year	34.4 (16–61)
Age at Onset (range), year	19.5 (1–56)
Duration of seizure (range), year	14.8 (2–51)
Medical treatment	
Monotherapy	54 (31%)
Polytherapy	120 (69%)
Type of seizure	
Complex partial seizure	148 (85.1%)
Simple partial seizure	26 (14.9%)
Seizure frequency	
4–11 per year	99 (56.9%)
≥1 per month	75 (43.1%)
Generalized tonic clonic seizures in the previous year	
Presence	60 (34.5%)
Absence	114 (65.5%)
Abnormal brain lesions on MRI	
Presence	96 (55.2%)
Absence	78 (44.8%)
Presumptive localization of seizure focus	
Temporal lobe	78 (44.8%)
Extratemporal lobe	37 (21.3%)
Sensorimotor area	19 (10.9%)
Unlocalized	40 (23.0%)

(44.8%) experienced temporal lobe seizures, 37 (21.3%) experienced extratemporal lobe seizures, 19 (10.9%) experienced sensorimotor seizures, and 40 (23%) experienced unlocalized seizures. MRI revealed structural abnormalities in 96 of the 174 (55.2%) patients, including hippocampal sclerosis, mass lesions, trauma-related destructive lesions, cortical dysplasia and encephalomalatic lesions. With regard to antiepileptic drug regimen, 120 patients (69%) were on polytherapy and 54 patients (31%) were on monotherapy.

Initial symptoms and perceived self-inhibition of seizures

Of the 174 patients, 120 had initial symptoms, all of the patients with simple partial seizures and 64.1% of the patients with complex partial seizures, but there was no correlation with location of seizure focus in the latter (Fig. 1). Of the 120 patients, who experienced initial symptoms, 78 tried to abort their seizures. The most frequently applied methods were intense concentration and activities to distract attention. About 80% of these patients reported that their self-inhibition methods were effective in stopping their seizures, with 12 patients reporting that their self-developed techniques were ‘very effective’.

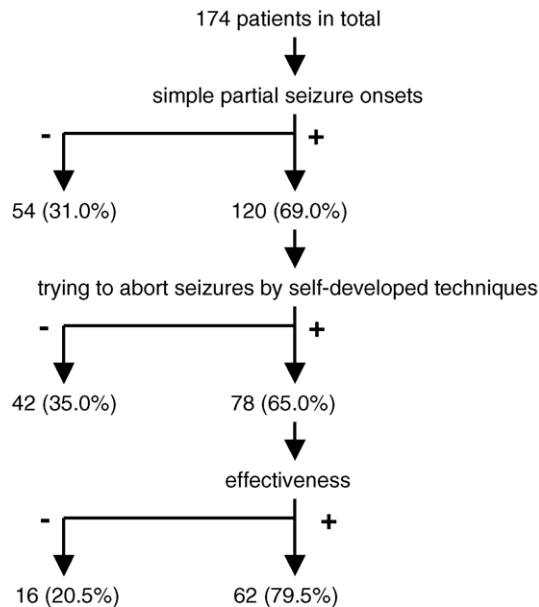


Figure 1 Simple partial seizure onsets were observed in 120 of 174 patients, of whom 78 tried to abort their seizures by self-developed techniques. Sixty-two patients said that their self-inhibition methods were effective in stopping their seizures. (The percentages are relevant to the different patient subgroups.)

The proportion of patients having secondary generalized seizures was significantly lower ($p < 0.05$) in patients who tried to abort their seizures (27%, 21/78) than in those who did not (48%, 20/42) (Fig. 2). There were no between group differences in type of seizure or location of seizure focus.

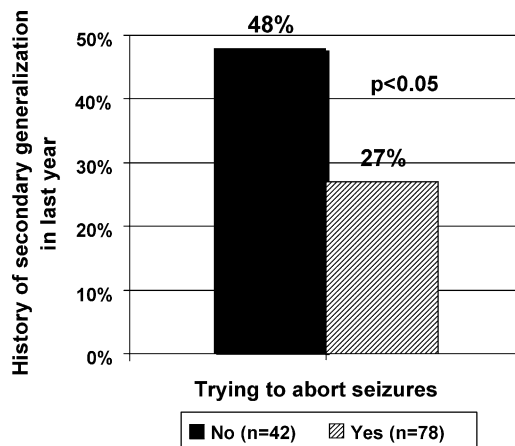


Figure 2 Patients with secondary generalized seizures as a function of attempts to abort seizures. Patients with self-developed techniques for aborting their seizures had significantly fewer secondary generalized seizures than those without such techniques.

Premonitory symptoms and perceived self-prevention of seizures

Forty of 174 patients reported the ability to predict their seizures before the actual onset (Fig. 3). Twenty-one patients reported that their premonitory symptoms presented as prodrome, whereas 19 patients reported that they presented as a cluster of isolated auras. The prodromal symptoms included depressive mood changes, irritability, sleep problems, nausea, and headache, which were consistent in individual patients. Twenty five patients recognized the premonitory symptoms the day the seizure occurred, whereas 15 recognized them one to three days, mostly one day, before the attack. Upon experiencing the premonitory symptoms, 35 patients tried to prevent their seizures by some particular maneuvers, with the most frequent being sleeping, resting, taking additional medicine, or changing their mood. Twenty-seven patients believed these techniques to be effective, with four patients reporting that they were ‘very effective’.

Of 40 patients who recognized their premonitory symptoms, 20 had brain lesions on MRI. The ability to prevent seizures was significantly more common in patients with brain lesions (85%, 17/20) than in those without (50%, 10/20) ($p < 0.05$) (Fig. 4). There were no differences between these two groups in the proportion of patients who tried something, in self-prevention methods, and in their effectiveness.

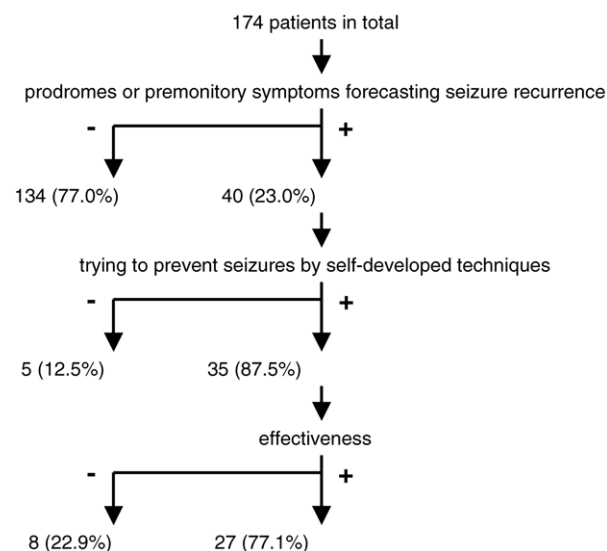


Figure 3 Prodrome or premonitory symptoms were observed in 40 of 174 patients, of whom 35 tried to prevent their seizures by particular maneuvers. Twenty-seven patients believed these techniques to be effective. (The percentages are relevant to the different patient subgroups.)

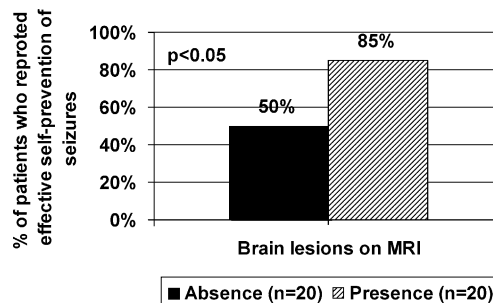


Figure 4 Self-prevention of seizures relative to brain lesions on MRI. Patients with brain lesions reported a greater ability to prevent seizures than those without lesions.

Seizure foci could be presumptively localized in 27 of 40 patients with premonitory symptoms, with 16 being in the temporal lobe, 6 in the extratemporal lobe, and 5 in sensorimotor areas. The types of premonitory symptoms differed significantly relative to seizure localization. Prodrome was significantly more common in patients with extratemporal lobe seizures (83.3%, 5/6) than in those with temporal lobe (56.3%, 9/16) or sensorimotor area (0%, 0/5) seizures ($p < 0.05$).

Patients’ awareness of the initial or premonitory symptoms and their perceived self-control of seizures were not associated with age at onset, duration of epilepsy, seizure frequency in the previous year, or EEG findings.

Discussion

The main focus of this study has been an exploration of clinical characteristics of perceived self-control of seizures in adult patients with uncontrolled partial epilepsy. The data collection was entirely based on self-reporting by patients. No attempts, such as video-EEG monitoring were made to explore the validity of the perceived self-control. We do not know if their seizure control was, in fact, actual self-control of seizure. So, the results should be cautiously interpreted in consideration of the methodological limitation.

We have shown here that a certain proportion of the epileptic patients assayed could control their seizures by various self-developed techniques, with 52% of the patients with simple partial seizure onset and 68% of those with premonitory symptoms being able to abort or prevent their seizures. In studies^{4,5} of patients with medically intractable epilepsy, the proportion of patients reporting self-inhibition of their seizures was somewhat higher, 60 and 68%. In contrast, in studies in which participants were not

limited to those with severe epilepsy but included well-controlled patients, only 23–25% of patients who reported having warnings claimed to be able to inhibit their seizures.⁸ These differences may be related to the differences in study population with regard to disease severity. Patients with poorly controlled seizures would have more opportunity to develop techniques to control their seizures than would patients with rarely occurring epileptic attacks.

We found that up to 80% of our patients who attempted to abort or prevent their seizures were successful in doing so. This is in good agreement with a previous study,⁸ which reported that almost 70% of patients who tried to prevent or inhibit their seizures were successful, although only 23% of those who reported having warnings could inhibit their seizures. These results suggest that only patients who regarded their self-developed techniques as effective persisted in trying to control their seizures, whereas those who regarded them as ineffective no longer did so. Although these data were obtained by self-reporting, the high proportion of self-control in people with poorly controlled seizures suggests that spontaneously developed methods are helpful in controlling seizures in many people with epilepsy. The effectiveness of self-techniques was further supported by our finding that the proportion of patients with secondary generalized seizures was significantly lower (27%) in patients who tried to abort their seizures than in those who did not (48%). This result is in agreement with a previous report⁸ showing that the number of independent seizures is lower in patients who experience warning symptoms.

Our study showed the potential relationship between structural abnormalities on brain MRI and the ability to develop self-prevention methods. About 85% of patients with brain lesions reported being able to prevent their seizures, compared with 50% of patients without brain lesions. The higher success rate in the former group may be explained by mechanisms of cerebral reorganization. That is, structural abnormalities-induced cerebral reorganization may allow patients to be able to more easily suppress firing of epileptic neurons by an act of will. It is generally acknowledged that cerebral reorganization is most likely to occur in the context of an early age of brain insult. An earlier study⁴ showed that patients who regard themselves as having some degree of control over their seizure disorder are more likely to have had an early age of onset of epilepsy (<1 year).

Self-developed inhibition techniques reported by our patients were quite similar to those in previous studies.^{2,4–8} These techniques have been categor-

ized as psychological, motor, or sensory, or combinations of the three.² The most frequently applied methods were concentrating hard on something, clenching the fists, relaxation, physical stimulation, deep breathing, and activities to distract attention. Among our patients, tensing was the most common method, whereas relaxation was the most common in another study.⁵ It is reasonable that people will try to abort their seizures by using an action that counteracts the situations that preceded or triggered them. It also indirectly supports the hypothesis that changes in arousal in any direction can precipitate seizures.^{12,13}

Unlike simple partial seizure onsets, prodromal or premonitory symptoms forecasting the ensuing seizures allow the individuals more time to do something to control their seizures. They may use more complex methods, such as a combination of pharmacological and non-pharmacological interventions.^{12–17} We found, however, that most of our patients used simple, non-pharmacological methods, including sleeping, resting, or changing mood. Only a small number of these patients reported that they took additional antiepileptic drugs.

Little is known about prodrome and its prevalence. It is not uncommon, however, that patients or parents of children with epilepsy report the occurrence of prodromal symptoms.^{18,19} Of our patients, 12% of those with uncontrolled partial seizures reported prodrome, with symptoms, including depressive mood changes, increased irritability, mood lability, sleep problems, nausea, and headache, which were consistent in individual patients. The proportion of patients with prodrome may differ according to seizure localization. In our study, prodrome was more frequently recognized in patients with extratemporal lobe seizures.

Further research is required to determine the validity of any claims to self-control of seizures and to develop more effective self-control methods, including combinations of pharmacological and non-pharmacological interventions.

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