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Review

Self-control of epileptic seizures by nonpharmacological strategies

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ABSTRACT

Despite the unpredictability of epileptic seizures, many patients report that they can anticipate seizure occurrence. Using certain alert symptoms (i.e., auras, prodromes, precipitant factors), patients can adopt behaviors to avoid injury during and after the seizure or may implement spontaneous cognitive and emotional strategies to try to control the seizure itself. From the patient's view point, potential means of enhancing seizure prediction and developing seizure control supports are seen as very important issues, especially when the epilepsy is drug-resistant. In this review, we first describe how some patients anticipate their seizures and whether this is effective in terms of seizure prediction. Secondly, we examine how these anticipatory elements might help patients to prevent or control their seizures and how the patient's neuropsychological profile, specifically parameters of perceived self-control (PSC) and locus of control (LOC), might impact these strategies and quality of life (QOL). Thirdly, we review the external supports that can help patients to better predict seizures. Finally, we look at nonpharmacological means of increasing perceived self-control and achieving potential reduction of seizure frequency (i.e., stress-based and arousal-based strategies). In the past few years, various approaches for detection and control of seizures have gained greater interest, but more research is needed to confirm a positive effect on seizure frequency as well as on QOL.

1. Introduction

Epilepsy is the most common neurological disease, affecting between 40 to 70 persons per 100,000 in the world [1] and between 55 and 60 per 100,000 in Europe [2]. The disease is defined by the chronic and spontaneous repetition of seizures. Among patients with epilepsy (PWE), seizures in 30% remain drug-resistant despite optimal administration of pharmacological treatments [3]. For these patients, curative or palliative intervention (i.e., gamma knife, radiosurgery, thermocoagulation, radiofrequency ablation) can be proposed. However, these methods are not accessible for all patients, are not always completely effective, or may be refused by the patients. Interestingly, some patients describe employing certain cognitive, emotional, and behavioral strategies that, in their personal experience, can reduce seizure intensity or even prevent seizure occurrence [4–6]. In particular, clinical features that warn of an impending seizure are especially useful, in order for the patient to be able to use these strategies effectively [7,8]. This review will focus on nonpharmacological strategies developed by PWE that attempt to prevent the consequences of seizures or to control the seizure itself. Various alert symptoms (due to seizure aura, prodrome, or precipitant factors) that patients can use to anticipate seizures will be described. The relationship between anticipation of seizure and self-control of seizures will be examined. Therapeutic possibilities for enhancing anticipation and self-control of seizures in PWE will then be reviewed.

2. How do patients anticipate their seizures?

The unpredictability of seizures is one of the most disabling aspects of drug-resistant epilepsy. It is indeed the reason for elevated risks of major accident or death, feeling of loss of control, psychosocial handicap, and need for long-term antiepileptic treatment [9]. Predicting seizure occurrence could have a positive impact on quality of life (QOL) and could increase the efficacy of pharmacological and nonpharmacological treatments [9]. Many patients report experiencing subjective manifestations that may be used as alert symptoms to anticipate seizures. These can involve sensory, behavioral, cognitive, or emotional changes and are specific to each individual [10]. They include “auras” that precede

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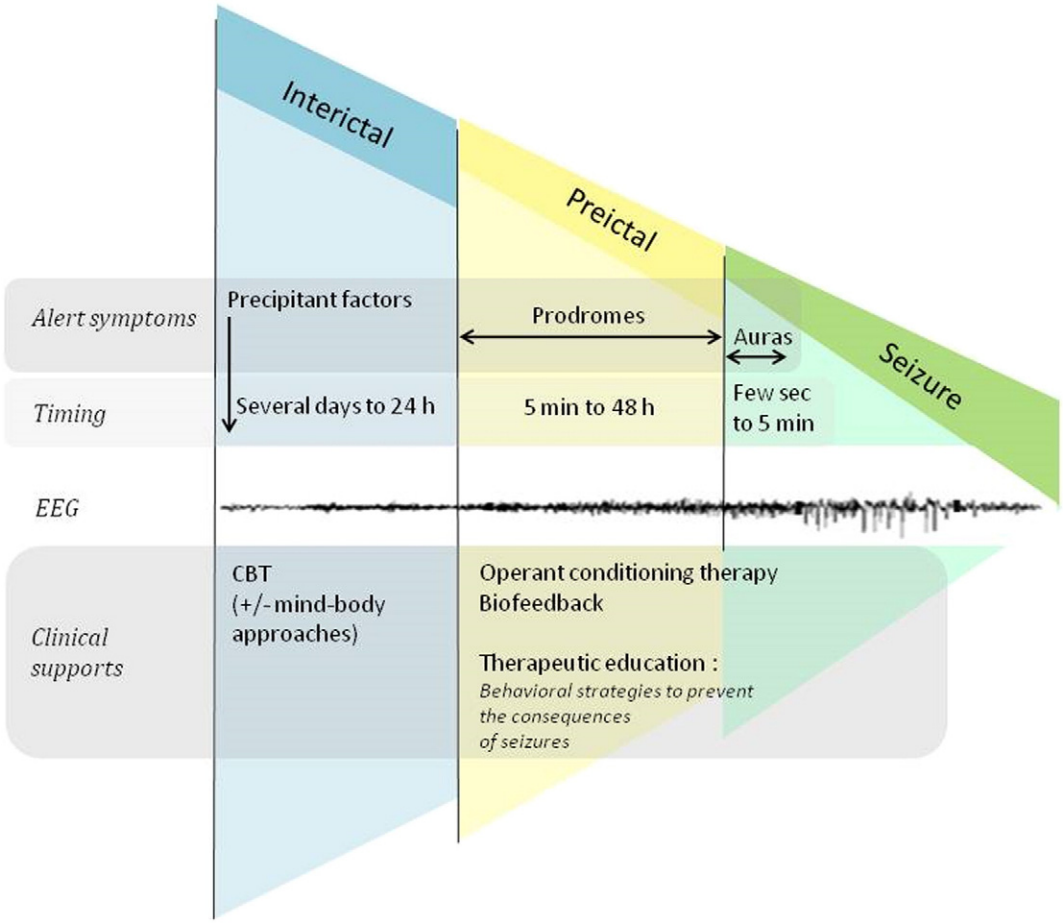

Fig. 1. Symptoms to anticipate seizures and strategies to control them, according to the periictal time window.

seizures from a few seconds to a few minutes and "prodromes" that are temporally distinguished from auras, since they appear a few minutes to two days before the seizure and may last from 30 min to several hours. Patients also report identification of precipitant factors that appear to trigger their seizures [11] (Fig. 1).

2.1. Auras and prodromes

Auras, which are of course the first subjective semiological features of the seizure, may be experienced by between 45% and 65% of people with partial epilepsy [12]. These are related to objective EEG abnormalities and characterized by various symptoms that are produced according to the type of epileptic discharge and the anatomical localization of seizure onset. These include neurocognitive changes (such as déjà vu), emotional changes (anxiety, fear), sensory changes (somatosensory, olfactory, gustatory, auditory, or visual), or viscero-autonomic features (e.g., epigastric sensation, feeling of retrosternal oppression, and tachycardia).

Prodromes are recognized by between 6.9% and 39% of PWE [13–15]. These are heterogeneous between patients and are characterized by diverse clinical features including behavioral changes, cognitive disorders, mood changes, fatigue, sleep disorders, headaches, gastrointestinal symptoms, changes in appetite, and altered voice [14,15].

While auras are part of the ictal event and participate in the detection of the onset of the seizure, prodromes are preictal, unaccompanied by objective EEG changes, but could also be used as alert symptoms by the patients [16].

2.2. Precipitant factors

Subjective identification of at least one potential triggering factor affecting the likelihood of seizure onset has been reported by 60 to 70% of patients [17,18]. For example, 28% of patients (from a cohort of 104) reported that 100% of their seizures were linked to a precipitant factor. In addition, 33% reported that the majority (75 to 99%) of their seizures were triggered by a precipitant factor [11]. Stress [19], stressful events [20], sleep deprivation [21], symptoms of depression, symptoms of anxiety, and fatigue [22–24] are the most frequently reported precipitant factors. Stress is the most frequently reported by PWE in general [25] and, more particularly, those with temporal lobe epilepsy (TLE) [11,17]. Lanteaume et al. [26] use the term "emotional vulnerability" to define this particular sensitivity to stress as a seizure precipitant in PWE. It appears that patients who report high levels of stress are more likely to be able to predict their seizures than patients with lower stress levels [27]. However, the existence of specific neurobiological factors underpinning emotional vulnerability remains uncertain. Positron emission tomography (PET) data obtained in patients with TLE with emotional vulnerability in comparison with patients not reporting sensitivity to stressful events depicted more marked changes in amygdala-related networks [28]. Moreover, patients who reported seizure precipitants tended to have higher levels of anxiety than those who did not report any [29]. A high level of anxiety could itself act as a precipitant factor through neurophysiological and hormonal alterations related to the impact of stress hormones on neuronal excitability and thus seizure susceptibility [30]. On the other hand, patients with