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An Emergency Medicine Perspective for Non-Convulsive Status Epilepticus Patients: Intravenous Midazolam

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Abstract

Non-convulsive status epilepticus (NCSE) characterized primarily by changes in consciousness in association with typical electroencephalography (EEG) changes is not very common; however, it is usually difficult to diagnose this SE type. NCSE should be one of the differential diagnoses for patients who present to the emergency department with impaired consciousness. There is no standard approach in the literature proposed by emergency physicians for NCSE patients. It is understood from current literature that intravenous (IV) diazepam is the most commonly used first-line therapy following the diagnosis with EEG. In the two case reports, we analyzed our approach for the patients with known refractory epilepsy who presented to the emergency department due to somnolence based on the preliminary diagnosis of NCSE. In this context, we concluded that IV midazolam was a fast and effective agent to terminate seizure of patients with known refractory epilepsy.

Keywords: Emergency medicine, midazolam, non-convulsive status epilepticus

Introduction

Status epilepticus (SE), which is a critical condition that must be intervened urgently, is characterized by seizures lasting for 5 minutes or longer on a continuous basis or two or more seizures without any improvement in consciousness (1). SE is divided to two groups as convulsive (CSE) and non-convulsive (NCSE) (2). NCSE accounts for 20%-25% of all SE cases (3). Although there are limited number of studies conducted on NCSE at emergency departments, there is no standard emergency approach developed for patients presenting with NCSE. Most of the studies of NCSE were performed by neurologists and anesthetists. In these studies, patients with NCSE were diagnosed with electroencephalography (EEG) and treated with IV diazepam or standard antiepileptics. However, the time to perform and interpret EEG at the emergency department is long for patients suspected to have NCSE; therefore, it will lead to a significant time loss for the termination of seizure. In this study, we emphasized the importance of IV midazolam to terminate seizures in 2 pediatric patients who presented to the emergency department due to impaired consciousness and were suspected to have NCSE.

Case Presentations

Case 1

A 15-year old male patient presented to the emergency department with impaired consciousness for about 40 minutes. When he was admitted to the emergency department, his eyes were open, but he did not respond to verbal stimuli. His vital signs were stable and he did not have high fever. He had a history of temporal lobe epilepsy diagnosed 5 years ago and thus underwent left temporal lobectomy 3 months ago. The patient was on quadruple antiepileptic treatment and adhered to the treatment completely. He neither had any comorbid diseases nor used any additional drugs recently. While he frequently experienced complex partial and secondary generalized seizures, he was suspected to have NCSE when he was admitted; therefore, electroencephalography (EEG) was performed. The spike-slow wave activity of a moderately high amplitude at 1–2 hz that was continuous on the right front–temporal region on EEG was considered as NCSE (Figure 1). In this context, midazolam from 0.05 mg up to 3 mg per kg was pushed intravenously (IV) to the patient who weighed approximately 60 kg. The patient regained his conscious-

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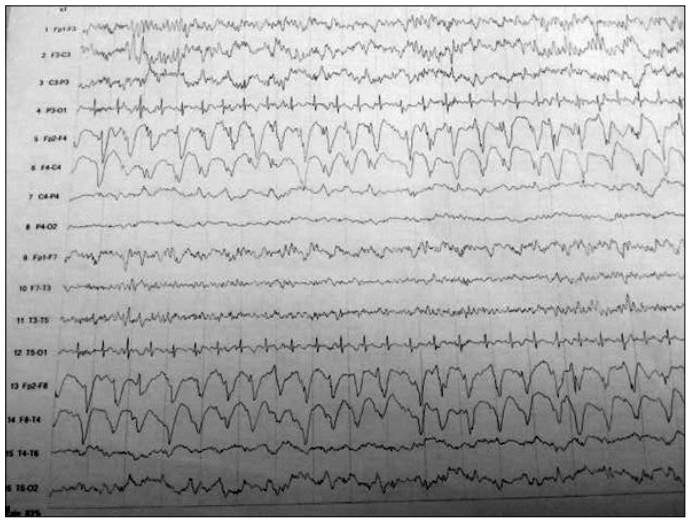

Figure 1. Electroencephalography of the first case before midazolam. Continuous spike-slow wave activity of moderately high amplitude at 1–2 hz in the right fronto–temporal region

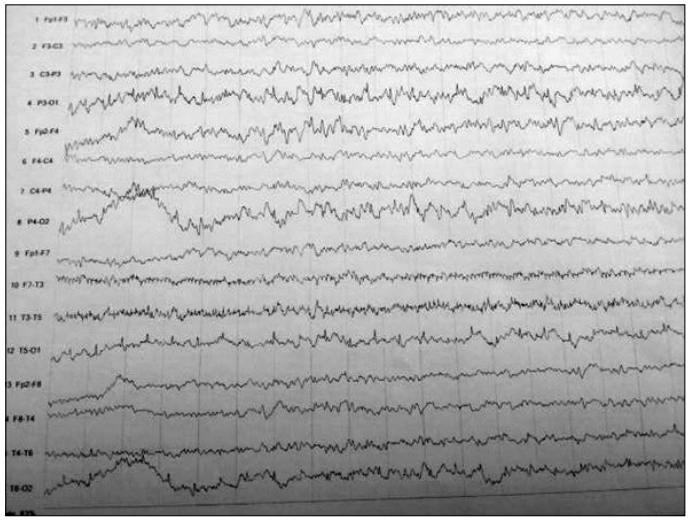

Figure 2. Electroencephalography showing the epileptic activity of the first patient suppressed after midazolam

ness within few minutes following midazolam; EEG was repeated and it was observed that the epileptic activity was suppressed (Figure 2). The cranial magnetic resonance imaging (MRI), and the cranial computerized tomography (CT) scan did not show any acute pathology. The laboratory parameters were within normal range, except for mild leukocytosis. The patient was observed for 6 hours at the emergency room and had full orientation and cooperation. Since he did not develop new seizures within that time, he was advised to visit the neurology polyclinic for control and was discharged from the emergency department.

Case 2

A 16-year old patient with epileptic seizures secondary to known schizencephaly was presented to the emergency department with impaired consciousness. He had been staring into space for a few seconds in the past month, while he had impaired consciousness since he did not respond to the verbal and painful stimuli for 2 hours on the day of admission. Despite the antiepileptic drugs, he intermittently experienced complex partial and secondary generalized seizures. He did not have any additional disease and a history of additional drug use. He did not have fever and his vital signs were stable when he was admitted to the emergency department. The patient who had grade 2 obesity was suspected to have NCSE that led to impaired consciousness and thus after he was monitored, he was given 4 mg (0.05 mg/kg) IV midazolam. He regained his consciousness in a few minutes after the administration of midazolam, with full recovery in 1 hour. His cranial MRI and CT scans did not show any acute pathology. His laboratory parameters were stable. Antiepileptic treatment was prescribed in consultation with the neurology department, and he was discharged from the emergency department after a 6-hour follow-up since did not experience a new seizure.

Discussion

Non-convulsive is a neurological emergency that is characterized by a variety of clinical conditions from confusion to coma. While it is difficult to recognize NCSE patients, the gold standard for diagnosis is EEG (4). EEG of NCSE patients shows continuous or intermittent electrographical discharges (5). Studies have shown that EEG might be useful to diagnose the NCSE patients who are admitted to the emergency department due to changes in the mental status (6, 7). We diagnosed our first patient through EEG. However, we did not deem it necessary to perform EEG for the second patient due to his history of schizencephaly, typical clinical manifestations, and based on our previous experience. It may take almost 1 hour to perform and interpret EEG of a patient who is admitted to the emergency department for suspected seizure. This will mean that the patient will have seizures for an additional 1 hour. Considering some of the technical challenges, this time may further increase. In fact, we terminated the seizure of the second patient more rapidly compared to the first patient.

The main clinical manifestations of NCSE patients include tendency to sleep and changes in consciousness (8). Similarly, both cases presented to the emergency department due to changes in consciousness. Studies show that most of the NCSE patients have known epilepsy similar to our cases (9).

The studies conducted on the termination of seizures in NCSE patients at the emergency department are limited, whereas the medications used for standard SE patients are known to have benefits (10). In a review by Maganti et al. (8) on NCSE, they reported that IV benzodiazepines could be given as first-line therapy followed by IV phenytoin, phenobarbital, or valproic acid. Levatiracetam has become a commonly used agent for SE at emergency departments, particularly for pediatric patients (11). In a retrospective study conducted by Osorio et al. (12), they found that the epileptiform waves of refractory SE patients who were administered IV 10 mg diazepam were suppressed on EEG. Similarly, in a single-case study by Akpınar et al. (13), they used 10 mg IV diazepam as first-line therapy to terminate NCSE caused by an infection. Moreover, in a case series including 7 patients who developed NCSE due to cephalosporins, all patients were successfully treated with IV diazepam (14). Contrary to these studies, we used midazolam that was more rapid and short acting to terminate seizures of our patients compared to diazepam. Both patients responded rapidly to midazolam. Furthermore, patients experienced no side effects.

Conclusion

When patients with known refractory epilepsy present to the emergency department with impaired consciousness with typical manifestations of NCSE, such as dull gaze and lack of response to verbal stimuli, they can be treated with midazolam, which is one of the fast-acting benzodiazepines without the need for EEG.

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