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Ictal Asystole in a Patient with Right Temporal Lobe Epilepsy

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INTRODUCTION

Seizure related cardiac asystole is a rare phenomenon and a diagnostic challenge for both neurologists and cardiologists. Video electroencephalography (EEG) monitoring (VEM) plays a crucial role in the diagnosis of ictal bradycardia and asystole which might increase the risk of seizure-related falls and injuries in epilepsy patients. In this report, we present a patient with ictal asystole during right temporal onset seizure to whom a cardiac pacemaker was implanted.

CASE REPORT

A 24-year-old, right-handed female patient with drug-resistant focal epilepsy since the age of 15 was admitted to the VEM unit for the planning of epilepsy surgery. Despite treatment with multiple antiepileptic drugs including oxcarbazepine 1800 mg/day, topiramate 100 mg/day, and lamotrigine 200 mg/day, she continued to have focal impaired awareness seizures followed by sudden falls or focal to bilateral tonic-clonic seizures with an average frequency of 1-2 per month. Her past medical history and family history were unremarkable. Her systemic, cardiac, and neurological examinations were normal. Cranial magnetic resonance imaging did not reveal any lesions. Resting electrocardiography (ECG) showed normal sinus rhythm without any ischemic ST/T changes or abnormal PR and QT intervals. On VEM performed with antiepileptic drug withdrawal, one focal and one focal to bilateral tonic-clonic seizures were recorded. Interictal EEG revealed bilateral temporal spikes mostly on the right temporooccipital region with a normal background rhythm. The focal seizure began with rhythmic sharply contoured theta waves at the right posterior temporal region (maximum at T6 and O2 electrode) spreading to the left temporal region. Fifty seconds after the seizure onset, the patient developed ictal bradycardia followed by ictal asystole lasting up to 20 seconds associated with generalized electroencephalographic suppression (Figure 1-2). Semiology of the seizure included interruption during eating, staring, unresponsiveness, an atonic fall over the bed, and pallor during asystole. The patient developed myoclonic jerks of the body and the limbs and regained her consciousness subsequently. Ictal bradycardia/asystole was not recorded during focal to bilateral tonic-clonic seizure which began from the right temporal region with left head deviation. A cardiac pacemaker was implanted given the long duration of asystole and high risk of seizure recurrence. Cardiac pacemaker implantation managed to reduce seizure-related syncope and falls. Three months after cardiac pacemaker implantation, another VEM was performed which recorded 3 focal to bilateral tonic-clonic and 1 focal seizure beginning from the right posterior temporal region. Cardiac asystole or syncope like presentation was not observed during these seizures. Right temporal lobe resection was planned for complete seizure control. However, during the 8 months follow-up the patient had only a few seizures, therefore the surgery is postponed.

DISCUSSION

In this report, we presented a patient with right temporal lobe epilepsy with ictal asystole to whom a cardiac pacemaker was implanted. Ictal bradycardia/

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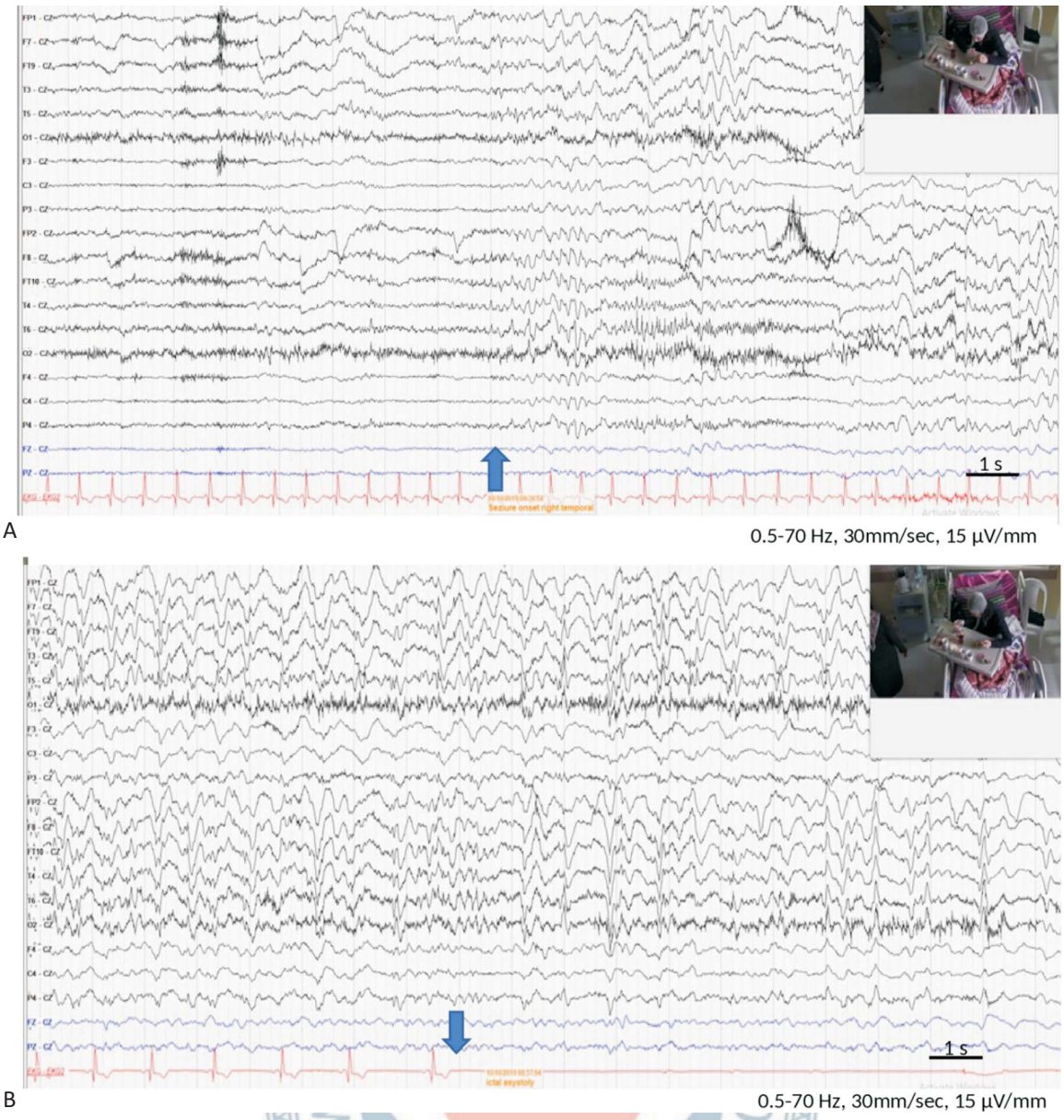


Figure 1. *(A) Onset of ictal activity on the right temporal lobe (arrow). (B) Ictal activity spread on bilateral temporal lobes. Onset of ictal asystole lasting about 20 seconds (arrow).*

asystole which might lead to sudden deaths are rarely detected, but prolonged VEM with the simultaneous ECG increases the probability of their diagnosis. Identification of ictal asystole and implantation of a cardiac pacemaker may stop seizure-related falls and injuries.[1]

Seizure-related cardiac asystole was defined as the absence of ventricular complex longer than 4 seconds after the onset of an electrographic seizure.[2] The frequency of ictal asystole of the patients with refractory epilepsy was reported to be between 0.25-0.40% in VEM units.[3-6] The majority of the cases were associated with long-standing, drug-resistant, left-sided, focal temporal lobe seizures as in our patient.[7] Tenyi et al. hypothesized that new-onset ictal asystole (onset < 1 year after epilepsy) was associated with female gender, preexisting heart conditions, normal neuroimaging, and drug-responsive epilepsy.[7] Late-onset ictal asystole was found more prominently in male patients with chronic, therapy-resistant epilepsy with epileptic lesions on neuroimaging.[7] Multiple-use of antiepileptic drugs or ge-

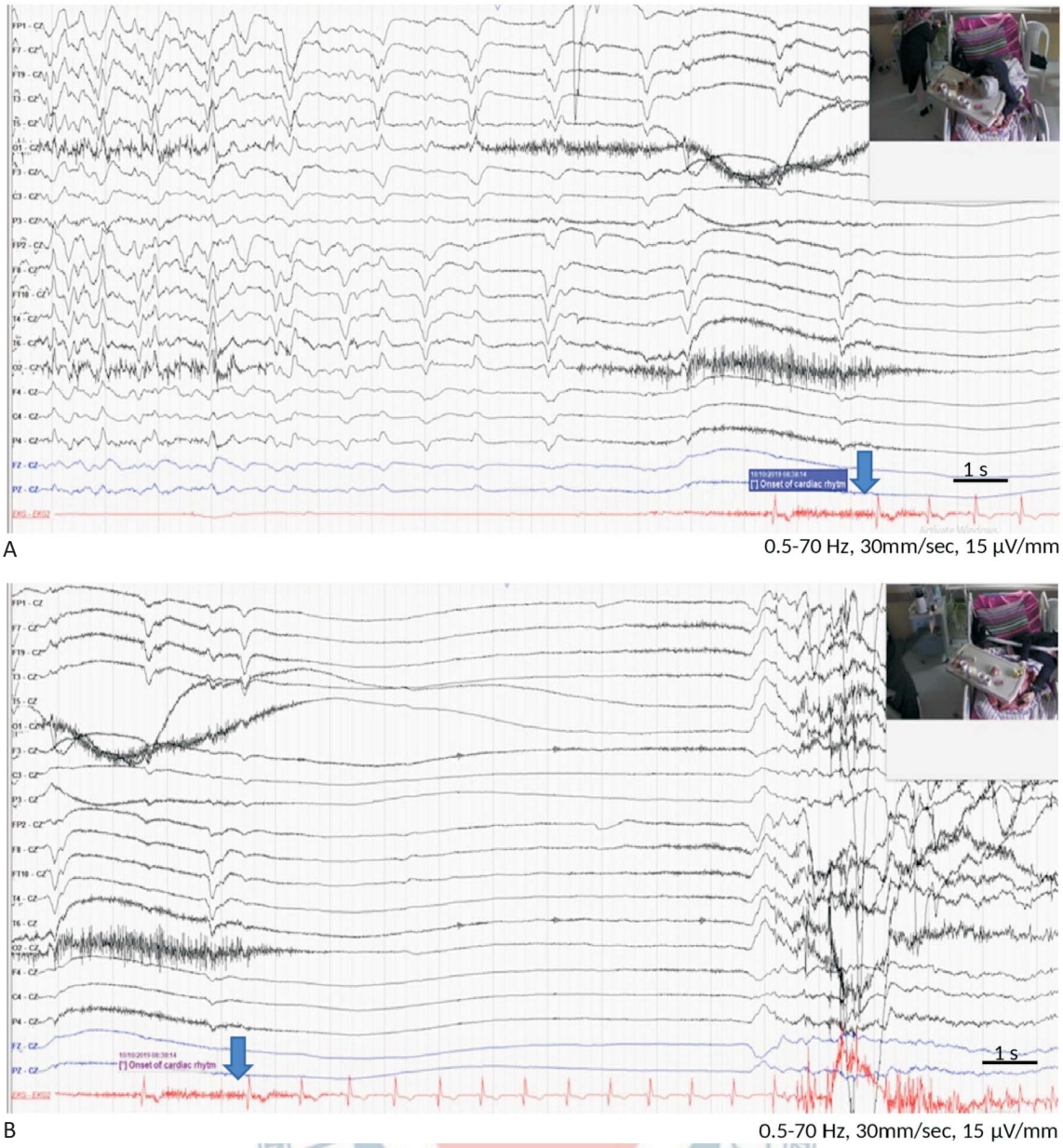


Figure 2. *(A, B) Generalized suppression of electroencephalography activity and end of ictal asystole (arrow).*

netic conditions (ion channel dysfunction) affecting cardiac conduction may promote ictal asystole.[8] In a minority of patients, ictal asystole may emerge after focal to bilateral tonic-clonic seizures and in extratemporal localizations (frontal and insular cortices).[7,9] Some of the authors suggested left hemispheric lateralization in a group of patients with ictal bradycardia/asystole.[10] Our patient developed ictal asystole leading to seizure-related syncope after spreading of the seizure activity from the right temporal region to the left hemisphere. As in our case, several patients show bilateral seizure activity during ictal asystole.[4,11] Sudden loss of tone is a rare feature in focal epilepsies. In patients with ictal asystole after a critical duration of cerebral hypoperfusion unexpected collapses can be seen in the course of a typical seizure.[4]

The mechanism of seizure-induced bradycardia and asystole is unclear. Epileptiform activity emerging from or spreading to central autonomic networks including the amygdala, hypothalamus, insular cortex, cingulate

gyrus, orbitofrontal cortex, and prefrontal cortex might activate parasympathetic or inhibit sympathetic networks through vasovagal reflex activation resulting in sinus node arrest.[8] The relation between ictal asystole and sudden unexpected death in epilepsy (SUDEP) is controversial. Some authors suggest a rather weak link with SUDEP since most of the ictal asystole cases are associated with focal self-terminating seizures which do not extend into the postictal period.[12] Mortality in epilepsy monitoring units' study (MORTEMUS) revealed that a postictal asystole is a terminal event after a long period of central apnea in cases of SUDEP.[13] Furthermore, ictal asystole is a condition with high morbidity and related to a high risk of severe injuries related to falls. Long-term implantable heart rhythm monitors may detect a higher frequency of cardiac arrhythmias and repolarization abnormalities in patients with refractory epilepsy.[14,15] The primary treatment includes seizure control with antiepileptic drugs and epilepsy surgery in treatment-resistant cases. Cardiac pacemaker implantation is recommended in refractory cases with frequent falls.[7]

In conclusion, long term VEM with simultaneous ECG recordings is important to diagnose seizure-related cardiac asystole and to identify seizure-related atonic falls. A collaboration between neurologists and cardiologists is crucial for the correct management of ictal asystole.

LEARNING POINTS

- Temporal lobe seizures can associate ictal bradycardia/asystole.
- Video-EEG monitoring with simultaneous ECG recordings is crucial for the diagnosis of ictal asystole.
- Ictal asystole is a condition with high morbidity and related to a high risk of severe injuries related to falls.
- Cardiac pacemaker implantation is recommended in drug-resistant patients with ictal asystole.

STATEMENT OF ETHICS

Written informed consent was obtained from the patient to publish their case.

DECLARATION OF CONFLICT OF INTEREST

All the authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

Concept: Ç. K., L. B. K.; Design: Ç. K., M. Y.; Supervision: Ç. K, L. B. K., C. G.; Materials: Ç. K., H. Ö., Y. A.; Data collection: Ç. K., M. Y., Y. A.; Literature search: Ç. K., H. Ö.; Analysis and interpretation: M. Y., Ç. K., H. Ö.; Writing: Ç. K., L.B.K.

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