



# COMPLETE ATRIOVENTRICULAR BLOCK AND ASYSTOLE DURING EPILEPTIC SEIZURE: A CASE REPORT

Nikolina Ivica Miše<sup>1</sup>, Pavao Jurinović<sup>1</sup>, Zrinka Jurišić<sup>2</sup>, Ana Repić Buličić<sup>1</sup>,  
Petar Filipović Grčić<sup>1</sup> and Marina Titlić<sup>1</sup>

<sup>1</sup>Department of Neurology, Split University Hospital Centre, Split, Croatia;

<sup>2</sup>Department of Cardiology, Split University Hospital Centre, Split, Croatia

**SUMMARY** – Cardiac arrhythmias during or after epileptic seizures are one of the possible pathomechanisms of sudden unexpected death in epilepsy. These arrhythmogenic epilepsies are most commonly associated with sinus tachycardia, but atrioventricular block and asystole can also be seen. Although a rare occurrence, these arrhythmias can lead to significant morbidity and mortality, but also can be potentially preventable with pacemaker implantation. Here we describe a patient with recurrent epileptic seizures, diagnosed with ictal third-degree atrioventricular block and asystole during seizure, which required a permanent cardiac pacemaker.

**Key words:** *Epilepsy; Complete heart block; Asystole; Cardiac pacemaker; Case report*

## Introduction

Epilepsy is a common neurological disease affecting people most frequently before age 20 or after age 65<sup>1</sup>. Patients with epilepsy are at a significantly higher risk of sudden death compared with the general population. Sudden unexpected death in epilepsy (SUDEP) is stated as one of the possible and important directly epilepsy-related causes of death, especially in patients with chronic epilepsy and refractory seizures<sup>2</sup>. Seizure-related conduction and cardiac rhythm abnormalities have been shown as one of the major pathomechanisms of SUDEP. Fatal arrhythmias that occur during or after seizure are associated with failures of autonomic regulation of the heart<sup>3</sup>.

Here we describe a patient with recurrent epileptic seizures, diagnosed with ictal third-degree atrioventricular (AV) block and asystole *via* electrocardio-

gram/electroencephalogram (ECG/EEG) co-registration.

## Case Report

A woman at the age of 83 was admitted to the Department of Neurology, Split University Hospital Centre after having experienced two grand mal seizures with bladder incontinence.

Past medical history including head trauma or neurological disease was uneventful except for previously reported gastric ulcer. Previous medication taken by the patient included pantoprazole (40 mg twice daily).

On admission, her pulse was 60 beats/min, blood pressure 140/65 mm Hg, respiratory rate 20 breaths/min and temperature 36.6 °C. The auscultatory finding on the heart was regular. The initial 12-lead ECG showed normal sinus rhythm with normal PQ and QT intervals and no ST-T wave changes. Interictal neurological examination was normal. Chest x-ray showed no abnormalities. Laboratory data including results of routine blood tests, electrolytes, CK-MB, and tropo-

Correspondence to: *Nikolina Ivica Miše, MD*, Department of Neurology, Split University Hospital Centre, Spinčićeva 1, HR-21000 Split, Croatia

E-mail: [n\\_ivica@net.hr](mailto:n_ivica@net.hr)

Received January 20, 2016, accepted February 15, 2017

nin-T were all normal. Head computerized tomography showed no intracranial bleed or mass lesion.

The patient was admitted to the intensive care unit for continuous EEG/ECG monitoring. During the same day, two recurrent episodes of generalized tonic seizures connected with third-degree AV block followed by the episode of asystole were observed. During EEG monitoring, 88% delta, 7% theta and 5% alpha waves were recorded.

Considering her cardiac arrest during the seizure, cardiology consultation was done and the patient was transferred to the intensive care unit of the Department of Cardiology. The patient was discharged with proper verbal contact, complaining of nausea and pain in the left inframammary region. A temporary pacemaker was implanted on the same day, and a few days later permanent pacemaker (Medtronic SENSIA SERR01) was implanted. Postoperative ECG revealed no abnormalities. Antithrombotic therapy (acetylsalicylic acid 100 mg/day) was prescribed at hospital discharge.

The EEG performed a month later was dysrhythmic and diffuse. During and after hyperventilation, the EEG revealed focal spike and wave complexes predominantly on both occipital regions.

Six months after pacemaker implantation, the patient was seizure free and no cardiac problem was detected.

## Discussion

Patients with epilepsy have a mortality rate two- to three-fold higher than the general population<sup>4</sup>. Apart from other mortality causes such as death associated with other neurological conditions in symptomatic epilepsy, accidents during epileptic attack or status epilepticus, in 7%-18% of patients with epilepsy, autopsy data do not show any anatomic or toxicologic abnormalities and then it is classified as SUDEP<sup>3</sup>.

According to the recent revised definition, SUDEP consists of sudden, unexpected, witnessed or unwitnessed, non-traumatic and non-drowning death in patients with epilepsy, with or without evidence for a seizure, excluding documented status epilepticus and asphyxia<sup>5</sup>.

Pathophysiological mechanisms for SUDEP are not completely explained, but cardiac arrhythmias are considered as the possible mechanisms<sup>5</sup>. Sinus tachy-

cardia may occur in up to 80% of seizures<sup>6</sup>. Heart block, atrial fibrillation, bradyarrhythmia, and asystole also play an important role, but can be potentially preventable with pacemaker implantation<sup>7-9</sup>. Lamberts *et al.*<sup>10</sup> analyzed ECGs of 185 subjects with epilepsy and demonstrated that these patients in addition to a higher heart rate had a longer PQ interval that could be associated with conductive heart block.

There are no guidelines for the management of patients with ictal AV block or asystole. However, results of some studies that showed a significant decrease in falls observed in these patients implicate that pacemaker implantation should be considered to decrease the risk of death, making the patients free from ictal symptoms and preventing epileptic seizure<sup>9</sup>.

Akbar *et al.*<sup>11</sup> showed that patients with epilepsy had higher odds of having a temporary pacemaker, which may be associated with the disorder pathomechanism causing bradyarrhythmia or asystole including heart block. They also found that patients with epilepsy had significantly higher odds of temporary pacemaker than patients with other neurological disorders such as demyelinating disease and migraine.

We described a sporadic case with third-degree AV block during generalized epileptic seizure, where a permanent cardiac pacemaker was needed. AV block rarely occurs during epileptic seizure. Opherk *et al.*<sup>12</sup> found first- or second-degree AV blocks just during 3 of 102 seizures (in one of 41 patients). Although arrhythmogenic epilepsy is unusual, limited duration of EEG or ECG monitoring may be insufficient. In cases in which suspicion of cardiac arrhythmia exists, the inclusion of ECG monitoring may be necessary and may prevent cardiogenic SUDEP. If arrhythmia is detected, cardiology evaluation and, if indicated, implantation of a cardiac pacemaker is required. Thorough cardiovascular history to get the comprehensive clinical picture including detailed history of symptoms, risk factors, and prior cardiac findings should also be undertaken.

## References

1. Holmes TR, Browne GL. Handbook of Epilepsy. 4<sup>th</sup> edn. Philadelphia: Lippincott Williams & Wilkins; 2008.
2. Tomson T, Walczak T, Sillanpaa M, Sander JW. Sudden unexpected death in epilepsy: a review of incidence and risk factors. *Epilepsia*. 2005;46 Suppl 11:54-61, <https://doi.org/10.1111/j.1528-1167.2005.00411.x>

3. Velagapudi P, Turagam M, Laurence T, Kocheril A. Cardiac arrhythmias and sudden unexpected death in epilepsy (SUDEP). *Pacing Clin Electrophysiol.* 2012;35(3):363-70, <https://doi.org/10.1111/j.1540-8159.2011.03276.x>
4. Duncan JS, Sander JW, Sisodiya SM, Walker MC. Adult epilepsy. *Lancet.* 2006;367(9516):1087-100, [https://doi.org/10.1016/S0140-6736\(06\)68477-8](https://doi.org/10.1016/S0140-6736(06)68477-8)
5. Nashef L, So EL, Ryvlin P, Tomson T. Unifying the definitions of sudden unexpected death in epilepsy. *Epilepsia.* 2012;53(2):227-33, <https://doi.org/10.1111/j.1528-1167.2011.03358.x>
6. Sevcencu C, Struijk JJ. Autonomic alterations and cardiac changes in epilepsy. *Epilepsia.* 2010;51(5):725-37, <https://doi.org/10.1111/j.1528-1167.2009.02479.x>
7. Surges R, Scott CA, Walker MC. Peri-ictal atrioventricular conduction block in a patient with a lesion in the left insula: case report and review of the literature. *Epilepsy Behav.* 2009;16(2):347-9, <https://doi.org/10.1016/j.yebeh.2009.07.036>
8. Giovannini G, Meletti S. Ictal asystole as the first presentation of epilepsy: a case report and systematic literature review. *Epilepsy Behav Case Rep.* 2014;2:136-41, <https://doi.org/10.1016/j.ebcr.2014.06.001>
9. Moseley BD, Ghearing GR, Munger TM, Britton JW. The treatment of ictal asystole with cardiac pacing. *Epilepsia.* 2011;52(4):e16-e9. PubMed PMID: 21463267, <https://doi.org/10.1111/j.1528-1167.2010.02972.x>
10. Lamberts RJ, Blom MT, Novy J, Belluzzo M, Seldenrijk A, Penninx BW, *et al.* Increased prevalence of ECG markers for sudden cardiac arrest in refractory epilepsy. *J Neurol Neurosurg Psychiatry.* 2015;86(3):309-13, <http://dx.doi.org/10.1136/jnnp-2014-307772>
11. Akbar U, Rincon F, Carran M, Campellone J, Milcarek B, Burakgazi E. Increased prevalence of temporary cardiac pacing in people with epilepsy. *Seizure.* 2012;21(7):518-21, <http://dx.doi.org/10.1016/j.seizure.2012.05.007>
12. Opherck C, Coromilas J, Hirsch LJ. Heart rate and ECG changes in 102 seizures: analysis of influencing factors. *Epilepsy Res.* 2002;52(2):117-27. [https://doi.org/10.1016/S0920-1211\(02\)00215-2](https://doi.org/10.1016/S0920-1211(02)00215-2)

#### Sažetak

### KOMPLETNI ATRIOVENTRIKULSKI BLOK I ASISTOLIJA TIJEKOM EPILEPTIČKOG NAPADAJA: PRIKAZ SLUČAJA

*N. Ivica Miše, P. Jurinović, Z. Jurišić, A. Repić Bulčić, P. Filipović Grčić i M. Titlić*

Srčane aritmije tijekom ili nakon epileptičkih napadaja jedan su od mogućih patomehanizama neočekivane smrti u bolesnika s epilepsijom. Ove aritmogene epilepsije najčešće su povezane sa sinus tahikardijom, ali se mogu uočiti i atrioventrikulski blok i asistolija. Iako se rijetko pojavljuju, ove aritmije mogu dovesti do značajnog pobola i smrtnosti, ali se također mogu prevenirati ugradnjom srčanog stimulatora. Ovdje opisujemo bolesnika s ponavljajućim epileptičkim napadajima i dijagnosticiranim atrioventrikulskim blokom trećeg stupnja i asistolijom tijekom napadaja kojemu je bilo potrebno ugraditi trajni srčani stimulator.

**Ključne riječi:** *Epilepsija; Kompletni srčani blok; Asistolija; Srčani stimulator; Prikaz slučaja*