Leadless solution for arrhythmia-related sudden unexpected death in epilepsy

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ABSTRACT

A leadless pacemaker is a recently approved pacing technology that helps mitigate lead-related complications, but it has several limitations. Careful candidate selection is needed. Here, we demonstrate leadless pacing as the solution for prolonged postictal bradycardia/asystole; there is no consensus regarding pacemaker implantation for seizure patients with such a risk of sudden cardiac death.

KEYWORDS Asystole; bradycardia; leadless pacemaker; seizure; sudden unexpected death in epilepsy

The recently approved leadless pacemaker helps mitigate lead-related complications. Here, we describe a case of leadless pacing for prolonged postictal bradycardia/asystole.

CASE REPORT

An 18-year-old man was referred for management of syncope. He developed his first episode of syncope at the age of 6 months, followed by recurrent sporadic episodes without abnormal movements around once a year. His electroencephalogram at the age of 11 showed only trivial and nonspecific abnormalities. Consequently, seizure was diagnosed and antiepileptic drugs were prescribed. Due to recurrent episodes, he underwent a thorough cardiac workup, which was unremarkable, and a cardiac loop recorder was implanted (*Figure 1b*). In February 2017, he had another episode of witnessed syncope while he was standing and talking. This episode was associated with tongue biting, the loss of bladder control, and generalized convulsions. Baseline electrocardiogram and laboratory results were unremarkable. His loop recorder interrogation

revealed explicit convulsion activity (*Figure 1a*). A leadless pacemaker was inserted uneventfully (*Figure 1b*).

DISCUSSION

There is no consensus regarding pacemaker implantation in the clinical context of prolonged postictal bradycardia or asystole.¹ With the concern of sudden unexpected death in epilepsy related to cardiac arrhythmia, decisions about device insertion are made on a case-by-case basis. The leadless pacemaker, a recently approved pacing technology, mitigates lead-related complications in both the short term and long term.² Its limitation of single-chamber ventricular demand as the only available pacing mode, its lack of ability to store rhythm data (in contrast to conventional pacemakers), and the plausible worsening cardiomyopathy from chronic right ventricular pacing are to be considered in order to select an appropriate candidate.

Here, we demonstrated leadless pacing as the solution for the exceptional clinical context when a backup pacing function is needed to prevent sudden cardiac death related to prolonged postictal bradycardia/asystole. Our patient was an ideal candidate for this pacing device: (1) a very low

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Figure 1. (a) The patient's loop recorder interrogation showing explicit convulsion activity associated with a sinus tachycardia of up to 150 beats per minute. When the convulsion was over, asystole ensued, lasting for 45 seconds with rare junctional escape beats. **(b)** Imaging showing the presence of a cardiac loop recorder (white arrow) and leadless pacemaker (black arrow).

rate of pacing was expected for a very short period at a time when VVI mode is hemodynamically acceptable and less likely to be detrimental to long-term left ventricular function; (2) there were concerns of long-term lead-related complications and cosmetic concerns considering the patient's young age and active lifestyle; (3) the efficacy of antiepileptic drugs for the risk of sudden unexpected death in epilepsy is unclear,³ and (4) the parents had immense concern about seizure-related sudden cardiac death.

Data are still lacking on removal of the device once it reaches the end of its service life (average longevity of 9.6 to 14.6 years for 0% to 50% VVI pacing with 2 V at 0.24 milliseconds). However, successful retrieval with snares has been reported,⁴ and dedicated tools to extract chronically implanted units are in development. Because the device volume is only 0.8 mL, it is reasonable to consider placing a new device adjacent to a nonfunctioning one.⁵ Programmed

pacing close to the pacing threshold is also advisable in our case to extend the longevity of the device.

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