

Title: Complete Atrioventricular Heart Block from an Epilepsy Treatment

Shorter Running Title: AV Block as a Late Effect of Epilepsy Treatment

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Atrioventricular (AV) heart block without adequate escape rhythm can result in sudden cardiac arrest and death. We report complete (third degree) AV block in a 16 year-old boy as a late effect of vagus nerve stimulation (VNS). He experienced brief, daily, complex partial seizures, treated with lamotrigine, levetiracetam, and the placement of Model 102 VNS at age 4.

Electroencephalography (EEG) showed generalized slow spike-and-wave discharges consistent with Lennox-Gastaut syndrome. At age 12, his VNS was changed to Model 303 PereniaDURA/Model 103 Demipulse generator, set at an output current of 2.25 mA on a standard 30 seconds on, 5 minutes off paradigm. At age 16, he experienced episodes of sudden collapse followed by unconsciousness. Holter monitor showed 15 second symptomatic complete AV block without escape (Figure 1). The patient was taking psychotropic medication with potential cardiac side effects: methylphenidate (tachycardia), guanfacine (first degree AV block), and haloperidol (prolonged QT interval, Torsades de Pointes). Haloperidol, methylphenidate, and VNS were stopped without further symptoms. Off these medications, the VNS was resumed at reduced current (1.25 mA), with re-occurrence of symptomatic AV block. Again, the VNS was stopped and symptoms/heart block ceased. Psychotropic medication was resumed without any side effects.

The vagus nerve innervates the heart. Therefore, precautionary practices include: (1) implanting the vagus nerve stimulator on the left side because the right vagus nerve innervates the sinoatrial node and its stimulation is more likely to cause bradycardia, asystole, or other adverse cardiac side effects, compared to the left vagus nerve which supplies the atrioventricular node¹; and (2) arrhythmia tests performed during implantation. Still, late onset cardiac side effects occur, such as bradycardia² and bradyarrhythmia³ in children, and asystole in an adult⁴. In all cases, VNS was stopped, resulting in symptom relief and return to normal rhythm.

Declaration of Conflicting Interests

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Figure I. Complete AV block as a late effect of vagus nerve stimulation (VNS). This tracing, which is a continuous 24 second record, shows a 13 second pause with only p waves identifiable (arrow).

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