

## Failure to Detect Life-threatening Arrhythmia by Implantable Loop Recorder

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**Introduction:** Syncope in patients with repaired congenital heart disease (CHD), owing to higher risk of serious arrhythmias, triggers a low threshold for extensive evaluation. If the symptoms are subtle, episodic and infrequent, implantable loop recorders (ILRs, a subcutaneous, single-lead, EKG monitoring implant device that stores the EKG data) are extremely valuable in establishing a symptom-EKG correlation. There have been reports of various sensing issues related to the clinical use of ILRs<sup>1</sup>. P-waves oversensing leading to a failure to detect significant bradycardia resulting in asystole has not been described.

**Case Report:** A 29 years old male with Trisomy 21 with complex CHD presented for concerns of episodic presyncope, pallor and unwitnessed collapse. The patient had undergone pulmonary artery banding and coarctation repair for palliation of complete atrioventricular septal defect with right ventricular hypoplasia and coarctation of aorta. A Blalock-Taussig shunt was later placed for pulmonary blood flow augmentation. Due to elevated pulmonary vascular resistance, he could not undergo single ventricle palliation. His comorbidities include diabetes, chronic kidney disease and episodic hyperkalemia. A 24-hour Holter monitor failed to show significant arrhythmia so an ILR was placed. During recovery, he had symptomatic bradycardia due to complete heart block (CHB). He was then admitted to intensive care unit (ICU) where he had an episode of asystole due to CHB and delayed ventricular escape (Fig. 1) that required

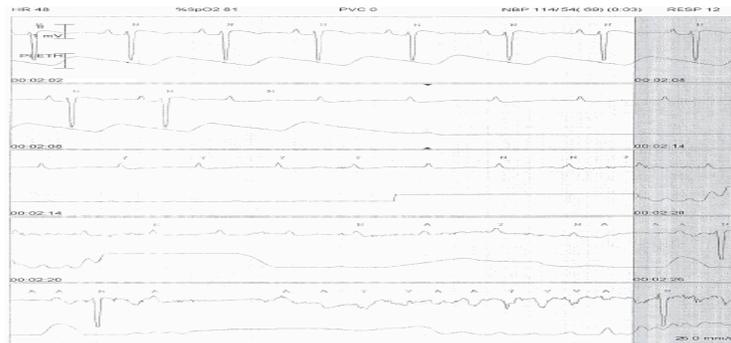


Fig 1: Complete heart block with delayed ventricular response. Note tall P-waves that appear regularly after the heart block

**Discussion:** One third of the patients with recurrent syncope, even after detailed baseline evaluation, may remain undiagnosed<sup>2</sup>. Boersma et al showed that the ILR definitely rejected arrhythmic cause in 16% and established an arrhythmia as the underlying mechanism in 28% of patients with unexplained syncope<sup>2</sup>. Although auto-activation capability improves the diagnostic yields, false positive recordings can be problematic. Bortnik et al reported false positive activation showing long-lasting asystole two days following ILR implantation<sup>3</sup>, but there are no previous reports of failure to auto-activate in the presence of



Fig 2: Interrogation of the loop recorder later showed intermittent tall P-waves, which probably could have been misinterpreted as R-wave during the event.

**Conclusion:** The continued advances in R-wave sensing algorithms of new generation ILRs may decrease false positive auto-activations but may not necessarily address the problem of oversensing the tall P-waves and underdiagnosing clinically significant events. Further studies to identify such problems and improvement of algorithms to address may be necessary.

cardiopulmonary resuscitation. Interrogation of the ILR revealed that the device failed to auto-activate in response to this rhythm (the device was not triggered manually). During ILR-interrogation intermittent tall P-waves were noted (Fig. 2). Emergent placement of a temporary transvenous ventricular pacer was performed that was followed by dual chamber epicardial pacemaker.

true asystole. The second-generation IRL devices (such as the one used in our case) are programmed such that they automatically adjust the sensing threshold after a sensed R-wave to help reduce oversensing from P-waves and T-waves, while ensuring a reliable sensing of the next R-wave<sup>4</sup>. Oversensing of the intermittently tall P-waves as R-waves after the episode of heart block might have led to the failure in auto-activation of the device in our case.