

# Persistent Hiccups Following Leadless Pacemaker Implantation

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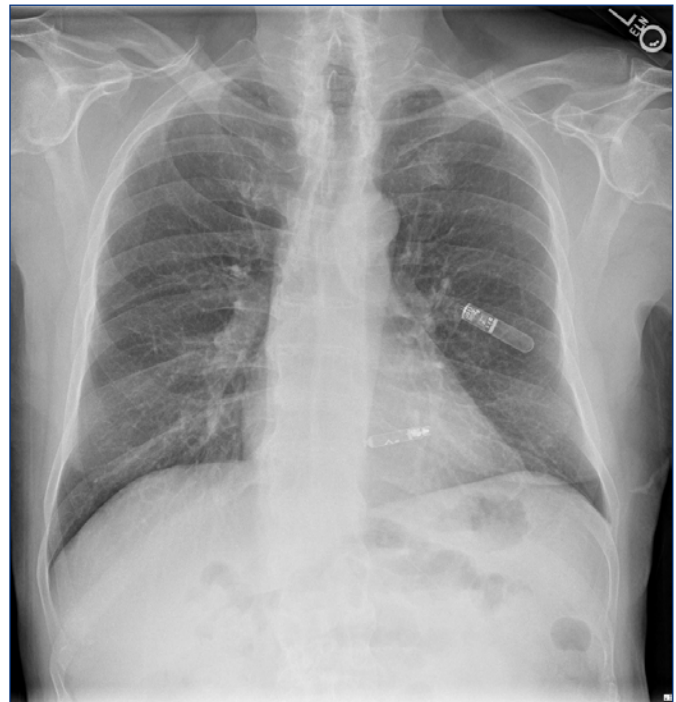
## CASE REPORT

A 76-year-old male with a several year history of progressive atrio-ventricular (AV) nodal conduction disease, including first-degree AV block, intermittent Mobitz I (Wenckebach) second-degree AV block predominately while asleep, and lifelong right Bundle Branch Block had an asymptomatic episode of complete AV block lasting seven seconds at 9 a.m. The episode of transient complete AV block was detected on an Insertable Cardiac Monitor (Assert-IQ EL+, Abbott).

Permanent pacemaker implantation with a leadless device for back-up ventricular demand (VVI) pacing was recommended as a Class I indication. The patient underwent insertion of a leadless Aveir (Abbott) pacemaker from the right femoral vein with Propofol anesthesia and a laryngeal mask airway (LMA). The procedure was uneventful, lasting less than an hour and the patient was discharged home four hours later.

At 2 a.m. the patient was awakened from sleep with hiccups which continued unabated for several hours until he got out of bed and then gradually tapered off but never completely resolved. He checked his heart rhythm on the Kardia Mobile EKG device which demonstrated sinus rhythm with no paced beats even while he was experiencing hiccups. He reported no chest pain, lightheadedness or shortness of breath. His BP and pulse were 130/66 and 70bpm and he was not aware of any diaphragmatic stimulation. Hiccups became more persistent the following night and most of the next day. He was seen by his electrophysiologist and pacemaker interrogation revealed no change in impedance or sensitivity compared to initial insertion parameters. There was no ongoing pacing detected. He was briefly paced at 70bpm with normal capture and sensing and no hiccups. PA and lateral chest X-ray views revealed the leadless device in appropriate position near the apex of the right ventricle (RV) (Figs. 1 & 2). He was prescribed colchicine 0.6 mg twice daily for possible inflammation related to the device. Follow-up pacemaker interrogation four days later remained unchanged.

**Figure 1.** PA chest X-ray showing Aveir leadless pacemaker within the cardiac silhouette. Note the Assert-IQ EL+ Insertable Cardiac Monitor over the left mid-lung field. Gas-filled loops of bowel are noted below the left hemidiaphragm.



The patient continued to have persistent daily hiccups which lasted for 12 days. These were most evident in recumbency, particularly in bed at night and after meals, and he had difficulty sleeping. Hiccups tended to improve while active, walking, or with other non-supine activities but never let up for any length of time. Colchicine was discontinued after four days, and he was switched to metoclopramide 10mg before meals and at bedtime. At no time did the patient have chest pain, lightheadedness, shortness of breath or diaphragmatic stimulation. He did note postprandial fullness, slowed digestion and constipation. Hiccups disappeared abruptly on day 12 and the patient discontinued metoclopramide 24 hours later.

**Figure 2.** Lateral chest X-ray view showing the Aveir leadless pacemaker device within the cardiac silhouette near the apex of the right ventricle. The Assert-IQ EL+ Insertable Cardiac Monitor is seen over the anterior chest wall. Distended loops of bowel are noted below the diaphragm.



## DISCUSSION

Hiccups are a common and predominately transient condition which affects most everyone at some point in their lifetime. Hiccups or “singultus” from the Latin *singult*, meaning gasp or sob, are due to intermittent, involuntary, spasmodic contractions of the diaphragm and intercostal muscles, causing sudden inspiration and ending with abrupt closure of the glottis and the resulting “hic” sound. Hiccups are believed to be neurologically mediated via a reflex arc, whose afferent and efferent limbs include the phrenic and vagus nerves and accessory neural connections to the glottis and inspiratory intercostal muscles. The central focus of hiccups, while not well defined, may include the medulla oblongata, the reticular formation of the brainstem, phrenic nerve nuclei and the hypothalamus.<sup>1</sup>

Hiccups are considered persistent when they last more than 48 hours. Persistent hiccups are extremely uncommon and there are few large studies assessing their causes. Souadjian et al reviewed the etiology of intractable hiccups in 220 patients and divided potential causes into surgical (1–4 days post-op) or medical, including hiatus hernia, myocardial infarction, pericarditis, cerebrovascular disease, metabolic disease, duodenal ulcer, psychogenic and other causes.<sup>2</sup>

Hiccups may be present in a variety of neurologic disorders and are a prominent feature of lateral medullary infarction (Wallenberg syndrome), but are rarely an isolated symptom.<sup>3</sup> Gastric causes of hiccups include gastric distention (overeating, carbonated beverages, aerophagia or gastric insufflation during endoscopy), gastroesophageal reflux disease, peptic ulcer disease and gastric cancer. The simple application of a nasogastric tube may successfully treat hiccups.<sup>4</sup> Esophageal causes include esophagitis, esophageal cancer and esophageal distention. Hiccups could be induced in 40% of healthy patients just by the inflation of a proximal esophageal balloon.<sup>5</sup>

In the postoperative setting where hiccups occur rarely, studies suggest an association with phrenic nerve irritation, including glottic stimulation due to intubation during general anesthesia.

Certain medications are associated with the development of hiccups through effects on the central nervous system or the phrenic or vagus nerves. Dexamethasone when used for chemotherapy-induced side effects is a recognized cause of hiccups, which may be relieved by switching to methylprednisolone. The incidence of hiccups following Propofol anesthesia is reportedly less than 1%.

There is no uniform agreement on the pharmacotherapy for persistent hiccups lasting more than 48 hours. A proton pump inhibitor should be considered when there is an obvious GI cause like GERD. Alternative empiric therapies may include metoclopramide, baclofen and gabapentin, or combinations of these agents.<sup>6,7</sup> Chlorpromazine is no longer considered first-line choice for intractable hiccups due to the potential of side effects, especially among the elderly. Nonpharmacologic interventions include acupuncture, hypnotherapy and diaphragm-related interventions, such as vagus-nerve stimulation<sup>8</sup> and a breathing pacemaker.<sup>9</sup>

The cause of persistent hiccups in the patient presented here is not fully clear. Obvious concerns related to leadless pacemaker implantation, including pericarditis and myocardial perforation with pericardial effusion were not demonstrated. The more likely causes relate to post-operative and gastrointestinal factors including gastric distention, functional gastroparesis, glottic stimulation from the LMA and medication effect from anesthetic agents.

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#### Disclosure

The author has no disclosures.

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