CORRESPONDENCE

Temperature-related tachycardia during rewarming from hypothermic cardiopulmonary bypass in a patient with a leadless cardiac pacemaker

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To the Editor,

The newly developed leadless self-contained right ventricular single-chamber pacemaker, implanted by percutaneous femoral access, represents a cutting-edge advancement in cardiac pacemaker technology.¹ Its presumed advantages include the avoidance of pocket and lead infections and pneumothorax during insertion. Nevertheless, femoral vascular complications and device dislodgement can happen.^{1,2} Unfortunately, there are no specific perioperative recommendations available for these devices as they were not captured in the most recent American Society of Anesthesiologist's *Practice Advisory Management of Patients with Cardiac Implantable Electronic Devices*.³ Currently, there are two single-chamber, single-component system devices available: the Nanostim Leadless Cardiac Pacemaker (LCP) (St. Jude Medical, Sylmar, CA, USA) and the Micra Transcatheter Pacing System (Medtronic, Minneapolis, MN, USA).

We present a case of a 78-yr-old patient with an indwelling Nanostim LCP (inserted in the US two years earlier after a prior conventional pacemaker caused

tricuspid regurgitation) who presented for tricuspid valve replacement. He was cooled during cardiopulmonary bypass (CPB) to 31.2°C and was subsequently rewarmed to 36.5°C before CPB was discontinued. At that time, the ventricular paced rate suddenly increased to 120 beats·min⁻¹. As the electrophysiology (EP) service that was consulted to intraoperatively interrogate the device did not have equipment compatible with the Nanostim, a sterile magnet was applied to the apical surface of the heart to asynchronously pace at 90 beats·min⁻¹. This was changed to two magnets used to cover the ventricular apex as the contracting myocardium intermittently displaced the original single magnet. Postoperatively, the magnets were secured to the skin on the left anterolateral chest wall. A permanent epicardial lead was also inserted and tested intraoperatively to overdrive the Nanostim LCP.

In the intensive care unit, postoperative chest radiography confirmed that the Nanostim LCP had not moved and, when subsequently interrogated, had a rate of 60 beats·min⁻¹. Therefore, temporary epicardial pacing wires were used to pace at 85 beats·min⁻¹ to optimize cardiac output. On the third postoperative day (POD), the device was interrogated by a company representative and found to be functioning nominally with the battery at 3.3 V and an estimated 5.7 years of battery life; thus, the epicardial pacing wires were removed. On POD 8 the patient was transferred to the ward without further pacemaker issues.

This patient's Nanostim LCP had originally been placed as part of the LEADLESS pacemaker IDE study (clinical trials.gov; NCT02030418) during which 1,423 devices were implanted.^{1,4} This pacemaker features a heart rate modulation function based on blood temperature.^{1,2} It is likely that its temperature sensor was activated during rewarming from CPB and increased the paced rate to its

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upper limit of 120 beats·min⁻¹ in a temperature-sensitive pacemaker. In October 2016, the trial was paused by the manufacturer who recommended more intensive follow-up and device replacement for pacemaker-dependent patients⁴; however, not all the patients have been followed up. Accordingly, patients with this leadless pacemaker might still present at various hospitals in different countries for unrelated procedures. It is therefore important to be familiar with leadless pacemakers as more advanced multicomponent leadless systems are expected to be implanted in the future. This case emphasizes the importance of preoperative assessment of unfamiliar devices and of a multidisciplinary intraoperative approach including ready access to EP services. Finally, preparation to use alternatives to guarantee uninterrupted pacemaker function in the case of an unreliable indwelling pacemaker is important.

Conflicts of interest None declared.

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References

1. Tjong FV, Reddy VY. Permanent leadless cardiac pacemaker therapy: a comprehensive review. *Circulation* 2017; 135: 1458-70.
2. Lee JZ, Mulpuru SK, Shen WK. Leadless pacemaker: Performance and complications. *Trends Cardiovasc Med* 2018; 28: 130-41.
3. American Society of Anesthesiologists. Practice advisory for the perioperative management of patients with cardiac implantable electronic devices: pacemakers and implantable cardioverter-defibrillators: an updated report by the American Society of Anesthesiologists Task Force on Perioperative Management of patients with Cardiac Implantable Electronic Devices. *Anesthesiology* 2011; 114: 247-61.
4. *Global Clinical Affairs*; Carlson M. Leadless II IDE/CAP Study Pause. Available from URL: <https://webcache.googleusercontent.com/search?q=cache:kdME6UjzUpwJ:https://www.sjm.com/~media/galaxy/hcp/resources-reimbursement/technical-resources/product-advisories-archive/battery-nanostim/leadlessiiide-investigator-letter-28oct2016-us.pdf%3Ffla%3Den+&cd=1&hl=es-419&ct=clnk&gl=ca> (accessed February 2018).