

Perioperative Management of Cardiovascular Implantable Electronic Devices: What Every Anesthesiologist Needs to Know

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This issue of *Anesthesia & Analgesia* features an interesting case report by Izrailtyan et al.¹ titled “Perioperative Pacemaker-Mediated Tachycardia in the Patient with a Dual Chamber Implantable Cardioverter-Defibrillator.” The authors describe the management of a patient who undergoes hip surgery with ischemic cardiomyopathy and an implantable cardioverter-defibrillator (ICD) inserted for primary prevention of sudden cardiac death. This case report is an excellent demonstration of classic pacemaker-mediated tachycardia (PMT) in a patient with an ICD.

PMT is seen in patients with a dual chamber pacemaker, whose conduction is anterograde via the pacemaker with retrograde conduction via the atrioventricular node where the activation of the atria is outside the programmed post-ventricular atrial refractory period (PVARP). As in this case, a premature ventricular contraction is conducted in a retrograde fashion and is improperly interpreted by the atrial channel of the pacemaker as a native atrial impulse, which initiates a paced ventricular beat. The authors correctly emphasize the difference in acute management of PMT depending on whether the device is a pacemaker or an ICD. If the device is a pacemaker, a magnet applied to the generator will result in asynchronous pacing of the heart (DOO), thus eliminating the atrial tracking and timing of a ventricular impulse. An ICD cannot be placed in asynchronous mode by applying a magnet; its pacemaker (bradycardia therapy) can only be altered by using a manufacturer-specific programmer. Extending the PVARP interval such that the atrial channel does not sense any retrograde conduction from the ventricles will also terminate a PMT. Many of the

current cardiac implantable electronic devices (CIEDs) have a specialized algorithm that allows the PVARP to be automatically extended in the presence of premature ventricular contraction.

At times, the term PMT is used to describe any pacemaker “assisted” tachycardia that is undesirable. For instance, atrial fibrillation is an example where the ventricle will track the atrial rate up to the upper rate limit programmed into the pacemaker, but technically this is not classic PMT. Interestingly, although the patient in this case report had a history of atrial fibrillation, he had no recorded episodes during the preoperative interrogation. If the patient had a recurrence of atrial fibrillation, ventricular tracking of atrial fibrillation could have resulted in a high and possibly undesirable rate as many devices have an upper rate limit that may or may not be in the best hemodynamic interest of the patient. In situations where patients with dual chamber pacemakers develop atrial fibrillation, the device can be programmed to DDI to avoid ventricular tracking of a high atrial rate. Alternatively, some devices have the ability to “mode switch.” Mode switching is a function that allows a pacemaker to temporarily change a triggering mode, such as DDD, to a nontriggering mode, such as DDI or VVI, which will prevent the pacemaker from initiating ventricular impulses to the high atrial rate of atrial fibrillation.

Perioperative management of CIEDs can be complex given the plethora of devices, manufacturers, and advanced functionalities in the newer models. Many institutions have developed patient-care algorithms for perioperative management of these devices based on local availability of experts in CIED therapy. Therefore, there can be several correct variations on the perioperative management of CIEDs. Some physicians would have reflexively disabled tachyarrhythmia therapy in this patient either by magnet or reprogramming, but according to the Heart Rhythm Society/American Society of Anesthesiologists consensus statements for Perioperative Management of CIEDs, disabling tachyarrhythmia therapy may not have been necessary in this case because the surgery was below the umbilicus.² Even though disabling tachyarrhythmia therapy is not an incorrect or unsafe choice, electromagnetic interference is considered minimal for surgery below the umbilicus, and keeping tachyarrhythmia therapy enabled in cases such as this allows the option for rapid

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identification and treatment of tachyarrhythmias in cases where significant electromagnetic interference is unlikely.

This case report highlights the larger issue of management of patients with CIEDs in the perioperative setting. Anesthesiologists as perioperative physicians need to take an active role in learning about and managing these devices in partnership with electrophysiologists and general cardiologists. CIEDs are inserted at a dizzying pace nationally and internationally, and patients who benefit from the therapy provided by these devices in their daily lives will present for surgery in increasing numbers. Such patients are entitled to a perioperative physician with the same education about their cardiac devices as one would expect from an anesthesiologist managing a patient with other complex illnesses such as renal failure and diabetes. Recent position articles and consensus statements are available to assist perioperative physicians in learning about CIEDs, and educational courses are offered at several annual meetings to create a more interactive experience.^{2,3}

This case report and its description of pacemaker behavior in a patient with an ICD undergoing surgery serves to educate and remind us all about the importance of correct identification of CIED behavior and appropriate management of CIEDs perioperatively. ■■

DISCLOSURES

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