

An Uncommon Intraoperative Implantable Cardiac Device Complication and Subsequent Troubleshooting

The Editor,

As the indications for cardiac implantable electronic devices (CIED) have increased, there have been an increasing number of patients with such devices undergoing various surgical procedures.^[1] Careful perioperative evaluation and understanding of such devices are very important as these patients are subject to potentially fatal complications intraoperatively if there is a malfunction to their CIED. Studies have shown that electrosurgical units are most common form of electromagnetic interference (EMI) in the operating room (OR).^[2,3]

We present a case of a 65-year-old female with a history of hypertension, sleep apnea, and nonischemic cardiomyopathy who presented for a scheduled left radical mastectomy. The patient had an ejection fraction of 35% with support of a biventricular implantable cardioverter defibrillator (ICD) (DDD with bipolar pacing, Medtronic, Shoreview, MN, USA). This was placed 10 years ago in the left pectoral region. The patient had a biopsy-confirmed 11 cm grade 3 infiltrating carcinoma, with computer tomography scan of the chest showed that the breast mass was encompassing and involving the generator of the ICD [Figure 1]. Before her breast tumor resection, the patient underwent implantation of new ICD generator in the right pectoral region. The patient's existing right atrial and left ventricular (LV) leads, which were entrapped within the tumor, were connected to the new generator using the lead extenders through tunneling under the anterior chest's subcutaneous tissue. A new right ventricular (RV) lead was placed through the right axillary vein access. The old RV lead was capped and placed back in the left side pocket.

One month after relocation of the ICD generator, the patient underwent a left total mastectomy with radical resection of soft tissue tumor left chest wall, sentinel node mapping, and

reconstruction with local tissue transfer. Intraoperatively, the surgeon noticed that the tumor was involving the pectoralis major muscle superiorly and was growing into the anterior and lateral pocket of the previous ICD generator location. This resection was undertaken carefully with the harmonic scalpel. One of the wires was intimately attached to the posterior aspect of the tumor embedded within the peritumoral fibrosis and was more posterior and lateral in location. Unknown to the surgeon, the LV wire's insulation was damaged by the harmonic scalpel. The anesthesiologist immediately noticed a loss of the lead capture on the electrocardiogram with the patient having subsequent symptomatic bradycardia down to 40 beats/min. This acute change was immediately communicated to the surgeon. Emergent intraoperative cardiology consultation was obtained. ICD function was checked and determined that the LV wire was still functional. Silicone adhesive (Silastic® Medical Adhesive) was applied per Medtronic protocol over the damaged wire insulation to protect it. After the placement of the silicone adhesive, the ICD immediately started to recapture. The remainder of the surgical dissection was completed without further events, and the patient remained hemodynamically stable.

Approximately, 750,000 patients receive pacemaker implants in the United States yearly, and at least 3 million patients have conventional pacemakers. More than 300,000 patients have ICDs, and approximately, 10,000 are implanted per month. It is estimated that approximately 670,000 ICDs would be present in the American population by 2020.^[1] As a result, more patients undergoing noncardiac surgery will have implanted cardiac rhythm management devices.

An anesthetic concern during the surgical procedures in patients with pacemaker/ICD is EMI caused by electrocautery. EMI from electrocautery can result in pulse generator inhibition or component failure, atrial or ventricular tachycardia and fibrillation, loss of/change in output, reprogramming of rate or mode of function, runaway pacing and electrical burns at the myocardial-electrode interface.^[2]

Studies have shown that Monopolar devices cause far more EMI than bipolar.^[2,3] In monopolar electrocautery, current must dissipate through the body and return to generator via the return electrode called electrodispersive pad (falsely known as grounding pad).^[1] Bipolar coagulation cautery causes minimal problems as the current flow is localized between the two poles of the instrument. However, bipolar devices are used less commonly than monopolar devices since it only offers coagulation, not dissection.^[4,5]

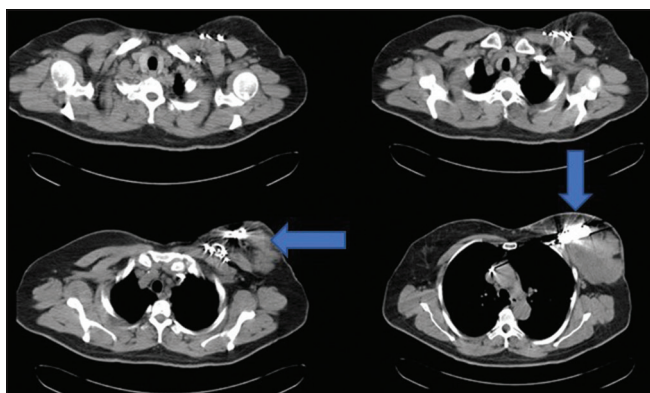


Figure 1: Computer tomography of the chest with blue arrows showing tumor encroachment of the implantable cardioverter-defibrillator generator and entrapment of the leads

An alternative to electrocautery is the ultrasound-based devices. Ultracision® (Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) represents a unique surgical device (harmonic scalpel) capable of performing both cutting and coagulation at different intensities without the use of electric energy.^[6] Since harmonic scalpel does not create an energy field, it does not have any adverse effects on implantable cardiac devices.^[7]

The aforementioned case reiterates the crucial role of the anesthesiologist in the perioperative surgical setting. The anesthesiologist must be knowledgeable of ICDs, its locations in the chest, and potential complications that can arise in future surgeries that may be unrelated to their underlying cardiac pathology. Intraoperatively, the anesthesiologist must be vigilant when the patient has a CIED and the surgeon is using a harmonic scalpel instead of electrocautery. Despite the effort of moving the generator to the right side, there was still damage to the LV lead insulation which was immediately noticed by the anesthesiologist as the patient developed bradycardia. On urgent consultation with cardiologist, it was found that lead was still functioning. Silastic® Medical Adhesive was applied over the damaged insulation and lead started working. This technique has been described in textbooks, but there are no recent studies of its usage in this situation.^[8]

Intraoperative ICDs are more prevalent than ever today, and the anesthesiologist should be cognizant about all the possible intraoperative complications related to these devices, including device malfunction secondary to surgical manipulation. We hope this letter highlights the need for education of clinicians in basic troubleshooting of ICDs when there is an acute decompensation intraoperatively, which can potentially include the use of silicone adhesive.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Rekha Suthar, Omar Viswanath, S Howard Wittels, Gerald P Rosen


Department of Anesthesiology, Mount Sinai Medical Center, Miami Beach Anesthesiology Associates, Inc., Miami Beach, Florida, USA

Address for correspondence: Dr. Gerald P Rosen, Department of Anesthesiology, Mount Sinai Medical Center, 4300 Alton Road, Suite 1401, Miami Beach, FL 33140, USA. E-mail: grosen167@me.com

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Access this article online	
Quick Response Code: 	Website: www.annals.in
	DOI: 10.4103/aca.ACA_86_17

How to cite this article: Suthar R, Viswanath O, Wittels SH, Rosen GP. An uncommon intraoperative implantable cardiac device complication and subsequent troubleshooting. *Ann Card Anaesth* 2017;20:483-4.

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