Double valve replacement in a patient with implantable cardioverter defibrillator with severe left ventricular dysfunction

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ABSTRACT

Recent data from landmark trials suggest that the indications for cardiac pacing and implantable cardioverter defibrillators (ICDs) are set to expand to include heart failure, sleep-disordered breathing, and possibly routine implantation in patients with myocardial infarction and poor ventricular function.[1] This will inevitably result in more patients with cardiac devices undergoing surgeries. Perioperative electromagnetic interference and their potential effects on ICDs pose considerable challenges to the anesthesiologists.[2] We present a case of a patient with automatic ICD with severe left ventricular dysfunction posted for double valve replacement.

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Key words: Cardiac implantable electronic device; Implantable cardioverter defibrillator; Pacemakers; Perioperative management

INTRODUCTION

Although there are quite a few case reports of patients with automatic implantable cardioverter defibrillators (AICDs) undergoing noncardiac surgeries, there is hardly any case report for cardiac surgery.

With the increasing number of patients being implanted with these devices, we are more likely to face the unique challenges posed by these patients undergoing cardiac surgeries and hence the relevance of this case report.

CASE REPORT

A 63-year-old female, nondiabetic, nonhypertensive patient presented with a history of generalized weakness, atypical chest pain, dyspnea on exertion for 8 months, which had worsened for 2 months. There was a history of paroxysmal nocturnal dyspnea for 15 days. She had no other comorbidities.

She had undergone single chamber AICD implantation for repeated episodes of palpitations and syncope 3 years back. The AICD had been programmed to ventricular demand (VVI) demand mode of pacing with a base rate of 40 beats/min. Therapy for ventricular tachycardia/ventricular fibrillation (VT/VF) was set as an initial anti-tachycardia pacing (ATP), followed by shocks of 25 J and 35 J if the rhythm was not responsive to ATP.

During her present admission, routine laboratory investigations were unremarkable. Chest X-ray showed AICD with the thick radiopaque shock coil in the right ventricle (RV) (not seen in a regular pacemaker) [Figure 1].

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She was scheduled to undergo double valve replacement with or without tricuspid repair. The night before the scheduled surgery, the patient developed severe acute pulmonary edema as evident in the chest X-ray [Figure 2]. She had to be intubated and put on ventilator support. The pacing rate was increased to 90 beats/min.

Monitoring included Transesophageal echocardiography (ECG), pulse oximetry, EtCO2, central venous pressure, invasive blood pressure, temperature, and urine output.

Swan-Ganz is not used routinely in our set up as we have TEE for assessment. Moreover, in this patient, the presence of thick AICD coil in the RV and the presence of tricuspid regurgitation (TR) would have made folating the Swan-Ganz difficult.

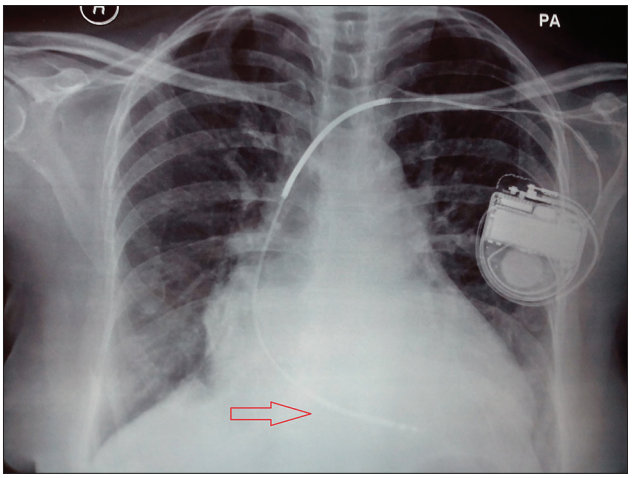

Figure 1: Preoperative chest X-ray showing the automatic implantable cardioverter defibrillator *in situ*. Thick radiopaque shock coil seen in the right ventricle

Figure 3: Monitor showing pacing spikes with pacing rate of 90 beats/min and stable hemodynamics

Transesophageal Echocardiography with Doppler revealed severe mitral regurgitation, moderate aortic stenosis, severe TR, and severe pulmonary arterial hypertension. Global left ventricular (LV) hypokinesia with ejection fraction of 35%.

Blood pressure was maintained with high inotropic support [Figure 3].

In addition to the regular anesthetic management, the perioperative period involved reprogramming of the device at various stages of the surgery as follows:

- The programming device was placed on the AICD to obtain the initial recordings [Figures 4 and 5]

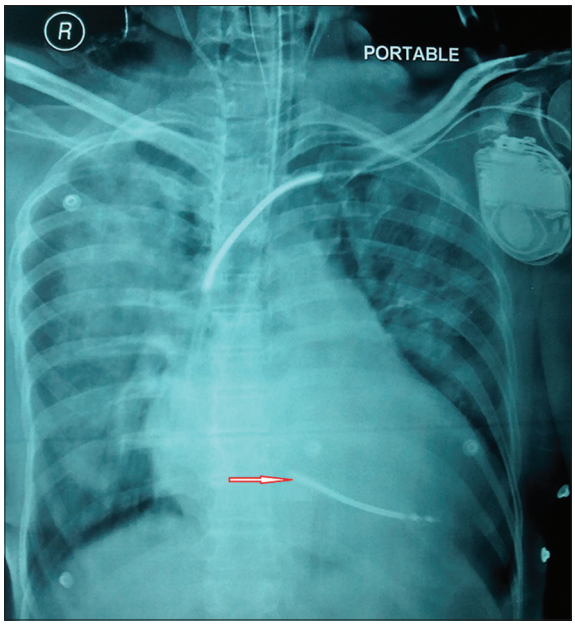

Figure 2: Chest X-ray showing pulmonary edema

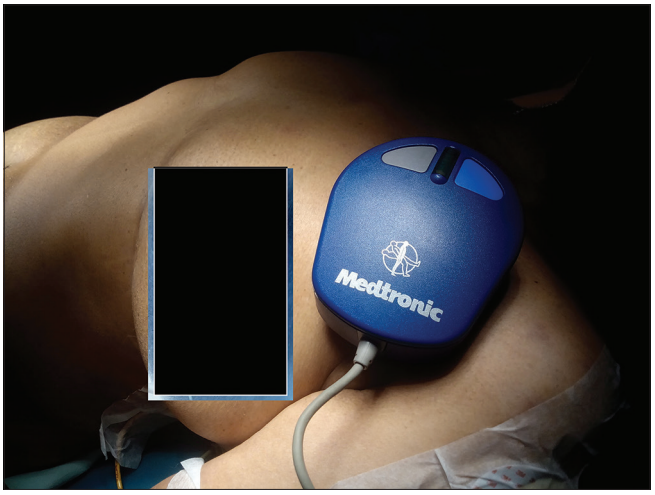

Figure 4: Programmer placed on the automatic implantable cardioverter defibrillator for initial interrogation

- To avoid electromagnetic interference from the electrocautery, the VT/VF therapy was switched off, which would otherwise result in unnecessary shocks being delivered to the patient. External paddles had been attached to the patient in case shock needs to be delivered before sternum is opened. VVI pacing was kept on [Figure 6]
- After heparinization and cannulation, the patient was put on cardiopulmonary bypass support. The pacing was now stopped (changed to monitoring-only mode (OVO) mode) [Figure 7] to facilitate cardiac arrest by cardioplegia
- After replacement of the valves and complete rewarming, the pacing was restarted with VVI mode initially at 80 beats/min, increased to 90/min to facilitate separation from bypass [Figure 8]. The anti-VT/VF therapy was still kept off
- After completion of hemostasis and chest closure, the AICD was reprogrammed to switch on the VT/VF therapy.

Figure 5: Initial recordings from the device

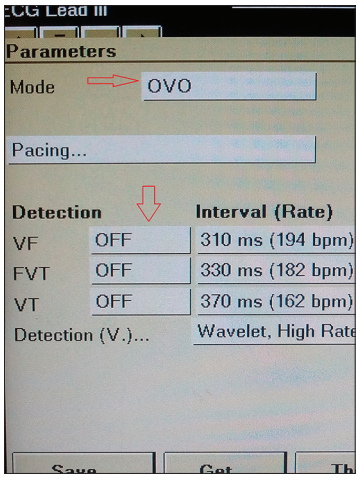

Figure 7: Pacing turned "off, " i.e., changed to "OVO" mode before cross-clamping

Postoperative TEE assessment showed well-functioning bioprosthetic mitral and aortic valves with no paravalvular leak. Mean gradient across the prosthetic mitral valve was 4 mmHg and across the aortic was 7 mmHg. Postoperatively, LV dysfunction persisted with an LV internal diameter (diastole) of 6 cm.

The patient had an uneventful postoperative course and recovery and was discharged with advice for reinterrogation of the device function a week later.

CONCLUSIONS

While magnet application to control the electronic device functions is appropriate in some cases, in others magnet application alone might fail to address all the necessary perioperative issues.[3]

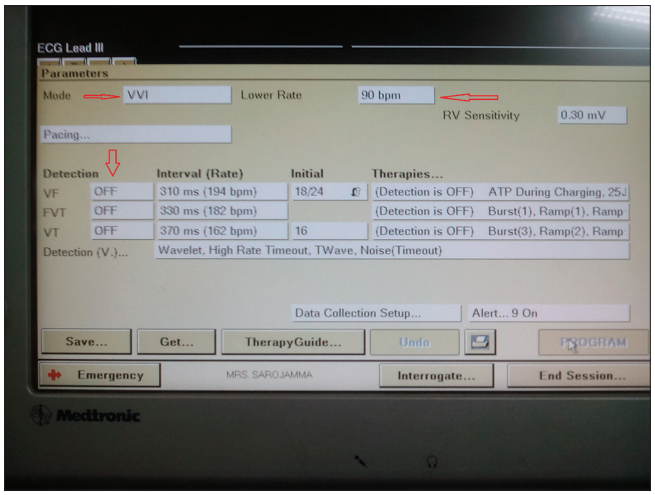

Figure 6: Ventricular fibrillation/fast ventricular tachycardia/ventricular tachycardia detection turned "off." VVI pacing continued at 90 beats/min

Figure 8: Pacing turned "on" before coming off bypass. Ventricular fibrillation/ventricular tachycardia/fast ventricular tachycardia detection kept "off" till skin closure

The ideal perioperative management of patients with AICDs forms a multidisciplinary approach involving the anesthesiologists, surgeons, and programmers.[4]

There is a paucity of data regarding current practice in the management of patients with implanted devices in the perioperative and emergency settings.

A survey of anesthesiologists and emergency physicians might usefully address this and define educational initiatives and guidelines.

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Conflicts of interest

There are no conflicts of interest.

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