

Original Research

Anaesthetic Considerations For Management Of A Patient With Cardiac Resynchronization Therapy Defibrillator In Situ: A Case Report

Ankita Rai¹, Kanwaljit Singh Bhatia², Sudhanshu Rai³, Rima Shah^{4*}

^{1,2,3}Consultant Anaesthesiologist, Park Nidaan Hospital, Sonipath, Hariyana, India

^{4*}Associate Professor, Department of Pharmacology, All India Institute of Medical Sciences (AIIMS), Rajkot, Gujarat, India

***Corresponding Author:** Dr. Rima Shah

*Associate Professor, Department of Pharmacology, All India Institute of Medical Sciences (AIIMS), Rajkot, Gujarat, India. Email: rimashah142@gmail.com

Abstract:

Here we are presenting anaesthetic management of 61-Year-old male patient with Cardiac Resynchronization Therapy Defibrillator (CRTD) in situ, posted for Open Reduction Internal Fixation (ORIF) of left tibia Fibula, without interfering in the function of CRT defibrillator. Right selection of mode of anesthesia and changing the CRTD mode into asynchronous one are few of all the important factors that could be practiced Perioperative care in CRTD implanted patients. General anesthesia is avoided and Sab-Arachnoid Block anaesthesia causing sympathetic blockage to avoid hypotension should be preferred. Patient was preoxygenated and premedicated with 2 mg butorphanol and 1 mg midazolam following which modified rapid-sequence induction was done using 100 mg propofol and 50 mg rocuronium intaveously. Maintenance of anaesthesia was done with oxygen, nitrous oxide, isoflurane and rocuronium. Patient surgery completed successfully without any post-operative complications.

Key words: Cardiac Resynchronization Therapy Defibrillator, CRTD, anesthetic management, rocuronium

Introduction

Patients with mild to severe cardiac disease with reduced left ventricular ejection fraction are exposed to higher risk of arrhythmia related heart failure and sudden death. Patients with left ventricular dysfunction and abnormal interventricular electrical synchrony manifests with prolonged QRS duration. Despite of optimal medical management and recent therapeutic advancements, 5-year mortality remains as high as 20% due to sudden death of patients with nonischemic dilated cardiomyopathy. (1) Due to anatomical constrains of coronary venous anatomy, larger proportion of patients demonstrates irresponsiveness towards conventional CRT (Cardiac resynchronization therapy) which is considered to be gold standard treatment for cardiac patients. (2) Adjuncts of CRT with implantable cardioverter defibrillators (ICDs) are more effective in precise management of heart failure and are proved to be useful in prevention of sudden cardiac death (SCD) and progressive pump failure. The number of patients with Cardiac Resynchronous treatment Defibrillator (CRTD) presenting for surgery is increasing (3) Perioperative care needs special attention to specific factors requiring proper functioning of these devices. Here we present a case report pertaining to effective anesthetic management of 61-Year-old male patient with Cardiac Resynchronization Therapy Defibrillator (CRTD) in situ, posted for Open Reduction Internal Fixation (ORIF) of left tibia Fibula, without interfering in the function of CRT defibrillator. (4)

Case presentation

A 61 year old male had a road traffic accident and presented in emergency department of the hospital. The patient was treated for hemodynamic stability and then wound cleaning and lavage, debridement of tissue lesions for local damage control was done. He was advised for surgery for the fracture. Pre-anesthetic evaluation showed that the patient had a past history of repeated episodes of syncope due to Ischemic Heart Disease (IHD) resulting in ventricular fibrillation. Immediately before surgical approach, a CRTD (MEDTRONICS) was attached below the pectoralis major. Soon the patient was relieved from the symptoms which was followed by taking Electro Cardio Gram (ECG) of the patient. The ECG showed Left Bundle Branch Block and echocardiography revealed abnormally lowered left ventricular ejection fraction (LVEF) 20% accompanied by hypokinesia. Mallampati score was used for airway examination as a predictor of Obstructive sleep apnea which showed that patient belong to Mallampati grade 1 with soft palate and entirely visible uvula. Haematological and biochemical reports of patient were within the normal limits. Intermittently, the functionality of CRT defibrillator was assessed which was found to be working normally. On the day of surgery the CRT defibrillator was reprogrammed to the asynchronous mode. Defibrillator equipment, vasoactive drugs and crash

cart were kept ready before the induction of anaesthesia. To reduce the risk of electromagnetic interference (EMI), the surgeons were advised to use bipolar diathermy instead of unipolar diathermy during the procedure of anesthesia. Due to IHD with abnormally lowered ejection fraction of 20 percent, it was constitutively decided to proceed with general anaesthesia rather than Sab Arachnoid Block anaesthesia causing sympathetic blockage to avoid hypotension.

Before surgical procedure a 22G intravenous cannula was placed in the dorsum of the left hand and the patient was simultaneously monitored through ECG, non-invasive blood pressure and pulse oximetry in the operating theatre. The patient was preoxygenated and premedicated with 2 mg butorphanol and 1 mg midazolam. Following preoxygenation with 100% O₂ for 2 or 3 min, modified rapid-sequence induction was done using 100 mg propofol and 50 mg rocuronium intravenously. Intubation was done with cuffed endotracheal tube 8.0. Maintenance of anaesthesia was done with oxygen, nitrous oxide, isoflurane and rocuronium. Arterial cannulation was performed to measure Intra Arterial Blood Pressure intraoperatively and acid base status with serum electrolyte concentration remained within the normal limits intraoperatively. Post-surgical reversal of anesthesia was performed using 2.5 mg neostigmine and glycopyrrolate 0.5 mg intravenous. In the later stage extubation was done when the patient was hemodynamically stable with a positive response to verbal commands and was able to lift head for more than 5 seconds. The patient was then shifted to postoperative room for further observation and the defibrillator was reprogrammed to original mode.

Discussion

CRT is considered to be one of the most advanced and promising techniques practiced in the treatment of heart failure with reduced ventricular ejection fraction. It is based on correction of mechanical ventricular dys-synchrony, a chronic condition which is responsible for highly symptomatic systolic HF in one third of patients with cardiovascular disease. CRT accompanied with defibrillation devices are used to counter the fibrillation occurring at any time leads to ventricular fibrillation causing fall in cardiac output and sudden death. In the preoperative evaluation of patients⁶ with CTRD presenting for non-cardiac surgery, the underlying cardiac disease (ischemic or valvular heart disease, cardiomyopathy) and the status of their ventricular function should be taken into account. (5)

Stringent peri-interventional management of patient with cardiac implantable electronic devices (CIED) undergoing non-device associated surgery is required to avoid electromagnetic interferences. Patients with CRT are majorly associated with symptomatic drug refractory heart failure which is a known independent risk factor for perioperative complications. (6,7) Patients with CRT are often old

age patients with comorbidities such as atrial fibrillation (AF), diabetes, and chronic kidney disease (CKD) which contribute to worse surgical outcomes. Even ICDs and pacemakers implanted for CRT are highly complex CIEDs involving different sensors, automatic algorithms, and programming features which itself increases perioperative risks. Various high risk clinical ADEs which were reported during surgery in earlier studies includes device-associated tachycardia and bradycardia or CIED associated ADEs such as hardware damage or changed pacing behaviour. (8) A significant observation made in previous study was association of higher risk of developing asystole or bradycardia in patients with CRT due to inappropriate pacing inhibition compared to patients with atrial fibrillation. Such patients are at higher risk of developing perioperative malignant arrhythmias due to pacing dependency. (9) Substantial evidences from previous literature suggest that inappropriate shock delivery occurs due to inconvenient placement of the electrosurgery dispersive electrode which can be solved by placement of electrode by maximizing the distance between current flow from electrosurgery to dispersive electrode and CIED generator/electrodes. Evidences also suggest to practice device programming rather than magnet application prior to surgery in pacing-dependent patients. (10) During the pre and post-operative phase intra-hospital remote monitoring reduces post-operative interrogation burden and device associated mortality.

Conclusion: A proper understanding of the function and behaviour of CRT device during exposure to electromagnetic interference (EMI) during surgery is necessary during peri- and intra-operative management of the patients. Right selection of mode of anesthesia and changing the CRTD mode into asynchronous one are few of all the important factors that could be practiced Perioperative care in CRTD implanted patients posted for orthopedic surgery for lower limbs with lower ejection fraction to improve the quality of care and reduce mortality.

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