

Anaesthetic Management of a case of Dilated Cardiomyopathy with Permanent Pacemaker Undergoing Modified Radical Mastectomy and Pacemaker Repositioning

S Mishra, A Singhal, S Bhatnagar, K Zuber

Citation

S Mishra, A Singhal, S Bhatnagar, K Zuber. *Anaesthetic Management of a case of Dilated Cardiomyopathy with Permanent Pacemaker Undergoing Modified Radical Mastectomy and Pacemaker Repositioning*. The Internet Journal of Anesthesiology. 2005 Volume 11 Number 1.

Abstract

The anaesthetic management of a patient with Dilated Cardiomyopathy (DCM) undergoing noncardiac surgery is always a challenge to the anaesthesiologist as DCM is most commonly complicated by progressive congestive heart failure. Chronic heart failure is one of the indications of atrio-biventricular pacemaker. We report a case of DCM with severe left ventricular dysfunction with ejection fraction 15% with permanent pacemaker posted for modified radical mastectomy (MRM) and repositioning of pacemaker to prevent pacemaker failure due to radiation as postoperative radiotherapy was planned. The present case was successfully managed with well planned perioperative care.

INTRODUCTION

The incidence of dilated cardiomyopathy (DCM) is reported to be 5 to 8 cases per 100,000 populations per year and appears to be increasing, although the true figure likely is higher as a consequence of underreporting of mild or asymptomatic cases.¹ Natural history of DCM is not well established. Many patients have minimal or no symptoms.² Prognosis of DCM patient is poor with only 25% to 40% of patients surviving 5 years after the definitive diagnosis. The management of a patient with DCM undergoing noncardiac surgery is always a challenge to the anaesthesiologist as DCM is most commonly complicated by progressive congestive heart failure (CHF), the cause of death in 75 % of these patients.³ Chronic heart failure is one of the indications of atrio-biventricular pacemaker.⁴ Patients with atrio-biventricular pacemaker are having increased anaesthetic risk because of significant morbidity as compared to the patients with single or dual chamber pacemaker. Pacemaker repositioning may be required in cancer patients, if pacemaker lying in the field of radiation beam. As several cases of pacemaker failure, secondary to radiation in vivo^{5, 6} and vitro⁷ have been reported. We report a case of DCM with severe left ventricular (LV) dysfunction with permanent pacemaker posted for modified radical mastectomy (MRM) and repositioning of pacemaker to

prevent pacemaker failure due to radiation as postoperative radiotherapy was planned.

CASE HISTORY

A 55 year old female of 61 kilogram was admitted with the diagnosis of carcinoma of the breast (left) and was scheduled to undergo left sided MRM. She was diagnosed DCM 4 years back when she presented with repeated episodes of breathlessness (New York Heart Association functional class III), palpitation, and ankle oedema to the cardiologist. She was hospitalized for 3-4 times for the same problems. She was investigated thoroughly and diagnosed as a case of DCM with normal coronary arteries with left ventricular ejection fraction (LVEF) of 32% and global hypokinesia and mild to moderate mitral regurgitation (MR). She was prescribed tab digoxin 0.25 mg OD, tab carvedilol 12.5 mg OD, tab losartan 25 mg OD and tab lasilactone (a combination of frusemide 20 mg and spironolactone 50 mg) 1OD and a permanent atrial and atrio-biventricular intrinsic pacemaker (Medtronic) was implanted through left subclavian route 4 years back as moderate to severe chronic heart failure are the current indication of atrio-biventricular pacemaker. She had regular follow up in cardiology clinic. There was marked improvement in the clinical symptoms with medical therapy and pacemaker implantation. Now she

had been diagnosed as a case of carcinoma left breast. Repositioning of pacemaker along with left sided modified radical mastectomy was planned as pacemaker was lying in radiation field, which could be damaged by postoperative radiation therapy. Preanaesthetic evaluation was done thoroughly. In clinical history; she had history of dyspnoea (NYHA functional class II). She had no history of nocturnal dyspnoea, orthopnea and palpitation. On physical examination there were no suggestive signs of heart failure e.g. raised JVP, ankle oedema, hepatomegaly. Her blood pressure was 130/78mmHg and heart rate was 78 beats/minute. Her recent echocardiography (ECHO) revealed progressive deterioration in cardiac function. ECHO revealed global hypocontractility with only 15% LVEF. There were no signs of pulmonary congestion on chest radiograph, only cardiomegaly was present. Her ECG showed sinus rhythm with all paced beats. Her hemoglobin was 11.5gm/dl. Her biochemical parameters (liver function and kidney functions) were normal. Cardiologist was consulted about the patient's medical management and pacemaker functioning preoperatively in the ward. She was advised to continue her drugs digoxin, diuretics, β -blockers and ACE inhibitors. Reprogramming was not required preoperatively. It was decided that cardiologist and pacemaker programmer would be present at the time of surgical procedure. Patient and their relatives were explained about anaesthetic and surgical risk.

General anaesthesia (GA) was planned and she was premedicated with tab diazepam 5 mg at bed time night before surgery and 5 mg on the morning of surgery. On arrival in the operating room, she was administered midazolam 2 mg IV, following which arterial line and central venous catheters were inserted under local anaesthesia. Monitoring of invasive arterial blood pressure, central venous pressure, ECG and oxygen saturation was instituted prior to the induction of GA. Anaesthesia was induced with IV fentanyl 100 ug, IV thiopentone sodium 250 mg and IV vecuronium bromide 8 mg. Patient's trachea was intubated with cuffed endotracheal tube (7.5 mm ID). Anaesthesia was maintained with O_2/N_2O in isoflurane (MAC of 1-1.5 %) and intermittent vecuronium bromide. The surgery lasted for 3 hours and intraoperative course was uneventful and systolic blood pressure varied between 120-160 mmHg and diastolic blood pressure between 70-98 mmHg. Her heart rate varied between 70-95 beats/minute. Her central venous pressure varied between 8-10 cmH₂O. Total blood loss was 200 ml and she received 1500 ml of

crystalloids and urine output was 300ml. The permanent pacemaker was repositioned from left side of chest to the right side. There were no injuries to pacemaker leads at time of repositioning. There were no arrhythmias intraoperatively. Surgeons used Harmonic scalpel (Ultracision™, Ethicon endosurgery) throughout the procedure. Neuromuscular blockade was reversed with inj neostigmine 2.5 mg and inj glycopyrolate 0.4 mg at the end of the procedure and the trachea was extubated. There was one episode of occasional ventricular ectopics at time of extubation which subsided. Patient was conscious, comfortable, pain free and was following commands immediately after extubation. She was shifted to intensive care unit (ICU) and was kept there overnight for close observation. She was shifted to the ward the next day.

DISCUSSION

DCM is a syndrome characterized by cardiac enlargement and impaired systolic function of one or both ventricles. Although it was formerly called congestive cardiomyopathy, the term dilated cardiomyopathy is now preferred because the earliest abnormality usually is ventricular enlargement and systolic contractile function, with the sign and symptoms of congestive heart failure often (but not invariably) developing later.⁸ The key hemodynamic features of the DCM are elevated filling pressures, failure of myocardial contractile strength, and a marked inverse relationship between afterload and stroke volume.⁹ Clinical picture of DCM may vary from asymptomatic with only cardiomegaly to severe CHF.¹⁰ Apart from CHF, dysrhythmias and embolism (systemic or pulmonary) are also common features of DCM patients.³ Recent management of chronic cardiac failure include medical therapy with drugs for example vasodilators, diuretics or beta-blockers and atrio-biventricular pacemakers for patients with incoordinate movements of heart chambers.^{4, 11}

GA carries a high risk as these patients may develop CHF or arrhythmias during intraoperative period. Patients with atrio-biventricular pacemaker are having significant morbidity and increased anaesthetic risk as compared to patients with conventional single and dual chamber pacemakers. It is equally important, however, to ensure that pacemakers are programmed optimally. This is particularly important for biventricular pacemaker as it delivers a therapy with each ventricular pace beat. In contrast, conventional single and dual chamber pacemakers pace only when required.⁴

The present case had two major problems, DCM with progressive severe cardiac dysfunction and permanent pacemaker at the site of surgery. Although she was clinically stable on drugs and pacemaker but there was progressive deterioration of heart function evidenced by decrease in LVEF from 32% to 15% over 4 years.

In the present case intraoperative course was uneventful. Preoperatively cardiologist was consulted for optimal medical management of cardiomyopathy and evaluation of pacemaker functioning. Central venous catheter placement and arterial cannulation were performed under local anaesthesia before induction. Anaesthesia was induced with vecuronium bromide as myogenic electrical activity associated with muscle fasciculation induced by succinylcholine may result in EMI (myopotential inhibition).¹² Inhibition of pacemaker function may occur in presence of electromechanical interference (EMI) leading to pacemaker failure at the time of surgery. EMI can also lead to inappropriate inhibition or triggering of a paced output, asynchronous pacing, reprogramming, damage to device circuitry and triggering a defibrillator discharge. Continuous invasive hemodynamic monitoring is essential as EKG is not reliable in the presence of EMI.¹³ In our case Harmonic scalpel (Ultracision™, Ethicon endosurgery) was used throughout the procedure as cautery may lead to EMI. Bipolar cautery is less hazardous than unipolar, although EMI may still occur.¹⁴ The cardiologist and the pacemaker programmer were present in the operation room throughout the procedure. As postoperative locoregional radiation therapy was planned and radiation can lead to malfunctioning of the pacemaker, so pacemaker was repositioned on the right side of the chest. During repositioning, there were high chances of injury to pacemaker leads as it was implanted 4 years back. American Association of Physicist in Medicine Task Group has recommended in their guidelines for radiation treatment in patients with cardiac pacemakers that pacemaker should not lie in the radiation beam field.¹⁵ There was no episode of hypoxia and hypercapnia throughout the procedure in the present case as pacing threshold may be affected by hypoxia, hypercapnia, metabolic disturbances or electrolyte imbalance.^{16, 17}

It has been reported previously that there is minimal cardiac risk in a post cardiac transplant patient with LVEF 15% undergoing laparoscopic cholecystectomy, if CHF is medically optimized by drugs e.g. diuretics, vasodilators and

ACE inhibitors.¹⁸ Regional anaesthesia may be an alternative to general anaesthesia in selected patients with DCM. Epidural anaesthesia produces changes in the preload and afterload that mimic pharmacological goals in the treatment of this disease.³ Regional anaesthesia was not used in the present case as extensive sensory level of block required. Yamaguchi et al,¹⁹ reported a case of total proctectomy under continuous epidural anaesthesia and total intravenous venous anaesthesia (TIVA) using ketamine and propofol in a patient of DCM. They demonstrated it a useful combination.

Patients with DCM with severe LV dysfunction undergoing noncardiac surgery are a challenge to the attending anaesthesiologist. There is further increase in risk if they are on pacemaker. These patients can be very well managed with preoperative optimized medical treatment and well-planned perioperative care.

CORRESPONDENCE TO

Dr. Seema Mishra F-56, AIIMS Campus, (West) Ansari Nagar, New Delhi, INDIA ,Pin: 110029 E-mail: mseema17@yahoo.co.in Fax: 91-11-26588641, 26588663 Phone: +91-9899061105

References

1. Dec GW, Fuster V. Medical progress: Idiopathic dilated cardiomyopathy. *N Engl J Med* 1994;331: 1564-1575.
2. Redfield MM, Gersh BJ, Bailey KR, Rodeheffer RJ. Natural history of incidentally discovered, asymptomatic idiopathic dilated cardiomyopathy. *Am J Cardiol* 1994;74: 737-739.
3. Stoelting RK, Dierdorf SF. Cardiomyopathy, In: Stoelting RK (ed). *Anaesthesia and Coexisting Disease* (3rd ed). New York: Churchill Livingstone 1993; 97-102.
4. Salukhe TV, Dob D, Sutton R. Pacemakers and defibrillators: anesthetic implications. *Br J Anaesth* 2004;93: 95-104.
5. Katzenberg CA, Marcus FI, Heusinkveld RS and Mammana RB. Pacemaker failure due to radiation therapy. *Pacing Clin Electrophysiol* 1982;5: 156-159.
6. Pourhamidi AH. Radiation effect on implanted pacemakers. *Chest* 1983;84: 499-500.
7. Ngu SL, O'Meley P, Johnson N and Collins C. Pacemaker function during irradiation: in vivo and in vitro effect. *Australas Radiol* 1993;37: 105-107.
8. Wynne J, Braunwald E. The cardiomyopathies and myocarditides, In: Braunwald E (ed). *Heart disease- A textbook of cardiovascular medicine* (6th ed). Philadelphia: W B Saunders Company 2001; 1751-1806.
9. Ammar T, Reich DL, Kaplan JA. Uncommon Cardiac Diseases, In: Benumof JL (ed). *Anaesthesia and uncommon diseases* (4th ed). Philadelphia: W B Saunders Company 1998; 70-122.
10. Stevenson LW, Perloff JK. The Dilated Cardiomyopathy: Clinical aspects. *Cardiol Clin* 1988;6: 187-218.

11. Molhoek SG, Bax JJ, Erven RV, et al. Effectiveness of resynchronization therapy in patients with end-stage heart failure. *Am J Cardiol* 2002;90: 379-383.
12. Finfer SR. Pacemaker failure on induction of anaesthesia. *Br J Anaesth* 1991;66: 509-12.
13. Senthuran S, Toff WD, Vuylsteke A, Solesbury PM, Menon DK. Implanted cardiac pacemakers and defibrillators in anaesthetic practice-Editorial III. *Br J Anaesth* 2002;88: 627-631.
14. Ramon-Gonzalez J, Hyberger LK, Hayes DL. Is electrocautery still a clinically significant problem with contemporary technology? [abstract] *PACE* 2001; 24: 709.
15. Marbach JR, Sontag MR, Van Dyk J and Wolbarst AB. Management of radiation oncology patients with implanted cardiac pacemakers: report of AAPM Task Group No. 34. American Association of Physicist in Medicine. *Med Phys* 1994; 21: 85-90.
16. Stokes KB, Kay GN. Artificial electrical cardiac stimulation. In: Ellenbogen KA, Kay GN, Wilkoff BL, eds. *Clinical Cardiac Pacing and Defibrillation*. Philadelphia: W B Saunders, 2000; 17-52.
17. Kroll MW, Tchou PJ. Testing of implantable defibrillator functions at implantation. In: Ellenbogen KA, Kay GN, Wilkoff BL, eds. *Clinical Cardiac Pacing and Defibrillation*. Philadelphia: W B Saunders, 2000; 540-61.
18. Amaranath L, Esfandari s, Lockrem J, et al. Epidural analgesia for total hip replacement in a patient with dilated cardiomyopathy. *Can Anesth soc J* 1986;33: 84-88.
19. Yamaguchi S, Wake K, Mishio M, et al. Anesthetic management of a patient with dilated cardiomyopathy under total intravenous venous anaesthesia with propofol and ketamine combined with continuous epidural analgesia. *Masui* 1999;48: 1232-34.

Author Information

Seema Mishra, M.D.

Assistant Professor, Unit of Anaesthesiology, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences

Amit Kumar Singhal, M.D.

Senior Research Associate, Unit of Anaesthesiology, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences

Sushma Bhatnagar, M.D.

Associate Professor, Unit of Anaesthesiology, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences

Khalid Zuber, M.D.

Senior Resident, Unit of Anaesthesiology, Institute Rotary Cancer Hospital, All India Institute of Medical Sciences