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Anaesthetic Management of a Patient with Permanent Pacemaker for Emergency Bilateral Hernioplasty.

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ABSTRACT

Advancing technologies in the field of medicine and health care has led to an increase in the global life expectancy by a large degree. This in turn has contributed to an increase in the number of geriatric patients being presented for medical procedures of varying complexities. Thus meticulous assessment and judicious anaesthetic management is required to handle such patients. The following report highlights the case of an elderly patient, with a permanent pacemaker, for bilateral hernioplasty. The anaesthesia technique adopted involved a combination of spinal and epidural anaesthesia keeping in mind the medical history of the patient.

Keywords : permanent pacemaker, bilateral hernioplasty, obstructed inguinal hernia, regional anaesthesia, combined spinal-epidural anaesthesia.

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INTRODUCTION

Cardiac pacemakers are being used extensively in treating patients with electrophysiological disorders like arrhythmias and conduction defects. More patients are presenting with these devices for non-cardiac surgeries posing a challenge to the anaesthesiologist. The understanding of pacemaker function and physiology with its anaesthetic implications is vital in the management of such patients.

CASE REPORT

A 67 year-old male patient weighing 54 kg, a known case of coronary artery disease (triple-vessel disease) and Atrio-Ventricular block had undergone permanent pacemaker implantation 5 years ago and was on VVI mode (ventricle paced, ventricle sensed and pacing inhibited when intrinsic activity is sensed - Medtronic). This patient was posted for bilateral hernioplasty – Left Irreducible Inguino-Scrotal Hernia and Right Direct Inguinal Hernia.

On clinical examination the patient was found to be 54 kg in weight and 150 cm in height. CVS – S1, S2 heard. HR – 60/min. BP – 160/90 mmHg. RS – NVBS. No added sounds. The patient's blood investigations including serum electrolytes (Potassium 3.69 mEq/L) were normal except for INR of 1.7. Electrocardiogram showed pacing spikes (Figure 1). Echocardiogram showed Regional wall motion abnormality, LAD territory, ejection fraction of 45%, moderate tricuspid regurgitation, moderate pulmonary hypertension, mild mitral regurgitation, mild aortic regurgitation and RVSP of 55mmHg. Chest X-Ray showed increased broncho-vascular markings, calcified blood vessels and presence of pacemaker. Airway examination revealed adequate mouth opening, Mallampati classification III, normal neck movements with good flexion and extension, no loose tooth and breath holding time of 15 seconds. The patient was on Tab. Telmasartan – 80mg HS, Tab. Glyceryl Trinitrate – 2.6mg TDS, Tab. Deplatt CV HS. The patient had stopped Tab. Deplatt CV three days prior to this anaesthetic clinic visit. The patient was asked to withhold Tab Deplatt CV for another couple of days and review at the clinic.

Two days after the patient's visit to the PAC, the patient suddenly developed breathlessness, palpitations and complained of inability to lie flat. On clinical examination CVS – S1, S2 heard. HR – 60/min. BP – 130/80 mmHg. RS – bilateral basal crepitations heard. RR – 25/min. SpO₂ 90% in room air, improved to 96% with O₂. Electrocardiogram showed pacing spikes, T Wave inversion in leads V₁ – V₆. Echocardiogram revealed Mild global hypokinesia of left ventricle, mild to moderate left ventricular systolic dysfunction, ejection fraction of 42%, moderate tricuspid regurgitation, moderate pulmonary hypertension, moderate mitral regurgitation, mild aortic regurgitation and RVSP of 67mmHg. Repeat INR was 1.3. Patient was diagnosed with pulmonary edema and was advised back rest, O₂ at 4 liters/min, Inj. Furosemide 20mg IV stat.

The next day the patient was presented with left obstructed irreducible inguinal hernia posted for emergency hernioplasty. The cardiologist opined that the patient was fit for surgery with high risk and the mode was changed to VOO mode (ventricle paced, none sensed and no response) with the help of the manufacturer prior to surgery. The patient was explained about the procedure of combined spinal epidural anaesthesia and consent was obtained for anaesthesia and post operative intensive care unit (ICU) care.

Anaesthetic management:

In the operating room, a wide-bore intravenous canula was secured. Monitors included electrocardiogram, pulse oximetry, and non-invasive blood pressure. A temporary pacing kit and a defibrillator were kept ready in case of any pacemaker malfunction. The defibrillator electrodes were placed in the Apex-anterior position (the right arm electrode placed under the right clavicle and the left leg electrode at the apex of the heart) as the impulse generator was placed in the left pectoral region. These electrodes were placed before surgery and connected to the defibrillator. With the patient in sitting position, under aseptic precautions, 18 gauge Tuohy needle was introduced in the L3-L4 interspace, the epidural space was achieved by loss of resistance technique and catheter was fixed at 12 cm. A subarachnoid block was performed in the L4-L5 space and 2.4 mL of 0.5% Hyperbaric Bupivacaine with 10 µg of Fentanyl was administered. The level of block achieved was T6. There was no episode of hypotension intraoperatively and the vital parameters were maintained within normal limits. After 60 min of surgery, Epidural was activated with Inj. Bupivacaine 0.5%

4mL. 150 min into surgery, an epidural top-up with Inj. Lignocaine 2% 2mL + Inj. Bupivacaine 0.5% 2mL was given. Intravenous fluids were judiciously administered.

Surgeons were requested to use bipolar electrocautery in short bursts that is limit cautery use to 1-second bursts every 10 seconds to prevent asystolic periods and avoid the use of unipolar electrocautery. The duration of surgery was three and half hours. Blood loss was within acceptable limits.

The patient was shifted to the post operative intensive care unit. The pacemaker was reprogrammed to VVI mode. The post operative period was uneventful and the patient was discharged on the seventh day.

DISCUSSION

Pacing can be provided in several ways including application of external pacing pads, insertion of transvenous pacing lead via central venous access and implantation of permanent intracardiac leads along with an impulse generator. Safe anaesthetic management of a patient with pacemaker includes a preoperative evaluation, detailed history, physical examination and investigations. The knowledge of the mode of the pacemaker is essential before surgery as there could be several factors that interfere with its functioning intraoperatively. A thorough understanding about the indication for pacemaker insertion is also important. The most common indications for pacing are symptomatic bradycardia- sinus node dysfunction, atrioventricular conduction block. The modes of a pacemaker is given by a generic code.

Amongst all investigations serum electrolytes is a must, as any imbalance in electrolytes such as a decrease in potassium leads to a loss of pacing [3, 4].

Electromagnetic interference is one other concern as it can lead to pacemaker malfunction or failure causing fatal arrhythmias and even death [5]. Bipolar cautery or ultrasonic (harmonic) scalpel is preferred as it causes less electromagnetic interference. If unipolar cautery is to be used then the grounding plate should be placed close to the operative site and as far as possible from the pacemaker, usually on the thigh with good skin contact [5, 6]. The response of pacemakers to electrocautery includes inhibition or triggering of pacing, asynchronous pacing, reset to backup mode (reprogramming), rarely myocardial burns and ventricular fibrillation [7]. The application of defibrillating electrodes at the desirable positions before surgery is essential for resuscitation of the patient in case of pacemaker malfunction. For generators positioned in the left pectoral region, apex-anterior or apex-posterior positions are advised and for generators positioned in the right pectoral region, apex-posterior positions are more appropriate [7,8]. The mode of the pacemaker should always be checked after the surgery [3] and reprogrammed if necessary.

Pacemaker Indications	
Symptomatic diseases of impulse formation (sinus node disease)	
Symptomatic diseases of impulse conduction (atrioventricular nodal disease)	
Long QT syndrome	
Hypertrophic obstructive cardiomyopathy	
Dilated cardiomyopathy	

Table 1: Pacemaker Indications [1]

Position I	Position II	Position III	Position IV	Position V
Pacing Chamber(s)	Sensing Chamber(s)	Response(s) to Sensing	Programmability	Multisite Pacing
O = None A = Atrium V = Ventricle D = Dual (A+V)	O = None A = Atrium V = Ventricle D = Dual (A+V)	O = None I = Inhibited T = Triggered D = Dual (T+I)	O = None P =Simple Programmable M = Multiprogrammable C = Communicating R = Rate modulation	O = None A = Atrium V = Ventricle D = Dual (A+V)

Table 2: North American Society of Pacing and Electrophysiology/British Pacing and Electrophysiology group revised (2002) Generic Pacemaker Code (NBG) [2]

Acute change in Potassium	Cause	Consequence
Increase	<ul style="list-style-type: none"> • Rapid replacement therapy in a chronically hypokalemic patient <ul style="list-style-type: none"> • Myocardial ischemia • Depolarizing muscle relaxants in patients with neuromuscular disease, burns or major trauma 	Possibility of ventricular tachycardia with VOO pacing or with non sensing VVI pacing
Decrease	<ul style="list-style-type: none"> • Hyper ventilation • Intraoperative diuretic therapy 	Possible loss of pacing

Table 3: Causes and consequences of acute changes in Potassium [4].

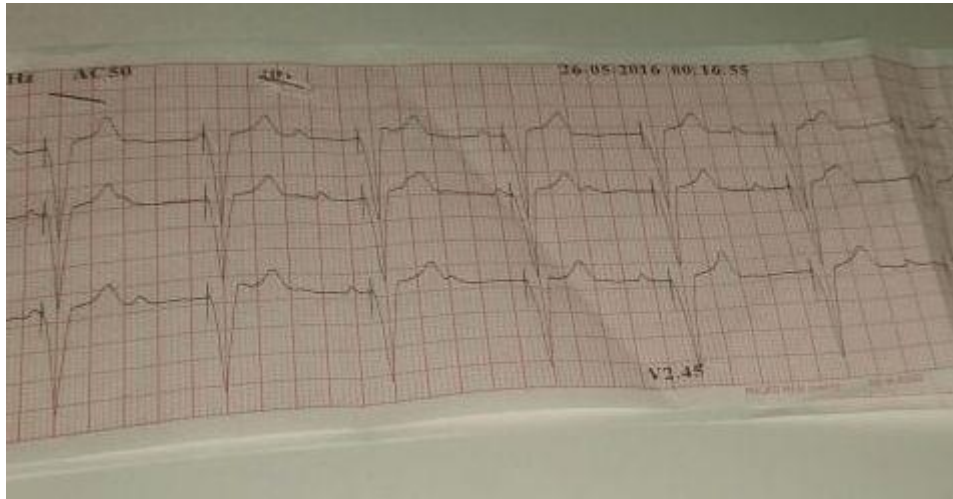


Figure 1: Patient's electrocardiogram

CONCLUSION

Regional anesthesia technique is a reasonable choice for an elderly patient with a permanent pacemaker. Adequate preoperative optimization, vigilant monitoring, favourable intraoperative techniques, prompt treatment of any complications, good pain relief and postoperative care is necessary for the successful management of these patients.

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