

Management Of A Parturient With A Permanent Pacemaker For Caesarean Section

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Abstract

We describe the anaesthetic management of a parturient with a permanent pacemaker for congenital heart block, presenting for elective caesarean section. The implications of a pacemaker and potential complications during caesarean section are described.

INTRODUCTION

There are major changes in cardiovascular physiology during pregnancy. The presence of cardiac disease process may have major implications for the anaesthetic management of a parturient. We report the management of a parturient at 39 weeks gestation with an implanted permanent pacemaker for congenital complete heart block (CHB), for elective caesarean section. There is paucity of literature describing “best practice” for anaesthetic care of parturients with pacemakers. The incidence, implications and management of CHB in pregnancy are reviewed.

CASE REPORT

A 33-year-old nulliparous woman presented at 39 weeks gestation for elective Caesarean section for breech presentation. She had previously had a general anaesthetic for evacuation of retained products of conception following a miscarriage during her first pregnancy. Pre-anaesthetic assessment revealed a medical history of ventricular septal defect at birth which closed spontaneously and congenital complete heart block. A DDD pacemaker [Medtronic – Synchrony® III 20₂9M] was inserted under local anaesthesia when the patient was 16 years old. She had annual pacemaker checks since insertion with no recorded malfunction to date, the last check being 4 weeks prior to her admission. She gave a negative history of any other intercurrent medical condition or medication. On examination the patient weighed 58 kg and was 160 cm tall. She had no symptoms or signs of cardio respiratory failure. On auscultation she had a quiet systolic ejection murmur with a normal second heart sound and no clicks. Her antenatal electrocardiogram (ECG) showed mostly sinus

rhythm with atrial-triggered ventricular pacing at a rate of 80 bpm: only a few beats were atrially paced as well. Her ECG on admission showed sinus rhythm with a rate of 90 bpm.

A combined spinal epidural technique was discussed with the patient and verbal consent obtained. Routine antacid premedication was administered the night before and on the morning of surgery and 30 mls of Sodium Citrate 0.3 M was given in the anaesthetic room.

A 14 gauge venous cannula was inserted in the left wrist, a 16 gauge in the right wrist, and a 20-gauge cannula in the left radial artery under local anaesthesia to enable monitoring and rapid correction of possible sudden drop in blood pressure. Monitoring of ECG, heart rate (HR), arterial haemoglobin saturation (SaO₂) and invasive blood pressure (iBP) was commenced. Initial readings of iBP were 150/90 mmHg, HR of 80 bpm, SaO₂ of 99% on air. An external pacing monitor (Physiocontrol Life Pack 12) was attached to appropriately positioned self-adhesive gel pads. A fluid preload of Gelofusine 500 mls was administered. Infusions of noradrenaline and isoprenaline were prepared and a pacemaker magnet was kept to hand.

A combined spinal epidural technique was performed with the patient in the left lateral position. The entire procedure was atraumatic. Twelve and a half milligrams (2.5mls) of heavy Bupivacaine 0.5% and Fentanyl 30 mcg were slowly administered intrathecally. The spinal needle was then withdrawn and an epidural catheter was threaded up to 4 cm into the epidural space. The patient was then positioned in the right lateral tilt for approximately 2 minutes and then to a left lateral tilt until her baby was born. An infusion of

metaraminol was administered at a rate of 2 mg hr⁻¹.

There were no major haemodynamic changes to the intrathecal dose of the local anaesthetic and opioid. The BP remained within 20% limits of initial measurements. The patient's HR remained constant at 80 bpm. Her SaO₂ on room air was 98-100% throughout the procedure. The patient had complete anaesthesia to both light touch and temperature bilaterally to the 4th thoracic dermatome. Caesarean section proceeded without complications or discomfort and a 3.9 kg male baby was delivered. The Apgar scores were 9 at one minute and 10 at five minutes. Syntocinon was administered slowly intravenously in boluses of 1 unit every minute to a total of 5 units. After each administration of Syntocinon there was an immediate fall in BP of 10-20 mm Hg, which resolved spontaneously on each occasion with no ECG rhythm changes. Antibiotic therapy included clindamycin 300 mg I.V. just before incision, co-amoxiclav 1.2 mg I.V. after delivery and a further dose of clindamycin 150 mgs 6 hours later. At the end of the procedure Diamorphine 3 mg diluted in 10 mls 0.9% saline was administered via the epidural catheter for post-operative analgesia and the epidural catheter was removed thereafter. Estimated blood loss was 600 ml.

The patient recovered on Labour Ward with one-to-one midwifery care and anaesthetic supervision for four hours until the local anaesthetic component of the subarachnoid block had worn off and then transferred to the post-natal ward. She made a completely uneventful recovery and was discharged home after five days.

DISCUSSION

Pregnancy and labour are associated with extreme stress and demand on the cardiovascular system in addition to other physiological changes. The cardiovascular system can potentially fail resulting in morbidity and mortality if predisposing factors such as conduction defects, are already present [1,2]. The administration of anaesthetics may further augment the risk of cardiovascular failure due to the myocardial depression, dysrhythmias and vasodilatation causing reduced venous return and lowering in cardiac output. Pacemakers are used to treat various congenital or acquired conditions producing bradyarrhythmias such as conduction defects, dilated or hypertrophied cardiomyopathy, hypersensitive carotid sinus syndrome, post-cardiac transplant [3,4]. Their use reduces the risks of cardiac failure / arrest provided proper precautions are taken to ensure appropriate functioning of the device and sources

of error are avoided.

Several published cases of obstetric deliveries in patients having cardiac pacemakers have been described, but there is a paucity of evidence describing best practice for anaesthetising such patients [13]. Most of those describe use of general anaesthesia for caesarean section [1,5,6,10,11,12]. On the other hand there is wealth of evidence available describing superiority of regional techniques over general anaesthesia in obstetric patients; however these techniques are generally avoided in patients with significant cardiovascular problems due to perceived association with haemodynamic instability[1].

Knowledge of the type of device, the manufacturer and mode of pacing is important before any surgery due to variation in their behaviour and functioning. Modern pacemakers are programmable in rate responsive fashion or fixed mode. In rate responsive mode the pacemaker senses body vibration as a stimulus for an increased rate. Other methods of sensing include minute ventilation, Q-T interval, temperature, oxygen saturation and myocardial contractility. In fixed mode the pacemaker generates fixed voltage at programmed rate without responding to any stimuli. The former mode is superior as it adjusts heart rate and thus cardiac output according to varying requirements of the body, however there are several factors which can interfere with sensing these variations. These include foetal movements, shivering, peripheral nerve stimulators, transcutaneous electrical nerve stimulators (TENS) and diathermy [5,7,8]. Defibrillation is a theoretical cause of pacemaker reprogramming or damage.

Safe anaesthetic management of the patient with a pacemaker should start with a preoperative visit and review of the clinical records. The pacemaker should be evaluated by the physician prior to the surgery as part of the routine preoperative evaluation. Of particular note should be the original indication for pacemaker insertion, date of insertion and details of recent follow-up pacemaker checks. The mode of action of the pacemaker should be noted. If the pacemaker has a rate modulator function, then this should be deactivated prior to anaesthesia. Direct enquiry from the patient may give clues as to recent pacemaker malfunction in terms of dizziness, syncope or heart failure. Any symptoms suggesting deterioration of the patient's underlying heart disease should be managed aggressively before anaesthesia. It is advisable to have the manufacturer's programmer available in the hospital should any problems arise.

The technique of induction and maintenance of anaesthesia will depend upon the clinical circumstances. However, in general, the use of succinylcholine should be avoided to reduce the chances of over sensing following fasciculation [9]. Should succinylcholine need to be given to a patient with a sensor mode activated pacemaker, then a defasciculating dose of a non-depolarising agent should be given prior to its administration. Careful monitoring of the ECG is vital after any patient positioning or after commencement of mechanical ventilation to ensure that the pacemaker is still functioning appropriately.

For all patients undergoing anaesthesia, there should be a contingency plan in case of pacemaker dysfunction. Primitive but effective pacing can be achieved by regular thumps to the precordium (percussive pacing). Isoprenaline infusions, where available, may be used to improve rate and rhythm. However, the most rapid and effective backup system in most hospitals is non-invasive transthoracic pacing via external pads either positioned below the right clavicle and over the apex of the heart or over the left side of the chest in the antero-posterior position [8]. Capture can usually be achieved at currents of about 80 mA. Alternatives to this include temporary transvenous and transoesophageal pacing, both of which will take longer to set up to achieve effective pacing.

Pacemaker function should be checked by technicians after the procedure, particularly if there have been any adverse events perioperatively. This will also permit the re-activation of rate modulation sensors and the re-institution of any specific pacing modes. In the setting of poor LV function with VVI pacing, reliable pulse oximetry with plethysmography is mandatory in order to confirm mechanical capture [8]. An external defibrillator should be available perioperatively. Ideally, this should be attached to adhesive patches as this will permit external defibrillation without excessive disturbance of the operating field.

Regional anaesthesia is a safe technique for caesarean section for a patient with a pacemaker if the patient is adequately prepared. Invasive monitoring should be used

and an alternative method of pacing must be available.

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