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# Anaesthetic management of a patient with permanent pacemaker - an anaesthetic challenge and overview of pacemakers

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**ABSTRACT**

Pacemakers are the devices which will produce automaticity of the heart by initiating electrical mechanical activity. Type of the pacemaker, type of pacing , manufacturer address, battery life , any malfunctioning of the device should be known by anaesthesiologist well before starting of the case .This knowledge help us to avoid complications and to choose which type of anaesthesia for that particular surgery .Its better to know always what all things we are using inside the operation theatre which interferes with the electrical mechanical activity and how to avoid them .Choosing of anaesthesia technique is very important for the safety of the patient ,as there are many complications like arrythmias , malfunctiong of the device, hypotension , cardiac arrest can occur . We should be aware of these complications and should take precautions to reduce complications. we are thus concluding nerve blocks can also be safest anaesthesia techniques for many surgeries with patients having permanent pacemakers. Regional anaesthesia techniques are very much safe in these type of cases. Nerve blocks are safest because of their least interference with haemodynamics.

## INTRODUCTION

Pacemakers and the underlying pathophysiologies leading to their implantation present challenges to the anaesthetist. In general the purpose of the pacemaker is to initiate electrical mechanical activity in a heart that is unable to maintain it's own automaticity. Electromagnetic interference is an important cause of pacemaker malfunction. There is a wide range of indications for pacemaker insertion. Loss of automaticity may be partial or total, but in any case renders myocardium incapable of maintaining the physiologic needs of the patient. IHD is number one cause of morbidity and mortality all over the world[1] Care of these patients require identification of risk factors, pre-operative evaluation & optimization, medical therapy, monitoring and the choice of appropriate anaesthetic technique and drugs[2].They may also have other pathological processes. 50% of permanently paced have CAD, 20% have hypertension and 10% are diabetic.

## CASE REPORT

A 66yrs old male, ASA (American society of anaesthesiologist) physical status III**,** 175cm tall and weighing 80kg was scheduled for left great toe amputation and debridement of sole of foot .His medical history included diabetic mellitus type II, hypertension since 15yrs and breathlessness of NYHA class II-III. A pacemaker had been implanted in 2008(3.5 yrs back) in right pectoral area. The pacemaker was in VVI mode (Ventricular pacing and sensing with inhibition) It is non- programmable and its correct functioning had been confirmed during routine check 3 weeks before surgery. A preoperative ECG showed normal pacemaker function with a frequency of 70beats/min and no spontaneous activity. According to pacemaker interrogation report, the patient was fully pacemaker dependent. His medication included Enalapril, Glibenclamide, metformin, fursemide, spironolactone, Aspirin and Atorvastatin.His preoperative potassium level was 3.5meq/l and his serum creatinine level was 1mg/dl, blood urea 61mg/dl, FBS (Fasting blood Sugar) 182mg/dl and no urine ketone bodies.

INTRAOPERATIVE - Emergency drugs like isoprenaline, atropine were kept ready. Options for transcutaneous pacing was available in the O.T. Premedication was given with IV midazolam 2mg, IV fentanyl 100µg, and Inj ondansetron 4mg. Intra operative monitoring included pulse oximetry, NIBP and ECG. Under aseptic precautions left Ankle block which involves blockade of the five nerves was given with bupivacaine 0.5% (10ml) and xylocaine2% (10ml). Onset of action was 5mins. Great toe amputation and debridement of the foot was done. Surgery lasted for 45 min and was uneventful. No pacemaker dysfunction was noted at any time before or during surgery. Patient remained conscious and no arrhythmias or other symptoms were observed.

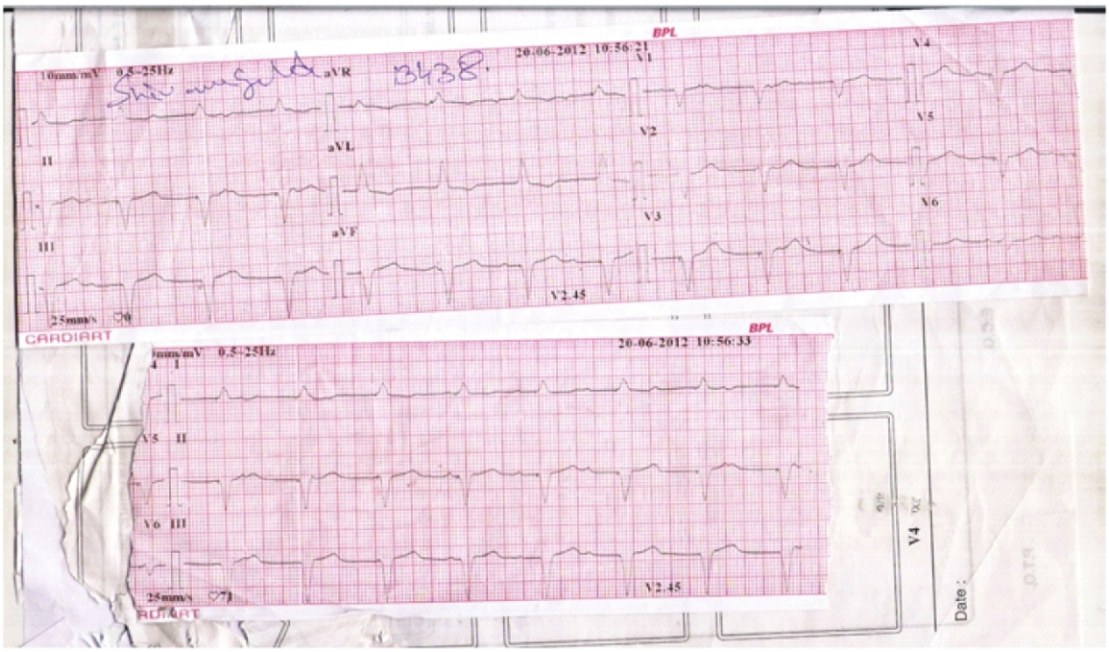


**Figure 1:** His ECG showed LBBB with pacing spikes.

ECHO - preoperatively showed IHD, RWMA, depressed LV Systolic function with LVEF - 35%, Diastolic dysfunction and mild PAH. Airway Mallampati - grade - III

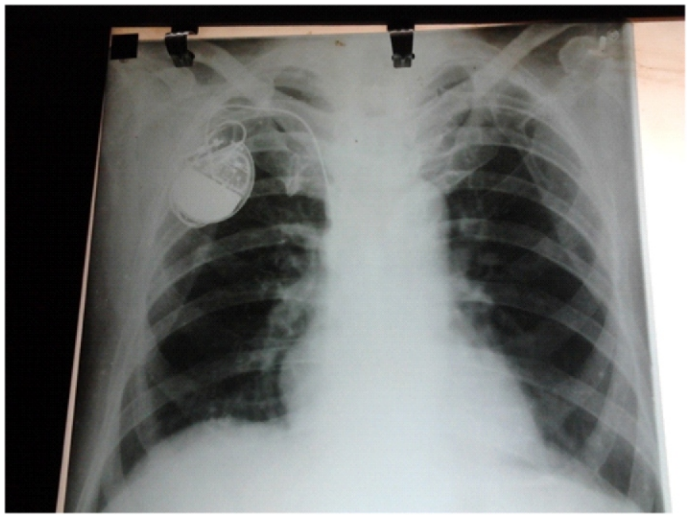

**Figure 2:** Chest X Ray - showed pacemaker in situ.

## DISCUSSION

**Goals of Anaesthesia**

i. Stable haemodynamic

ii. Prevent MI by optimizing myocardial oxygen supply and reducing oxygen demand

iii. Monitor for ischaemia

iv. Treat ischemia or infarction if it develops

v. Normothermia

vi. Avoidance of significant anaemia

Management depends upon the type of surgery whether emergency or elective. For emergency surgery proceed for the surgery with medical management of cardiac ailment. For elective surgery perioperative management depends upon various clinical risk factors and surgery specific risk factors [3] . The principal sources of electromagnetic interference that affect implantable devices are found within the hospital environment. Radio frequency waves with frequencies between 10 &10 Hz can cause device interference. There are several forms of cardiac pacing with the site being either the atrium, the ventricle, or both. Possible responses to external interference include inappropriate inhibition or triggering of a paced output, asynchronous pacing , reprogramming, damage to device Circuitry and triggering a defibrillator discharge. Asynchronous pacing and mode setting are the most common outcomes of EMI, and should be considered if pacing modes appear to change suddenly or intermittently on ECG monitors. Knowing about the type of device , name of manufacturer and the type of pacing help us to deal with device very correctly without complications . Two types of pacemakers available in programmable type first one rate responsive mode and second is fixed mode. In rate responsive type, pacemakers senses body vibration as stimulus for increased rate. Other types of sensing include minute ventilation, Q-T interval, temperature, oxygen saturation and myocardial contractility. In fixed mode pacemakers generate fixed voltage at programmed rate without responding to any stimulus. The former mode is better as it adjusts heart rate and thus cardiac output according to varying requirements of the body. Anderson et al observed there are several factors which interfere with sensing like foetal movements, shivering, peripheral nerve stimulators, TENS (Trans cutaneous nerve stimulation) and diathermy. [5,7,8] Defibrillation is a theoretical cause of pacemaker reprogramming or damage. The technique of induction and maintenance of anaesthesia will depend on the clinical condition, type of surgery, duration of surgery and comorbidities.Sethuran S .et al observed

succinyl scholine should be avoided because fasciculations caused by the succinyl scholine oversenses the pacing. [9] If at all succinyl choline need to be used patient should be with sensor mode activated pacemaker and defasciculating dose of non depolarizing agent given before administration. Careful monitoring of ECG is vital during the start of surgery for knowing about functioning of pacemaker. There should be always an alternate plan in case of pacemaker dysfunction. Percussive pacing can be used as effective pacing in case of dysfunction . Isoprenaline can be used for increasing the rate and rythm. In most of the hospitals the effective and most rapid backup system will be transthoracic pacing via external pads.[8] Alternate methods are transvenous pacing and transesophageal pacing both of which take longer time to achieve effective pacing .[4] General anaesthesia might be the option we avoided as it makes patient more prone for arrhythmias and variation in hemodynamics. Spinal Anaesthesia was avoided in our case because of risk of hypotension and bradycardia and the need to use vasopressors. So because of these we opted ankle block as patient is completely awake, no interference with vitals , very less chances of arryhtmias and less complications postoperatively.

## CONCLUSION

The assessment and management of a patient who has an implanted cardiac device does require some special attention. Anticipation of behaviour, both of the patient and of device is the key to safe management and an uncomplicated procedure. When device interrogation are not available locally, the most important information can be gained from careful history taking, inspection of the patient device, information card and by contacting the pacing clinic that the patient attended. Nerve blocks are the best way of management for these patients without any major complications .

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