**ANAESTHETIC MANAGEMENT OF PATIENTS WITH CARDIAC PACEMAKERS AND DEFIBRILLATORS FOR NONCARDIAC SURGERY**

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**ABSTRACT**

 The ultimate measure of a man is not where he stands during the moments of comfort and convenience but where he stands at the time of challanges and controversey

**- Martin Luther king**

 Advances in the field of medicine is an ever expanding, with the availability of better medical facility and sophisticated diagnostic methods, many patients especially of the elderly age group, are detected to have electrophysiological disorders. Cardiac pacing is one of the most reliable documented treatment for various cardiac arrhythmias, especially bradyarrhythmias . Patients with cardiac pacemakers may present for non cardiac surgeries though no definite figures are available regarding the number of cases, yet the trend is increasing in india. The purpose of this presentation is to anticipate the adverse outcomes that occurs while taking up these cases for surgery and to provide a safe peri operative environment.

 It would be unfair to deal directly with perioperative management without a mention about the pacemakers, its indications, its physiology, hemodynamic changes during pacing and detection of malfunction. Hence this discussion would brief on the above said factors before moving on to perioperative management.

 The american college of cardiology/ American heart association (ACC/AHA) establlished certain indications for permanent pacemakers in 2002. amongst which 1. Acquired AV block. 2. After MI. 3. Bifascicular or Trifascicular block. 4. sinus node dysfunction. 5. Hypertensive carotid sinus and neurocardiac syndromes, are worth mentioning. The generic codes of pacemakers that was defined by NASPE/BPEG consists of five position systems using a letter in each position to describe the programmed function of a pacing system.

**PREOPERATIVE EVALUATION**

 Evaluation of patients and the pacemaker is an important aspect of the anaesthetic management of a patient with permanent pacemaker undergoing noncardiac surgery, the following things to be evaluated before subjecting the patient for surgery.

* The initial indication for the pacemaker and pre implantation symptoms such as light headedness, dizziness or fainting should be sort.
* The general physical examination to rule out the presence of any bruits, and signs of congestive heart failure to be done.
* The location of the pulse generator should be noted.
* Routine biochemical, hematological investigation, ECG, X- ray chest (for visualization of continuity of leads) and measurement of serum electrolytes (especially K+) should be performed.
* PACEMAKER EVALUATION – a.Type of pacemaker (fixed rate or demand rate). b. Time since implanted, c. Pacemaker rate at the time of implantation, d. Half life of the pacemaker battery.
* 10% decrease in the rate from the time of implantations indicates power source depletion.

**A STEPWISE APPROACH TOWARDS A PATIENT WITH A PACEMAKER/AICD BEFORE TAKING UP FOR A NON CARDIAC SURGERIES.**



**INTRAOPERATIVE MANAGEMENT**

monitoring should be based on patients underlying diseases and the type of surgery

* ECG monitoring, pulse oximetry, arterial line if indicated
* If CVP or PA catheter is indicated utmost care should be taken during insertion of the guide wire or catheter, as they are potentially arrthymogenic. In patients whom pacemaker or AICD has been recently implanted this can easily dislodge the freshly placed transvenous endocardial electrode.
* Skeletal myopotentials, ECT, fasciculation, myoclonic movements, can appropriately inhibit or trigger stimulation, depending on the programmed pacing modes.
* Etomidate and ketamine – should be avoided as this may cause myoclonic movements.
* scoline to be avoided – as it may cause fasciculation induced pacemaker malfunction.
* PPV – pacemaker function to be evaluated before and after initiation of PPV as it may dislodge.
* ~~N~~~~2~~~~O~~ to be avoided as it may get entraped in the pacemaker pocket.
* Magnet application still appears to be the standard management of such patients. While magnet application may be appropriate in many instances, blind magnet application without knowing its limitations and complications is nothing more than acquiring a false sense of security.
* Any device that emits radiofrequency waves between 0 and 109 Hz can generate EMI and therefore interfere with pacemaker/ICD function. Thus electrocautery is known to cause pacemaker malfunction.

 If unanticipated device interactions are found, consider discontinuation of the procedure until the source of interference can be eliminated or managed and all corrective measures should be taken to ensure proper pacemaker function should be done.

**Potential adverse events if a patient with an implanted pacemaker is exposed to a MRI**

* Lead electrode heating and tissue damage; this may result in loss of sensing or capture or both

 • Device heating resulting in tissue damage in the implant pocket or patient discomfort or both Induced currents on leads resulting in continuous capture, VT/VF, hemodynamic collapse or all three

 • Damage to the device or leads causing the system to fail to detect or treat irregular heartbeats or causing the system to treat the patient's condition incorrectly

 • Damage to the functionality or mechanical integrity of the device resulting in the inability to communicate with the device

 • Movement or vibration of the device or leads (lead dislodgement can occur)

 • Competitive pacing and potential for VT/VF induction due to asynchronous pacing when MRI Settings are enabled.

 Post procedure, the cardiac rate and rhythm should be monitored continuously and emergency drugs and equipments should be kept ready and consultation with a cardiologist or a pacemaker–implantable cardioverter defibrillator service may be necessary.