



ANAESTHETIC MANAGEMENT OF A PATIENT WITH PACEMAKER

SHALINI

Department of Anaesthesiology, MADRAS MEDICAL COLLEGE AND GOVERNMENT GENERAL HOSPITAL

Abstract : Cardiac pacing remains one of the most reliable means of treating various arrhythmias especially brady-arrhythmias since 1950. Implantable pacemakers, as a method for treating heart problems, gained popularity recently and as a result, more patients with these devices are likely to present for elective or emergency surgeries. Careful preoperative anesthetic evaluation is mandatory for proper intraop management. It is essential for an anesthesiologist to anticipate, recognize and treat pacemaker dysfunction in the perioperative period. The anaesthetic management of a 24 year male with pacemaker, who came for a non-cardiac surgery, has been discussed in this case report.

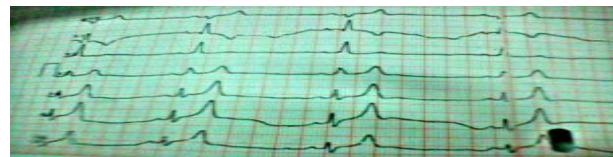
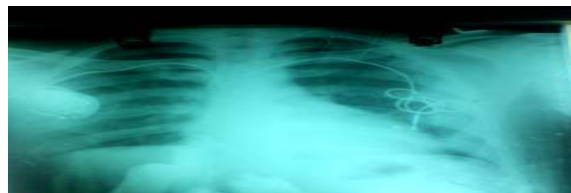
Keyword : permanent pacemaker, congenital heart block, anesthesia

CASE REPORT:

24 yr old male patient, a known case of congenital heart block on VVI pacemaker was admitted in our hospital with complaints of sinus discharge from the left side of the chest from the previous pacemaker implant site. No h/o breathlessness, chest pain, palpitations, dizziness, fever, pedal edema. BIRTH H/O- Antenatal period was uneventful. He was born of full term normal delivery (as congenital

at 5 yrs and 12 yrs of age respectively and in the right side of the chest at 19yrs of age done under local anesthesia. O/E- No pallor, icterus, cyanosis, clubbing, pedal edema or lymphadenopathy. weight -50kgs. PR-70/min, regular. BP-90/60mm of Hg. CVS- S1S2 normally heard, RS- b/l NVBS (+). AIRWAY- MMS II. TMD, IID and neck movements -normal. INVESTIGATION: HB 12gm%, RBS 123mgs/dl, blood urea 24 gm/dl, serum creatinine 1mgm/dl, platelets 2.74 lakhs /cu mm. ECG-pacing spikes(+), LBBB(+), 100% RV capture. chest x-ray—normal, pacemaker seen in right infra-clavicular region. ECHO- no RWMA, LVD:5.3/3.9/52%, adequate LV systolic function, mild MR and TR, no PHT.

CXR SHOWING PACEMAKER IMPLANT IN THE RIGHT INFRACLAVICULAR REGION ECG SHOWING PACING SPIKES

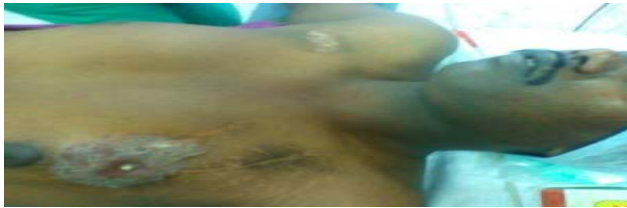


24 yr old male patient, a known case of congenital heart block on VVI pacemaker was admitted in our hospital with complaints of sinus discharge from the left side of the chest from the previous pacemaker implant site. No h/o breathlessness, chest pain, palpitations, dizziness, fever, pedal edema. BIRTH H/O- Antenatal period was uneventful. He was born of full term normal delivery (as congenital rubella may be associated with congenital heart block). PAST H/O -At the age of 3 yrs, he was diagnosed as having third degree congenital heart block, when he was admitted for h/o syncope and repeated chest infections. He had his 1st, 2nd and 3rd pacemaker (transvenously) implanted in left side of the chest

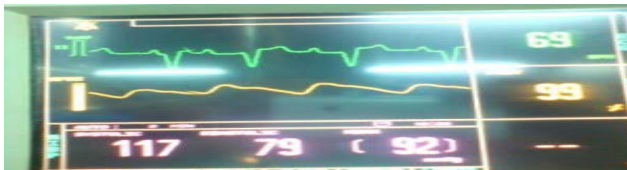
INTRAOP:

Patient was shifted to OR. Emergency drugs like inj. atropine, inj. isoproterenol, inj. dopamine, and inj. dobutamine were kept ready. Equipments for temporary/transvenous pacing, external defibrillator and cardiopulmonary resuscitation were kept ready. A cardiologist was made available in the OR for emergency cardiac care. ECG, NIBP and pulse oximetry monitors were connected to the patient. Artifact filter in ECG monitor was disabled (the default setting of most monitors detects pacemaker spikes as an artifact). IV cannulation done with 18 gauge IV cannula in the right dorsum of hand. Patient was premedicated with inj. glycopyrrolate 0.2mg, and inj. fentanyl 100 microgram given intravenously. After preoxygenation with oxygen for 3mins, pa

patient was induced with inj. thiopentone 250mg. For muscle relaxation, inj. atracurium 130mg was used. Inj. succinylcholine avoided in patients with pacemaker as, 1) it can increase the threshold stimulation due to an acute increase in serum potassium levels 2) it can inhibit normally functioning pacemaker by the fasciculation's (myopotentials) caused by it, which the pulse generator senses it as the intrinsic R wave. Patient was intubated with 8 size CETT. Bilateral air entry checked and ET tube fixed in position. Anesthesia maintained with O₂:N₂O -1:2 and sevoflurane 1%-2%. Electrocautery was avoided during the procedure and the surgery lasted for 1 hr 45 mins. Intraoperatively, patient received 1500ml of crystalloids and hemodynamics were maintained between 69-72/min pulse rate, 100-120/70-90mm of Hg blood pressure, 99-100% oxygen saturation. Patient reversed with inj. neostigmine 2.5mg and inj. Glycopyrrolate 0.4 mg and extubated. Post op vitals stable. Patient shifted to PACU. The case was observed for 24 hours and later shifted to postoperative ward.



PATIENT SHOWING SINUS DISCHARGE FROM THE (LEFT SIDE OF CHEST) PREVIOUS IMPLANT SITE



MONITOR SHOWING PACING SPIKES INTRAOPERATIVELY

DISCUSSION:
Congenital heart block is a rare disorder. Its incidence is 1 in 22,000 live births. Survival rate of newborns with CHB without underlying structural heart lesion is about 85%. Most of the patients will require pacemaker implantation, as they are potentially under the risk of developing left ventricular dilatation and mitral insufficiency later in their life, due to longstanding bradycardia. Congenital heart block is known to be associated with Congenital Rubella Syndrome (clinical triad of deafness, cataract, congenital heart defects-PDA). Anaesthetic management of such patients with pacemaker poses a great challenge and needs to formulate a multidisciplinary approach. Pre-operative evaluation:

Direct consultation with the cardiologist and the pacemaker-representative is the only reliable method till date, for evaluation of the battery condition, functioning of the leads and the adequacy of current functioning of the pacemaker. The consultation also helps in programming the pacemaker, to avoid inappropriate inhibitions or high rate pacing that occurs due to electrical interference, to set the rate response function to OFF mode in those pacemakers that use minute ventilation method of physiological pacing or the implant sleep mode. Prior to surgery, the anesthetist and surgeon should discuss the implications of using diathermy or electrocautery in such patients.

During surgery:

The patient's ECG is monitored throughout the peri-operative period to confirm the proper functioning of the pulse generator. In order to ensure that the paced electrical activity is converted to a mechanical systole, the pulse wave from either an intra arterial line or a pulse oximeter can be useful. When surgical diathermy/ electrocautery becomes necessary, the following problem may arise. The pacemaker senses the electrical artifact produced by

the electrocautery as either an interference or an intrinsic R wave. - If the pacemaker detects the electrical artifact as an interference, the unit will go into 'asynchronous' mode (fixed rate) to ensure the delivery of a paced beat. - If the pacemaker detects the electrical interference as an R wave, it results in inhibition of the pulse generator and loss of pulse generation. In order to overcome such mishaps, the anesthesiologist should be ready to institute cardiopulmonary resuscitation, temporary external/ transvenous pacing, and external defibrillation. The paddles should be placed more than 15 cm away from the implant and placed perpendicular to the path of the implanted lead and the lowest possible energy has to be used for cardioversion. A cardiologist should be available in the OR for cardiac care. Bipolar cautery is always preferred over a monopolar cautery.

This is because, in monopolar surgery, the current passes through the patient and completes the current cycle, while in bipolar surgery, the current passes only through the tissue between the two cautery tips (electrodes) of the instrument. Use of harmonic scalpel², an ultrasonic cutting and coagulating instrument, can avoid surgical diathermy and its hazards. The scalpel thermally transfers heat to the tissue without electrical current passing through the patient. Recently, it has gained popularity as an alternative to electrocautery (without generating electromagnetic interference) on patients with pacemakers. If a monopolar electrosurgical unit must be used, pure cut settings are preferable to blend or coagulation. It should be used in short and intermittent burst of cautery. The electrosurgical current -return pad (grounding pad) must be positioned in a proper way, so that the current pathway between the diathermy electrode and the return electrode is as far away from the pacemaker. The cables attached to the electrosurgical unit must also be placed away from the site of pacemaker. In this patient, diathermy was avoided for two reasons: 1) surgical site was very close to the implant. The recommended minimum distance between the pacemaker implant and the surgical site should be greater than 6 inches (15 centimeters) in case of electrocautery use⁵.

2) Need for diathermy was not absolute, weighing the risk-benefit ratio. Pacemaker failure: Pacemaker failure can occur intraoperatively. It can be due to generator failure, lead failure or capture failure. If the patient's vitals are stable, arrangements are made to correct the problem, while he/she is under observation. If the patient becomes hemodynamically unstable, then the following steps need to be attempted:

- 1) A magnet can be applied if the patient is known to revert to asynchronous mode.
- 2) Temporary pacing can be done either by transvenous, transcutaneous or transesophageal routes. The transesophageal route is contraindicated in atrial flutter, as it requires functional atrium and av node for ventricular activation.
- 3) Sympathomimetic drugs - epinephrine (0.5 to 1µg/min), dopamine (5 to 20µg/kg/min) or isoproterenol (0.5µg/min) can be administered.
- 4) If Myocardial infarction develops, it should be treated appropriately.
- 5) Electrolyte imbalance can raise the depolarization threshold and hence needs to be corrected, if present.
- 6) If above measures fail, placement of epicardial leads by surgical means should be considered. Post-op: Patient requires continuous monitoring of cardiac rhythm. Facility for cardio version / defibrillation should be made available. Reassessment of the patient and the pacemaker implant by the cardiologist should be done as soon as possible.

CONCLUSION

Patients with implanted pacemakers can be successfully managed, only after a thorough understanding about the indication of its insertion, pacing modes, and its programming. Consultation with a cardiologist is mandatory for evaluating the pacemaker functioning and its battery life. Patient's medical status should be evaluated and the anesthetic management planned accordingly. Careful monitoring of ECG, pulse oximetry and arterial blood pressure should be done. While using electrocautery, steps for minimising electrical interference should be done. Rate responsive pacemakers should have rate responsive mode disabled before surgery. In view of pacemaker malfunctioning anytime during surgery, temporary pacing should be made available in the OR. Rechecking of the pacemaker should be done once the procedure is over, to check for any damage and malfunction.

REFERENCES:

- 1.MILLER'S ANAESTHESIA;7th edition ;Pharmacology of muscle relaxants;pg 874.
- 2.NandalanSP,Vanner RG:use of the harmonic scalpel in a patient with a permanent pacemaker.Anaesthesia 2001;94:710 .
- 3.Shivani Rastogi,Sanjay Goel et al. Anaesthetic Management of Patients with Cardiac Pacemakers and Defibrillators for Noncardiac Surgery: Annals of Cardiac Anaesthesia 2005; 8: 21-32.
4. Chardack WM, Gage AA, Greatbatch W: A transistorized , self-contained, implantable pacemaker for the long-term correction of complete heart block. Surgery 1960; 48:643-654.
- 5.Paul G. Barash;6th edition;pg 1589 .

