

# PACEMAKER & DEFIBRILLATOR

## PREOPERATIVE KEY POINTS

### 1. Identify the manufacturer and model of the generator

- The Pacemaking Code of the North American Society of Pacing and Electrophysiology (NASPE) and the British Pacing and Electrophysiology Group (BPEG) describes basic pacing behaviors as follow:

Table 1: NASPE / BPEG Generic Pacemaker Code (NBG) [Revised 2002]

Position I	Position II	Position III	Position IV	Position V
Chambers Paced	Chambers Sensed	Response to Sensing	Programmability	Multisite Pacing
O = None	O = None	O = None	O = None	O = None
A = Atrium	A = Atrium	I = Inhibited	R = Rate Modulation	A = Atrium
V = Ventricle	V = Ventricle	T = Triggered		V = Ventricle
D = Dual (A+V)	D = Dual (A+V)	D = Dual (T+I)		D = Dual (A+V)

### 2. Get a copy of the device recent interrogation from the company. Identify if a magnet mode is present from the manufacturer.

- The interrogation includes battery status, lead performance and adequacy of current settings.
- Consider replacing the device before a major surgery if near its elective replacement period.
- NOT ALL pacemakers switch to a continuous asynchronous mode when magnet is placed.

### 3. Determine the patient's underlying rhythm and rate from ECG to identify if he is pacemaker dependent or not.

- Pacemaker beat should be present in ECG.
- If no pacemaker beat is seen: either patient's intrinsic rhythm is overriding pacemaker; or the generator is not functioning.
- Perform carotid sinus massage with cardiac monitoring to trigger pacemaker beat to confirm it is functioning.

#### 4. Reprogramming

- Reprogramming to asynchronous mode at a rate > patient's underlying rate usually ensures no over- or under-sensing from EMI will take place.
- Reprogramming is likely needed if:

Presence of any minute ventilation rate responsiveness. Disable
Presence of any rate enhancements. Disable
Pacemaker-dependent patients
Major procedure in chest or abdomen
Special Procedures: <ol style="list-style-type: none"><li>1. Lithotripsy</li><li>2. Transurethral or hysteroscopic resection</li><li>3. Electroconvulsive Therapy ECT</li><li>4. MRI (usually contraindicated)</li></ol>

#### 5. Disable antitachycardia therapy in ICD. Magnet use has been associated with inappropriate ICD discharge.

- ECG monitoring and the ability to deliver external cardioversion or defibrillation must be present during the time of ICD disablement.

### **INTRAOPERATIVE KEY POINTS**

1. Monitor cardiac rhythm / peripheral pulse with pulse oximeter or arterial waveform. Change ECG monitor to "Pace" mode.
2. Avoid use of monopolar diathermy. Bipolar diathermy is recommended.
3. If monopolar has to be used:
  - Use lowest energy as possible
  - Use shortest time as possible
  - Place current return pad as far away from PM as possible.
4. Prepare resuscitation drugs e.g. Isoprenaline and adrenaline in case of emergency
5. Attach external pacing pad if high chance of EMI.

## **POSTEROPERATIVE KEY POINTS**

- 1. Have the device interrogated and reset appropriately to ensure proper functioning and remaining battery life if any ESU was used.**
- 2. ICD patient must be monitored until the antitachycardia therapy is restored.**

## **INTRAOPERATIVE PM/ ICD FAILURE**

### **1. PM failure etiologies**

- Failure to capture can result from myocardial ischaemia, infarction, acid-base disturbance, e abnormalities or abnormal antiarrhythmic drug levels.
- Potassium level is especially important as PM may not function in hypoK, while hyperK reduces the action potential threshold and increases risks of arrhythmia.
- Outright generator or lead failure is rare.
- EMI could reprogramme or reset PM.

### **2. ICD failure**

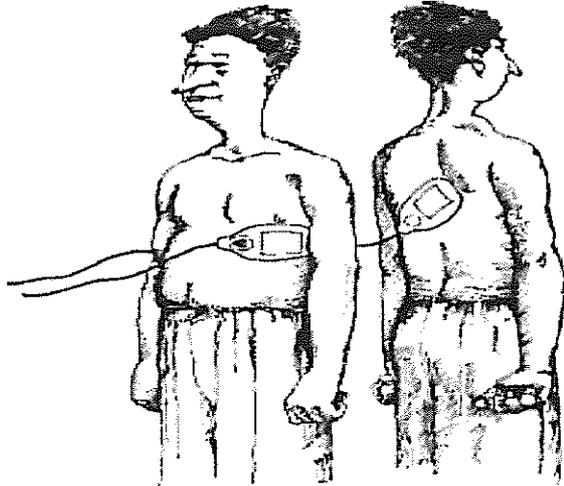
- ICD should be disabled prior to insertion of central line to prevent inappropriate shock, possible ICD failure or patient injury.

### **3. If PM fails as a result of EMI intraoperatively:**

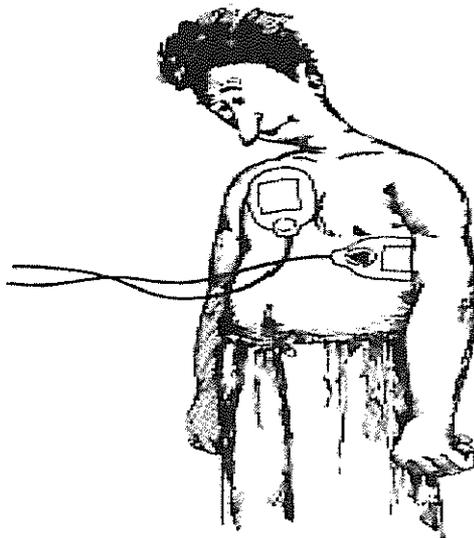
- Administer resuscitation drug immediately
- Place magnet to PM if magnet mode is present
- Start external pacing

## **EXTERNAL PACING**

1. Usually Non-demand mode: deliver current at selected rate and ignores intrinsic beats.
2. Pacing System: ECG monitor, ECG electrodes, Pacing electrodes & cables.
3. Placement of Pacing electrodes:
  - Anterior-Posterior



- Anterior-lateral

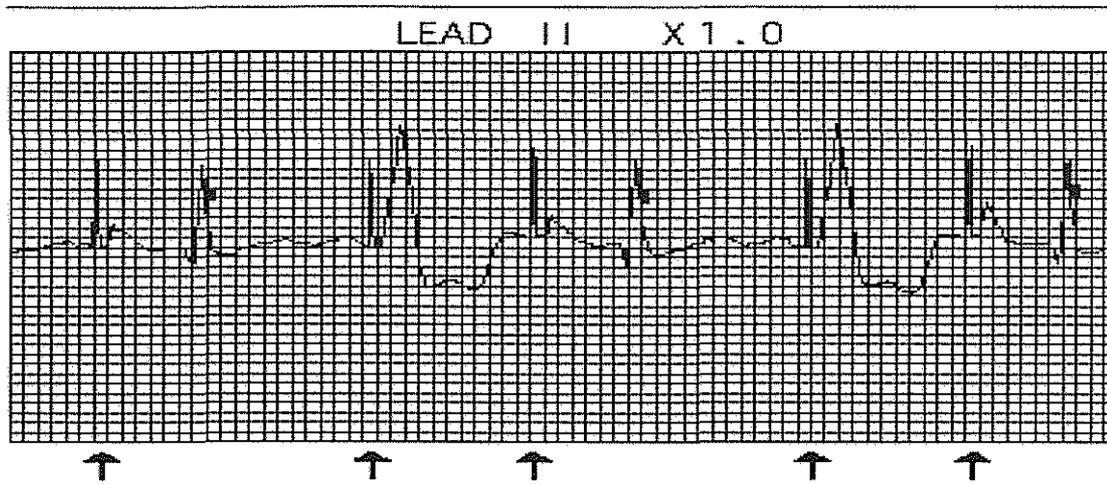


#### **4. Select Mode, Rate & Current**

- 0 mA until Pacing Mode is selected
- adjust current upward 20mA steps until mechanical capture
- decrease by 5mA steps to achieve lowest current that maintain mechanical capture
- set initial rate at 70ppm

## 5. Electrical Capture vs Mechanical Capture

- Electrical capture occurs when the pacing stimulus leads to a depolarization of the ventricles as evidence by the ECG changes: widening QRS with tall broad T wave.



**Intermittent electrical capture. Second and fourth pacing stimuli result in capture. Current should be increased until continuous capture occurs.**

- Mechanical captures is evident by improved in cardiac output, blood pressure, palpable pulse, level of consciousness and skin colour and temperature.
- Both electrical and mechanical capture must occur.

## 6. Safety Precaution

- Patient should be monitored all the time during and after pacing procedure
- Pacing threshold may change and loss of capture may result
- It is safe to touch patient and perform CPR during pacing.
- Therapy will be interrupted if pacing electrodes fall off.

## REFERENCE

1. Practice advisory for the perioperative management of patients with cardiac rhythm management devices: pacemakers and implantable cardioverter-defibrillators: a report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Rhythm Management Devices. *Anesthesiology* 2005; 103:186
2. Perioperative Pacemaker and Defibrillator Management: What you Need to Know. *ASA 2010 Refresher Course Marc A. Rozner*
3. Transcutaneous Cardiac Pacing Training Program Spring 2003. Marc Burdick