



## DOUBLE TROUBLE

### CASE REPORT OF DCR DONE IN A HCV POSITIVE PATIENT ON PACEMAKER

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#### ABSTRACT

Reporting a case of non-cardiac surgical management of a HCV positive patient with implanted cardiac device. Discussing patient monitoring, endonasal surgical management of dacrocystitis and expected complications during intra operative & post-operative period. Preventing these complications by taking proper precautionary steps..

#### Introduction:

Cardiac pacing is one of the most reliable documented treatment for various cardiac arrhythmias, especially bradyarrhythmias since 1950. In 1958, Arne Larsson from Sweden was the first person to receive an implantable pacemaker. Pacemaker is a medical device that uses electrical impulses, delivered by electrodes contracting the heart muscles, to regulate the beating of the heart. The primary purpose of a pacemaker is to maintain an adequate heart rate, either because the heart's natural pacemaker is not fast enough, or there is a block in heart's electric conduction system.

There are three basic types of permanent pacemakers, classified according to the number of chambers involved and their basic operating mechanism.

✓ Single-chamber pacemaker:- In this type only one pacing lead is placed into a chamber of the heart, either the Atrium or the Ventricle.

✓ Dual-chamber pacemaker:- here wires are placed in two chambers of the heart. One lead paces the atrium and one paces the ventricle. This type is more closely resembles the natural pacing of the heart by assisting the heart in coordinating the function between the atria and ventricles.

Currently more than 5,00,000 patients in the United States have pacemakers and nearly 1,15,000 new devices are implanted each year. Although, no definite figures are available approximately 15000 individuals undergo permanent cardiac pacemaker implantation in India and the number is also increasing. These patients may require one or more surgical procedures after receiving the pacemaker. Care of the pacemaker during surgery as well as understanding its surgical and anaesthetic implications is crucial in the management of these patients. The perioperative management of patients with permanent pacemaker undergoing non-cardiac surgery is discussed.

Hepatitis C was first detected in 1989 using molecular biology techniques after extensive testing of serum from experimentally infected animals. It was later characterized to be an RNA virus that belongs to the Flaviviridae family and genus Hepacivirus. Ever since its discovery it became clear that this virus was the major cause of acute hepatitis after a blood transfusion that was neither related to hepatitis A nor to hepatitis B (hence the early name for this disease, non-A, non-B hepatitis).

It has been estimated that the global prevalence of Hepatitis C virus (HCV) infection is around 2%, with 170 million persons chronically infected with the virus and 3 to 4 million persons newly infected each year. It is now widely recognized as one of the common aetiological agents for cirrhosis of the liver. It is the leading cause of liver transplantation and the most common chronic blood borne infection in developed countries like the USA.

#### CASE REPORT:

A 72 year old lady came to ENT out patient department with chief complains of left eye epiphora & swelling on the medial end of left eye for past 6 months. Her epiphora was continuous even during indoor. She had grade 4 epiphora as per Sahlin grading system( table 1). No history of any trauma. No history of eye or nose surgeries in the past. She gave history of undergoing laprotomy in 1989 during which she was transfused 2 units of blood. She also gave history of undergoing surgery for permanent pacemaker implantation 3 year ago when she was diagnosed to have atrioventricular conductive heart block. On examination of the lacrimal system, on palpation left side there was a soft cystic swelling medial to left eye.

Syringing test showed simple regurgitation, diagnostic probing elicited obstruction at the level of lacrimal sac. Flourescein dye disappearance test was found to be positive. Diagnostic nasal endoscopy showed lack of tears flowing in the inferior meatus on giving pressure over the lacrimal swelling.

CT- paranasal sinuses was done to assess the anatomy. All these tests were found to be normal on right side. She was diagnosed to have left eye dacrocystitis. On routine blood investigation all the parameters were normal except, she was positive to anti-HCV. She was later planned for endoscopic dacrocysorhinoplasty under general anesthesia. Cardiological fitness was obtained for surgery.

Grading	Degree of epiphora
0	No epiphora
1	Epiphora only outdoors during windy times
2	Outdoor Epiphora no indoor epiphora
3	Outdoor and indoor epiphora

SAHLIN GRADING OF EPIPHORA (TABLE -1)

#### ANESTHETIC EVALUATION:

Patients with cardiac disease presenting for non-cardiac surgery pose a considerable challenge to the anaesthesiologists. 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. Pacemakers are being used with greater frequency for both conduction and arrhythmia problems in such patients. The American College of Cardiology /American Heart Association (ACC/AHA) established indications for permanent pacemaker or antitachycardia devices in 2002, which are depicted below.

Indications of permanent pacemaker implantation.

1) Acquired AV block:

A) Third degree AV block

Bradycardia with symptoms

After drug treatment that cause symptomatic bradycardia

Postoperative AV block not expected to resolve

Neuromuscular disease with AV block

Escape rhythm <40 bpm or asystole > 3s

B) Second degree AV block

Permanent or intermittent symptomatic bradycardia

2) After Myocardial infarction:

Persistent second degree or third degree block

Infranodal AV block with LBBB

Symptomatic second or third degree block

3) Bifascicular or Trifascicular block:

Intermittent complete heart block with symptoms

Type II second degree AV block

Alternating bundle branch block

4) Sinus node dysfunction:

Sinus node dysfunction with symptoms as a result of long term drug therapy

Symptomatic chronotropic incompetence

5) Hypertensive carotid sinus and neurocardiac syndromes:

Recurrent syncope associated with carotid sinus stimulation

Asystole of >3s duration in absence of any medication

AV: atrioventricular, LBBB: Left bundle branch block,

To understand the language of pacing, it is necessary to comprehend the coding system that was developed originally by the international conference on heart disease and subsequently modified by the NASPE/BPEG (North American society of pacing and electrophysiology/British pacing and electrophysiology group) alliance. The NASPE/BPEG code consists of a five position system using a letter in each position to describe the programmed function of a pacing system (Table 2). The first letter indicates the chamber being paced, the second letter designates the chamber being sensed, third position designates response to sensing (I and T indicates inhibited or triggered responses, respectively). The fourth and fifth positions describe programmable and antitachyarrhythmia functions, but these two are rarely used. And R in fourth position indicates that the pacemaker incorporates a sensor to modulate the rate independently of intrinsic cardiac activity such as with activity or respiration.

I Pacing	II Sensing	III Response	IV Programmability	V Tachycardia
O-none A-atrium V-ventricle	O-none A-atrium V-ventricle	O-none I-inhibited T-triggered	O-none C-communicating P-simple programmable	O-none P-pacing S-shocks
D-Dual (A+V)	D-Dual (A+V)	D-dual (I+T)	M-multi programmable	D-dual (P+S)
S-simple (A or V)	S-simple (A or V)		R-rate Modulation	

Table 2. Generic codes for pacemaker

Pacing threshold:

This is minimum amount of energy needed to consistently cause depolarization and therefore contraction of the heart. Pacing threshold is measured in terms of both amplitude and duration for which it is applied to the myocardium. The amplitude is programmed in volts (V) or in milliamperes in some devices, and the duration is measured in milliseconds. Factors affecting the myocardial pacing threshold are listed in table 3.

Increase	Decrease
1-4 weeks after implantation	Increased catecholamines
Myocardial ischemia/infarction	Stress, anxiety
Hypothermia, hypothyroidism	Sympathomimetic drugs
Hyperkalaemia, acidosis/alkalosis	Anticholinergics Glucocorticoids
Antiarrhythmics (class Ic,3)	Hyperthyroidism
Antiarrhythmics ( class IA/B,2)	Hypermetabolic status
Severe hypoxia/hypoglycaemia	
Inhalation-local anaesthetics	

Table3. Factors affecting pacing threshold

### Types of Pacing Modes

#### Asynchronous: (AOO, VOO, and DOO)

It's the simple form of fixed rate pacemaker which discharges at a preset rate irrespective of the inherent heart rate. It can be used safely in cases with no ventricular activity. However, the problems associated with asynchronous pacemaker are that it competes with the patient's intrinsic rhythm and results in induction of tachyarrhythmias. Continuous pacing wastes energy and also decreases the half-life of the battery.<sup>7</sup>

#### Single Chamber Atrial Pacing (AAI, AAT)

In this system atrium is paced and the impulse passes down the conducting pathways, thus maintaining atrioventricular synchrony. A single pacing lead with electrode is positioned in the right atrial appendage, which senses the intrinsic P wave and causes inhibition or triggering of the pacemaker. This is useful in patients with sinus arrest and sinus bradycardia provided atrioventricular conduction is adequate. It is inappropriate for chronic atrial fibrillation and long ventricular pauses.

#### Single Chamber Ventricular Pacing (VVI, VVT)

VVI is the most widely used form of pacing in which ventricle is sensed and paced. It senses the intrinsic R wave and thus inhibits the pacemaker function. This type of pacemaker is indicated in a patient with complete heart block with chronic atrial flutter, atrial fibrillation and long ventricular pauses. Single chamber ventricular pacing is not recommended for patients with sinus node disease, as these patients are more likely to develop the pacemaker syndrome.

#### Dual Chamber AV Sequential Pacing (DDD, DVI, DDI, and VDD)

Two leads that can be unipolar or bipolar are used, one for the right atrial appendage and the other for right ventricular apex. The atrium is stimulated first to contract, then after an adjustable PR interval ventricle is stimulated to contract. These pacemakers preserve the normal atrioventricular contraction sequence, and are indicated in patients with AV block, carotid sinus syncope, and sinus node disease.

In DDD system, both the atrium and ventricle can be sensed and paced. The advantages of dual chamber pacemaker are that they are similar to sinus rhythm and are beneficial in patients, where atrial contraction is important for ventricular filling (e.g. aortic stenosis).

The disadvantage of dual chamber pacing is the development of a pacemaker-mediated tachycardia (PMT) due to ventriculoatrial (VA) conduction in which ventricular conduction is conducted back to the atrium and sensed by the atrial circuit, which triggers a ventricular depolarization leading to PMT. This problem can be overcome by careful programming of the pacemaker. BPEG have issued guidelines on the recommended pacing modes for all types of bradyarrhythmias requiring pacing (Table 4)

**PRE-OPERATIVE EVALUATION:**

**Potassium:** - Its equilibrium across the cell membrane determines the resting membrane potential (RMP). In certain clinical situations, the RMP becomes less negative and approaches the membrane's threshold potential so that less current density at the electrode tissue interface is required to initiate an action potential, making capture by the pacemaker easier. If the RMP becomes more negative, an increased current density would be required to raise the RMP to the membrane threshold potential, making it more difficult for the pacemaker to initiate myocardial contraction.

An acute increase in extracellular potassium concentration as in patients with myocardial ischaemia, rapid potassium replacement in chronic hypokalaemic patients or use of depolarising muscle relaxants in patients with burns, trauma or neuromuscular disease may increase the RMP to less negative value, thus making the capture easier. Similarly, decrease in extracellular potassium (in patients on diuretic therapy or those undergoing hyperventilation such as neurosurgical patients) leads to more negative RMP making the pacemaker capture difficult.

<b>Sinus node disease</b> Optimal Alternative Inappropriate	AAIR AAI VVI,VVD
<b>Atrioventricular block</b> Optimal Alternative Inappropriate	DDD VDD AAI, DDI
<b>Sinus node disease with atrioventricular block</b> Optimal Alternative Inappropriate	DDDR, DDIR DDD, DDI AAI, VVI
<b>Chronic atrial fibrillation with atrioventricular block</b> Optimal Alternative Inappropriate	VVIR VVI AAI, VVI, VDD
<b>Carotid sinus syncope</b> Optimal Alternative Inappropriate	DDI DDD,VVI(with hysteresis) AAI,VDD
<b>Malignant vasovagal syndrome</b> Optimal Alternative Inappropriate	DDI DDD AAI, VVI, VDD

**Myocardial Infarction:** - The scar tissue is unresponsive to electrical stimulation and may cause loss of pacemaker capture.

Antiarrhythmic Drug Therapy: - Class Ia (quinidine, procainamide), Ib (lidocaine, diphenylhydantoin), and Ic (flecainide, encainide, propafenone) drugs have been found to increase the pacing threshold.

Acid Base Status: - Alkalosis and acidosis both cause increase in pacing threshold.

Hypoxia: - It causes increase in pacing threshold.

Anaesthetic Drugs: - These drugs are not likely to change the pacing threshold. It is notable that addition of equipotent halothane, enflurane, or isoflurane to opiate based anaesthesia after cardiopulmonary bypass did not increase pacing threshold.

Co-morbidities:- Detailed evaluation of the underlying cardiovascular disease responsible for the insertion of pacemaker, and also other associated medical problems. Since substantial number of these patients suffers from coronary artery disease (50%), hypertension (20%) and diabetes (10%).

Routine biochemical and haematological investigations should be performed as indicated on an individual basis. A 12 lead electrocardiogram, X-ray chest (for visualization of continuity of leads) and measurement of serum electrolytes (especially K<sup>+</sup>) should be performed.

Pacemaker evaluation: - It is equally important to evaluate the function of pacemaker in the pre-operative period. Assistance from the cardiologist and the manufacturer's representative may be obtained for the purpose. Most of the information about the pacemaker, such as type of pacemaker (fixed rate or demand rate), time since implanted, and pacemaker rate at the time of implantation.

Reprogramming the pacemaker is generally indicated to disable rate responsiveness. The AICD also needs to be disabled before anaesthesia. ACC/ AHA guidelines advise that all antitachycardia therapy should be disabled before anaesthesia. If the risk of electromagnetic interference (EMI) is high, such as, when the electricity is in close proximity to the generator, alternative temporary cardiac pacing device should be available. The use of magnet may also be necessary.

#### INTRA-OPERATIVE:-

Intraoperative monitoring should be based on the patient's underlying disease and the type of surgery. Continuous ECG monitoring is however, essential to monitor pacemaker functioning. In addition, both electrical and mechanical evidence of the heart function should be monitored by manual palpation of the pulse, pulse oximetry, precordial stethoscope. . Because the use of electrocautery also interferes with the ability of the ECG to monitor the heart, heart rate and blood pressure should be monitored using an arterial line (Fig 1 & 2).



Fig 1

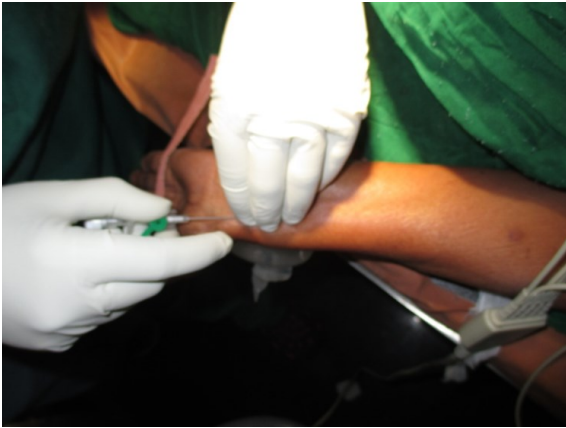


Fig 2



Fig 3

Fasciculations associated with the use of depolarizing muscle relaxants such as succinylcholine can create myopotentials. These high-frequency electrical signals can be interpreted as cardiac activity and cause device malfunction. The muscle fasciculation induced by succinylcholine can be avoided by using nondepolarizing muscle relaxant or defasciculating with nondepolarizing muscle relaxant before giving succinylcholine. Etomidate and ketamine should be avoided as these cause myoclonic movements. Drugs such as isoproterenol and atropine were avoided.

Also, due to the possibility that the pulse generator may be damaged during the surgery, inotropic and chronotropic support should be available.

Taking all the above precautions patient was shifted to operation theatre & connected to monitors NIBP, ECG, SPO2. After noting the patients vitals which were stable, Pacemaker mode was changed from DDD mode to DOO (asynchronous) mode with heart rate set at 76/min.

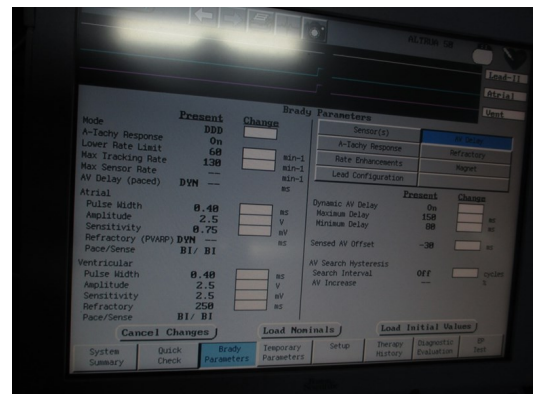


Fig 4

Anaesthesia used ETGA with controlled ventilation. Premedicated with inj glycopyrrolate 0.2 mg iv + inj midazolam 1mg iv + inj fentanyl 100mics iv. Then after re-oxygenating for 3 minutes Patient was induced with Inj thio-pentone sodium 200mg iv + inj vecuronium 5mg iv. And patient was intubated with 7mm id cuffed endo tracheal tube and connected to ventilator.



Anaesthesia maintained with N<sub>2</sub>O : O<sub>2</sub> in 3:1.5 desflurane 4%. Right radial artery cannulated with 20g venflon for intra-arterial BP monitoring. Intra operatively patient vital were stable. Inj Vecuronium repeated 1mg iv. Inj paracetamol 1g IV given for pain relief.

#### OPERATIVE PROCEDURE:

Universal hygiene precautions were observed and special disposable kits been used by surgeon and anaesthetist.

Patient was put in supine position with 15 degree head end elevation. Nasal cavity was packed with cotton pellets soaked in 4% lignocain. An incision was made in the mucosa overlying the anterior lacrimal crest and a posterior based mucoperichondrial flap is raised. The anterior lacrimal crest was identified as a white vertical ridge of bone immediately anterior to the middle turbinate. The anterior lacrimal crest is removed using kerrison punch. Posterior to the anterior lacrimal crest, unciniate process was identified and just lateral to the unciniate process is the thin lacrimal bone that forms the remainder of the medial aspect of the lacriamal fossa. This bone is paper thin and is easily resected. A large rhinostomy was created using kerrison punch. The lacrimal sac is exposed, using a sickle knife sac is divided vertically. Following which pus oozed out. Microscissors are then used both inferiorly and superiorly to create anterior and posterior flaps. These flaps of sac mucosa are then placed in continuity with the mucosa of the nasal wall. Syringing was done to assess the patency of the lacrimal system. Hemostasis attained and patient extubated. Pacemaker mode was reversed back from DOO to DDD mode. Post operatively uneventful. Later patient was shifted to ICU for post operative observation and care.

#### POST -OPERATIVE EVALUATION:

An evaluation of pacemaker and ICD function similar to that performed before surgery was done in the early postoperative period and then again 24 to 48 hours later. This is necessary because failure of the device to capture, due to damage at the lead–tissue interface, may not be apparent until 24 to 48 hours after surgery. If the capture threshold has increased, then endocardial burns should be suspected and the patient should be followed until stability is demonstrated. However, a progressive rise in capture threshold may ultimately exceed the output of the pulse generator, resulting in a loss of capture. Revision of the pacing system before loss of capture requires replacement of the pulse generator with one capable of higher output, replacement of the lead(s), or both.

#### DISCUSSION:

##### EMI:-

Electromagnetic interference occurs in two forms:

##### 1. Conducted:

Conducted EMI occurs when an electromagnetic source comes in direct contact with the body. This type of EMI can be generated by electrocautery and defibrillation.

## 2. Radiated:

Radiated EMI occurs when the body is placed within an electromagnetic field; no contact with the source is necessary. This type of EMI can be generated by magnetic resonance imaging (MRI), positron emission tomography (PET), and radiation therapy. The effects of radiated EMI are usually only temporary, resulting in alteration of device function for the duration the patient spends in the electromagnetic field.

In the surgical setting, conducted EMI produced by electrocautery and defibrillation can cause several different alterations in device function.

Electrocautery involves passing a high-voltage, high-frequency (10,000 Hz) current through tissue to cut or coagulate. This current can be bipolar or monopolar, depending on the type of system being used. Monopolar current begins at the tip of the instrument, travels through the body, and returns to the generator through a dispersing ground plate. Bipolar current does not require a ground plate because both electrodes are built into the tip of the instrument. This means that the current flows only through the area of tissue in direct contact with the instrument. However, bipolar electrocautery units are much less powerful. This can be an advantage if the surgery is delicate but renders them impractical for many procedures. When monopolar electrocautery is used, surgeons may use the electrocautery to pass current through other surgical instruments. This normally poses no problems.

However, if the electrocautery is activated before it is in contact with the surgical instrument, the current can arc through the air toward the instrument and demodulate. When the current is demodulated, its frequency fluctuates.

Normally the current remains at a frequency of 10,000 Hz, but if it is allowed to demodulate it can dip well into the frequency range that pacemakers and ICDs are designed to sense. These devices might interpret the current as cardiac in origin and respond inappropriately. Normal electrocautery current at 10,000 Hz can also cause pacemaker and ICD malfunction, but it is just much less likely than if the current is demodulated.

Defibrillation involves the delivery of high-voltage current in the immediate vicinity of the heart. Although all pacemakers and ICDs use some form of defibrillation protection (usually zener diodes) to shunt excessive current away from the delicate internal components of the pulse generator, the protection is by no means complete.

The number of leads is also important. Dual-chamber systems pick up more EMI than single-chamber systems simply because there are more leads acting as antennae within the heart. In addition, because signals can be picked up only if they are traveling parallel to a lead, and the leads in a dual-chamber system are frequently oriented perpendicular to each other, it follows that dual-chamber systems provide a larger area of sensitivity. Unfortunately, few patients have bipolar, single-chamber pacemakers. In fact, most of today's pacemakers are dual-chamber, unipolar units, many of which employ high sensitivity settings in the atrial component to sense low-amplitude P waves.

## EFFECTS OF EMI ON PACEMAKERS

- 1. The signal might be interpreted as cardiac in origin and temporarily inhibit or trigger output, depending on the pacing mode.
- 2. The signal might be interpreted as noise and temporarily cause reversion to an asynchronous pacing mode at a rate set by the manufacturer. This can lead to dangerous tachyarrhythmias as a result of an R-on-T phenomenon.
- 3. The signal might be interpreted by the device as a programming signal, leading to inappropriate reprogramming.
- 4. A continuous train of electrical impulses, such as that produced by electrocautery, conducted down the lead can induce ventricular or atrial fibrillation.
- 5. High levels of current can pass through the device, down the lead, and into the endocardium, causing thermal burns at the lead–tissue interface. This can raise the pacing threshold, leading to an inability of the device to stimulate the myocardium.
- 6. High levels of current can pass from the leads to the pulse generator and cause irreversible loss of battery output.

Many strategies have been employed to protect today's pacemakers and ICDs from EMI. The most important of these advances are electrical filtration systems designed to increase the ability to discriminate between EMI and signals that are cardiac in origin. A band pass filter provides the initial line of defence by prohibiting the entry of signals that are above or below a certain frequency threshold. Once the signal enters the internal circuitry, its frequency and amplitude are evaluated.

If the signal is similar in frequency and amplitude to a cardiac signal, then it will be interpreted by the device as cardiac in origin and the appropriate response will be delivered. If the signal is above or below the device's frequency threshold or continuous in nature, the device will interpret the signal as noise. Most pacemakers respond to noise by reverting to an asynchronous mode; most ICDs respond to noise by suspending arrhythmia detection.

Pacemakers and ICDs also employ zener diodes designed to shunt high levels of current flow away from the delicate internal circuitry. However, repeated exposure to high levels of current, such as occurs during repeated attempts at defibrillation, can overwhelm these protection circuits, resulting in permanent damage to the pulse generator. Also, the current shunted away from the pacemaker or ICD can lead to myocardial burns at the lead–tissue interface.

The following steps should be taken if the use of electrocautery is unavoidable:

- 1. When possible, bipolar electrocautery should be used.
- 2. If this is not practical, and monopolar electrocautery must be used, the cautery current pathway should be perpendicular to the pacemaker's lead system when possible. This is done by manipulating the placement of the grounding plate. However, a perpendicular pathway is not always a realistic possibility, especially when operating on a patient with a dual-lead system.

- 3. The grounding plate should be placed so that the current flows away from the pulse generator, and the distance between it and the active tip of the electrocautery should be as small as possible.
- 4. Care should be taken not to arc current between the tip of the electrocautery and another surgical instrument, to prevent demodulation of the signal. The instrument and the cautery tip should be in physical contact before the electrocautery is activated.
- 5. If it is impossible to place the pacemaker in a triggered or asynchronous mode, and it becomes apparent that the electrocautery is adversely affecting the pacemaker, the cautery current should be applied for no more than 1 second at a time, allowing at least 10 seconds for the device to function properly. This will permit the pacemaker enough time to maintain cardiac output.
- 6. Because the use of electrocautery also interferes with the ability of the ECG to monitor the heart, heart rate and blood pressure should be monitored using an arterial line. When the electrocautery is not in use, the ECG should be checked for arrhythmias or alterations in pacemaker function.
- 7. If the device appears to have been inappropriately reprogrammed by electrocautery, it is advisable to take the time to return the device to the mode selected before continuing the procedure. This is why it is important to have the programming device in the operating room.

The following steps should be taken if defibrillation is unavoidable:

- 1. If possible, use the anterior-posterior type of paddles, placing the anterior paddle as far away from the pulse generator as possible. This should allow the current to flow away from the generator.
- 2. If the anterior type of paddles must be used, place them along a line perpendicular to the lead(s). This may be difficult if the patient has a dual-lead system.
- 3. Use the lowest defibrillator current setting possible. Inability to defibrillate at low current settings will necessitate an increase, and damage to the pulse generator may become unavoidable. For these reasons, a temporary pacing system must be available.

If at any time during the procedure it becomes apparent that the device has lost its ability to stimulate the heart, due to damage to the pulse generator or the lead-tissue interface, temporary pacing measures must be taken. Inotropic support should also be available and used if necessary. The appropriate cardiology or cardiothoracic surgery department should be informed, and a decision should be made about the repair or replacement of the device.

## HEPATITIS C:

Hepatitis C is increasingly found to a significant aetiological agent causing liver disease in India. The clinical manifestations include acute hepatitis, chronic hepatitis, cirrhosis and hepatocellular carcinoma. Hepatitis C can present as acute or chronic hepatitis. Most of the cases of acute hepatitis C are asymptomatic with patients unaware of the underlying infection. Symptomatic acute hepatitis with jaundice is seen in only 25% of patients and this virus usually does not cause fulminant hepatitis in immunocompetent individuals. The only acute life threatening illness caused by hepatitis C is a variant called fibrosing cholestatic hepatitis which is seen in liver transplant recipients. The worrying aspect of acute hepatitis C infection is that spontaneous viral clearance is unusual with nearly 54%-86% of the infected individuals progressing to chronic hepatitis. Approximately a fifth of the patients with chronic hepatitis C progress to cirrhosis over a time spanning nearly a decade.

Development of portal hypertension in these patients leads to ascites, variceal haemorrhage, hepatic encephalopathy, spontaneous bacterial peritonitis and hepatorenal syndrome. Extra-hepatic manifestations as a result of chronic hepatitis C infection such as cryoglobulinemia, porphyria cutanea tarda, arthralgia, membranoproliferative glomerulonephritis, Sjogren's syndrome, Raynaud's syndrome, idiopathic thrombocytopenic purpura and non-Hodgkin's lymphoma have been reported. The patients with cirrhosis are at a higher risk of hepatocellular carcinoma with nearly 1-4% of patients developing this complication every year.

The common modalities of spread of hepatitis C infection are:

1. Blood transfusion.
2. Injection drug use.
3. unsafe therapeutic injections
4. Health care related procedures.

In developed countries the predominant route of hepatitis C infection is IV drug use, whereas in India as alluded before, blood transfusions and unsafe therapeutic injections are the predominant modalities of transmission of hepatitis C.

Routine pre-operative screening of all patients for Anti-HCV, HBsAg & HIV should be done.

Precautions recommended:

Invasive procedures in all patients

- \* Have vaccination against hepatitis B
- \* Cover all cuts and abrasions with waterproof dressings
- \* Do not pass sharps hand to hand
- \* Do not use hand needles
- \* Do not guide needles with fingers
- \* Do not resheath needles
- \* Dispose of all sharps safely into approved containers
- \* Put disposables and waste into yellow clinical waste bags for incineration

Additional precautions when caring for known HIV and hepatitis B virus positive and high risk patients

- \* Consider non-operative management
- \* Remove unnecessary equipment from theatre
- \* Observe highest level of theatre discipline
- \* Have only experienced surgeons and health care workers in theatre
- \* Use: double glove, high efficiency masks, eye protection, boots, impervious gowns, closed wound drainage
- \* Use disposable anaesthetic circuitry or appropriate method of decontamination
- \* Disinfect theatre floor with hypochlorite

**CONCLUSION:** Among all the other highrisk comorbidities, Pacemaker patients can be managed confidently by detailed evaluation and taking all the above discussed precautions peri-operatively.

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