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Implant Procedure Concepts

*Implant Procedure and Testing*
This presentation is provided with the understanding that the slide content must not be altered in any manner as the content is subject to FDA regulations.

This presentation is to be used in conjunction with other resource material including the applicable Boston Scientific device physician’s manual and any implant accessories instructions for use.

This presentation is not intended to replace implant training.

Proper surgical procedures and techniques are the responsibilities of the medical professional.

If this presentation is not used in its entirety, the following information must be included:

- Appropriate Indications
- Contraindications
- Warnings
- Precautions and Adverse Events
When we complete this program you will be able to:

- **Describe** basic room set up for pacemaker implant
- **Understand** the patient needs during implant
- **Describe** the basics of the implant procedure
- **Explain** the measurements taken during lead testing
**Pacemaker Implant**

**Set up**

*EP Lab/Surgical Suite Equipment Consists of:*

- Fluoroscopic Imaging
- Patient Hemodynamic Monitors
  - EKG
  - Blood Pressure
  - Pulse Oximeter
- External Defibrillator – External Pacemaker
- Sterile Table and Instruments
Pacemaker Implant
Set up

Medical Education

Implant Procedure & Testing

Disclaimer

Objectives

Pacemaker Implant
- Set up
- Procedure
- Measurements & Testing
- Insertion & Closure

ICD Implant
- Procedure
- Testing

Device Evaluation

Questions

EP Lab
Pacemaker Implant
Set up

Circulating Nurse’s Responsibilities:

- **Control** flow of case
- **Monitor** patient’s vital signs
- **Anticipate** needs of personnel
- **Administer** medications as ordered
- **Chart** record of case
- **Reassure** patient
Preparation

- Monitoring equipment is attached to the patient
- Gentle restraints are applied
- The skin is shaved and prepped
Pacemaker Implant

Set up

Draping

Medical Education

Implant Procedure & Testing

Disclaimer

Objectives

Pacemaker Implant

• Set up
  • Procedure
  • Measurements & Testing
  • Insertion & Closure

ICD Implant

• Procedure
• Testing

Device Evaluation

Questions
Draping the Patient

- The surgical area is cordoned off with sterile towels

- The patient’s entire body is draped
Sterile Table Consists of:

- Pacemaker Tray
- Surgical Instruments
- Drapes
- Cautery Equipment
- Sterile Basins
Administration of Local Anesthetic

- The skin is numbed with Xylocaine
- A sedative is usually given prior to the procedure to help relieve anxiety
Pacemaker Implant
Set up

*Introducer Kit Consists of:*

- Introducer
- J-guide wire
- Needle with syringe
**Lead Insertion**

- The needle is inserted into the subclavian vein
- The J-wire is inserted through the needle
- The needle is removed and the introducer is advanced over the wire
Guide Wire Introduction

- Access for both the atrial and ventricular lead is obtained
- The lead is inserted through the introducer and then the introducer is peeled away
Pocket Formation

- The pacemaker incision is approximately 2 inches
- The pocket is made by blunt dissection
- The pocket must be big enough to accommodate the pacemaker and the leads
Lead Insertion Overview

1. The ventricular lead is positioned first
2. The atrial lead is then positioned and tested
3. The leads are then attached to the pacemaker
Fluoroscopic Lead Position

- Fluoroscopic position of ventricular and atrial lead

- The ventricular lead is positioned with the tip in the RV apex, well beyond the spine shadow
Lead Measurements

The leads are tested with a pacing system analyzer to verify good position and thresholds before the pacemaker is attached.
Implant Measurements Include:

- Stimulation Threshold
- Sensing Threshold
- Slew Rate
- Pacing Impedance
- High Output Testing
- Retrograde Conduction
### Acceptable Electrical Parameters of Lead Placements

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<tr>
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<th>Atrium</th>
<th>Ventricle</th>
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<tr>
<td><strong>Thresholds</strong></td>
<td>≤1.5 Volts</td>
<td>≤1.0 Volts</td>
</tr>
<tr>
<td><strong>Sensed P/R</strong></td>
<td>≥1.5 mV</td>
<td>≥5.0 mV</td>
</tr>
<tr>
<td><strong>Impedance</strong></td>
<td>300-1500* Ω</td>
<td>300-1500* Ω</td>
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* for standard impedance leads
Stimulation Threshold

Purpose:
- To assure proper lead placement
- To assure pacing system integrity
- To assure an adequate safety margin between the excitation energy threshold and the output of the pulse generator
Stimulation Threshold

Affected by:
- Lead maturation
- Lead technology
- Medications
- Lead location
Sensing Threshold

- Measurement of the cardiac signal (P & R waves) available to inhibit a demand pulse generator

- Proper sensing depends on:
  - signal amplitude
  - slew rate
  - polarity
Signal Amplitude

Measured voltage of the intrinsic signal
Slew Rate

The change in R-wave voltage versus the change in time (dV/dt; slope)
Pacing Impedance

- Total opposition to current flow in an electrical circuit
- To verify pacemaker system integrity
- Normal range: 300 – 1500 Ohms, average is 300 – 1000 Ohms
High Output Testing

- Device is programmed to maximum voltage

- Patient is evaluated for diaphragmatic stimulation
  - Muscle twitching near rib cage
  - Hiccupping
Retrograde Conduction

Conduction of an electrical impulse from the ventricles to the atria through the heart’s conduction system.
Pacemaker Mediated Tachycardia

- Retrograde conduction can lead to pacemaker-mediated tachycardia (PMT)

- To prevent retrograde-induced PMTs, measure the retrograde conduction time at implant and program a longer PVARP
Permanent Pacemaker Insertion

- The lead is secured in place after proper lead position has been confirmed.

- The pocket is irrigated with antibiotic solution prior to pacemaker insertion.
Attaching the Pacemaker

- The leads are inserted into the pacemaker header
- Visualization of the leads past the distal setscrew
- The setscrews are tightened
- The pacemaker is sutured to the pectoral muscle
Pocket Closure

- The pocket is closed with suture
- Steri strips may be used to reinforce the suture
- The wound should be checked in 7 to 10 days
Just like a pacemaker except . . .
Just like a pacemaker except . . .

- Implant ICD shocking lead
- Implant atrial pacing/sensing lead, if applicable
- Use fluoroscopy to verify lead position
- Take baseline lead measurements with PSA
- Create a pocket for device
ICD Implant
Procedure

Just like a pacemaker except . . .

- Induce the patient into arrhythmia
- Have the device shock patient
- Assess device performance during episode
Assesses the ability of the implanted ICD system to terminate ventricular fibrillation

Usually includes 2 tests at an output determined by the physician

Safety margin should be at least 10 J
Device Evaluation
Pacemaker or ICD Evaluation

The patient should have an evaluation of the device prior to leaving the OR using the programmer to establish an immediate baseline.