Perioperative Management of Cardiac Implantable Devices

Let’s Talk Pacemakers!
Practice Advisory for the Perioperative Management of Patients with Cardiac Implantable Electronic Devices: Pacemakers and Implantable Cardioverter-Defibrillators
An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Implantable Electronic Devices

Perioperative Experts!
• 3 million people worldwide with pacemakers
• 600,000 pacemakers implanted every year
• Most patients >60 years old
• They often need surgery
• We should know what’s going on!

Main Points of the talk
• Get help
• Interrogate the device
• Don’t fly blindly
• Device Product reps get paid a lot of money
• Device companies make a lot of money
• They work to help you
• They are always on call
• Figure out what your hospital has
  • EP nurse, cardiologist, product rep

Financial Disclosures
• None

Where did the rec’s come from?
• Heart Rhythm Society
• ASA
• Tried to find evidence and then gain consensus
There is no level 1A evidence

- You will not find level 1A evidence for the perioperative management of pacemakers
- You will not find level 1A evidence for the use of pulse oximetry either

Preoperative Evaluation

(Anesthesiology 2011; 114:247-61)

- Establish if patient has a CIED
- Determine whether patient is CIED-dependent for antibradycardia pacing function
- Define the type of device
- Determine Device function
- LEVEL B Evidence
  • Suggestive literature

Preoperative Evaluation

(Anesthesiology 2011; 114:247-61)

- Focused history
- Medical records review
- Review of Chest x-ray
- EKG
- Check for scars palpate device

Peroperative Evaluation

(Anesthesiology 2011; 114:247-61)

- Obtaining the manufacturer’s ID card
- Order Chest x-ray
  • I found fluoro works best because you can magnify
- Refer to supplemental resources
  • Manufacturer’s database
  • Pacemaker clinic record
  • Consultation with a cardiologist
  • Rarely necessary if you know dangers of asynchronous pacing

Results

(NEJM 1996; 335:1933-40)

- 196 patients enrolled
- 27 month follow up
- 15 deaths in defibrillator group
- 39 deaths in conventional therapy group
- Mortality reduction of 56%
  • P < 0.009

Bi-Ventricular Pacemaker
Preoperative Evaluation

• CIED dependence
  • Verbal history or indication patient has experienced a bradyarrhythmia that has caused syncope or other symptoms requiring CIED implantation

Preoperative Evaluation

• CIED dependence (cont’d)
  • History of successful AV node ablation
  • No evidence of spontaneous ventricular activity when the pacemaking function of the CIED is programmed to VVI pacing mode at lowest programmable rate

Painful Nomenclature

<table>
<thead>
<tr>
<th>Position I</th>
<th>Position II</th>
<th>Position III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chamber(s)</td>
<td>Chamber(s)</td>
<td>Response(s)</td>
</tr>
<tr>
<td>O = None</td>
<td>O = None</td>
<td>O = None</td>
</tr>
<tr>
<td>A = Atrium</td>
<td>A = Atrium</td>
<td>I = Inhibited</td>
</tr>
<tr>
<td>V = Ventricle</td>
<td>V = Ventricle</td>
<td>T = Triggered</td>
</tr>
<tr>
<td>D = Dual (A+V)</td>
<td>D = Dual (A+V)</td>
<td>D = Dual (T+I)</td>
</tr>
</tbody>
</table>

Preoperative Preparation

• Determine if electromagnetic interference is likely to occur during the procedure
  • Electrocautery
  • Radiofrequency ablation
  • MRI
  • Lithotripsy

Preoperative Preparation

• Suspend:
  • Antitachyarrhythmia function if present
  • Rate Adaptive Therapy
Preoperative Preparation
(Anesthesiology 2011; 114:247-61)

- Advise:
  - The individual performing the procedure to consider bipolar or ultrasonic (harmonic) scalpel to minimize adverse effects on the pulse generator or leads

- Additional Programming
  - Pacemaker dependent patients should be programmed to an asynchronous mode before surgery

Assure:
- The availability of temporary pacing and defibrillation equipment

Numerous descriptive studies and case reports suggest the following are associated with EMI:
- Electrocautery
- Radiofrequency ablation
- MRI
- Radiation therapy
- No STUDIES were found that reported EMI during ECT

Intraoperative Management
(Anesthesiology 2011; 114:247-61)

- Monitor the operation of the device
- Prevent potential CIED dysfunction
- Perform emergency defibrillation, cardioversion, or heart rate support

- Continuous EKG
- Peripheral pulse monitoring
  - Pulse ox, A-line, ultrasound peripheral pulse(?)

Category B3 Evidence
**Intraoperative Management**

- **Electrocautery**
  - Assuring cautery tool, current return pad positioning
  - Current pathway does not pass through or near CIED pulse generator and leads
  - B2-B3 evidence
    - Two case reports
    - One Observational study

- **B2-B3 evidence**
  - Two case reports
  - One Observational study

- **B2-B3 evidence**
  - Total pacemaker failure when short burst of cautery used
  - Multiple Case reports
    - Uneventful surgery with bipolar cautery or harmonic scalpels (B3 Evidence)
    - One case report pacemaker failure with bipolar cautery

- **B2-B3**
  - One case report

- **Experts opinion/Summary**
  - Position the cautery tool and current return pad away from device
  - Avoid proximity of the cautery electrical field to the pulse generator and leads
  - Use short intermittent and irregular bursts at the lowest feasible energy level
  - Use bipolar or ultrasonic (harmonic) scalpels if possible

- **Lithotripsy**
  - Avoid focus of the lithotripsy beam near the pulse generator
  - Disable atrial pacing if the lithotripsy system triggers on the R wave

- **Radiofrequency Ablation**
  - High frequency alternating current
  - We will see it in OR and IR
  - Treatment of solid organ tumors/metastatic disease
  - Keep RF current path as far away from the pulse generator and lead system as possible

**Hemodynamics of Pacing**

- **Hierarchy of rhythm**
  - Normal sinus rhythm
    - If rate is fast enough

- **Atrial Pacing**
  - AV pacing
  - V pacing

- **Switching Modes of pacing**
  - Can have serious hemodynamic consequences
Intraoperative Management
(Anesthesiology 2011; 114:247-61)

• Magnetic Resonance Imaging
  • Observational studies and case reports suggest MRI can be done safely
  • Expert Opinion
    • MRI is contraindicated
  • If absolutely necessary
    • Consult
      • Manufacturer
      • Cardiologist
      • Ordering Physician
      • Radiologist

• Electroconvulsive Therapy
  • No studies exist
  • Two case reports
    • ICD’s turned off for procedure
      • No mention of effect on device
  • Radiation
    • The device should be outside the field of radiation

Intraoperative Management
(Anesthesiology 2011; 114:247-61)

• Emergency Defibrillation or cardioversion
  • Minimize the current through the pulse generator
  • Expert Opinion
    • Anterior-Posterior Position should be used

Intraoperative Management
(Anesthesiology 2011; 114:247-61)

• If life-threatening arrhythmia occurs
  • Don’t screw around
  • ACLS protocol
  • Remember the MADIT, MADIT II, MADIT-CRT, CARE-HF
  • These patients are sick!

WHAT ABOUT A MAGNET?

• Asynchronous?
• Turns off AICD?
• No industry standard
• Usually does...
• Would not depend on it if you have time
  • Interrogate
  • Interrogate
  • Interrogate
Postoperative Management
(Anesthesiology 2011; 114:247-61)

• Interrogate and restore defibrillation function
• Observational study + case report
• Postoperative pacemaker check revealed the need to alter pacing mode or other parameters which include increasing ventricular thresholds
• B2-B3 evidence
• My opinion
  • Don’t take the pads off until the device is interrogated and activated!

Conclusion

• Find out all the information you can
• Interrogate, interrogate, interrogate
• Prepare for the worst
  • These patients are sick
• Have a back up plan
• GO RAIDERS!

Questions?