Perioperative Electrophysiology Training Program

Perioperative Management of ICDs

Lecture #18

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What Will I Discuss Today?

- ICD functions
- ICD CXR interpretation
- Magnet-ICD interactions
- Perioperative ICD management publications
- Recommendations for Periop ICD Managem't

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ICD Functions

- Defibrillation
- Cardioversion
- Overdrive pacing
- Demand Pacing
  - VVI
  - DDDR
  - DDDRV

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Key Concept #1

- Whenever you think about managing a patient's ICD in the perioperative period, you must also think about the ICD's pacemaker component as well.

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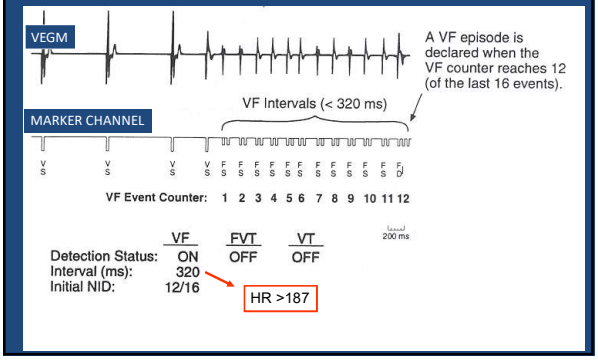
ICD Detection and Treatment of VF



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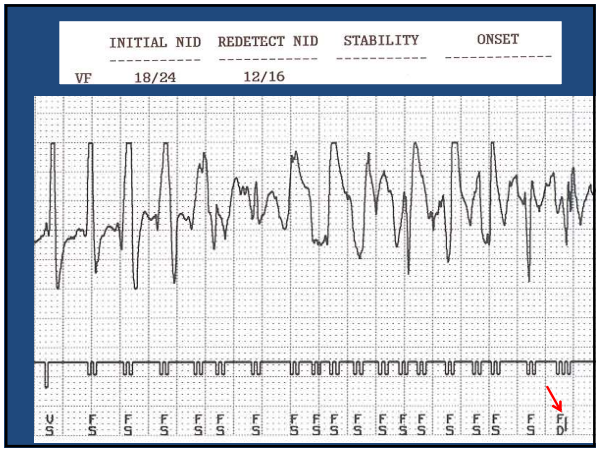

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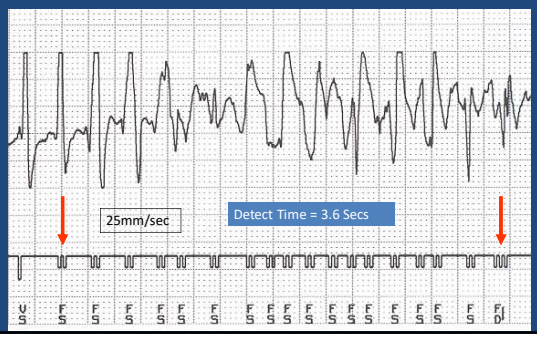
Defibrillation

12

How Long Did it Take to Detect VF?



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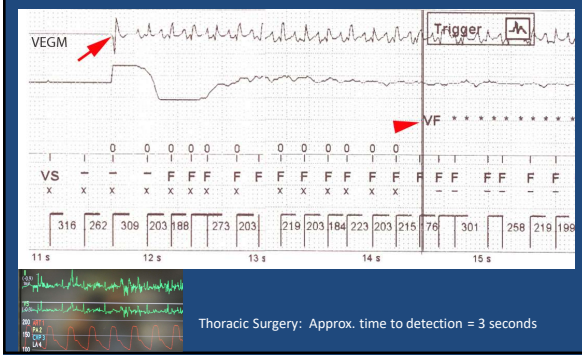
How does an ICD respond to Cautery?



Thoracic Surgery: Approx. time to detection = 3 seconds

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Key Concept #2

- ICDs can detect VF within 3-4 seconds
- ICDs can misinterpret cautery as VF

15

CXR Interpretation and ICDs

1. Determine if the patient has an ICD
2. Determine the ICD's manufacturer

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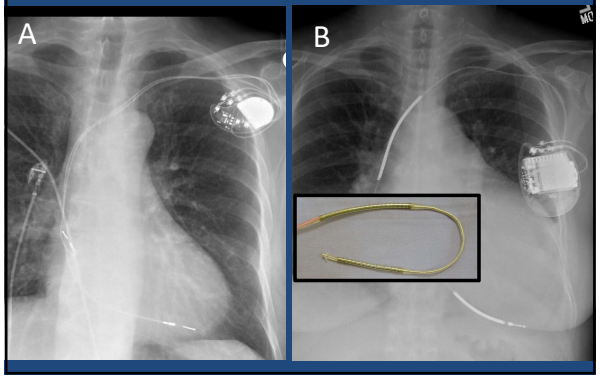
Pacemaker vs ICD CXR



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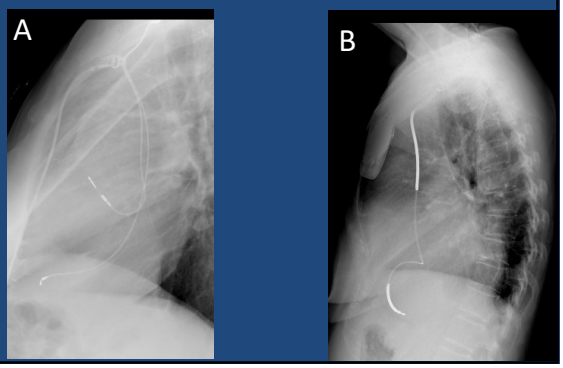
Pacemaker vs ICD CXR



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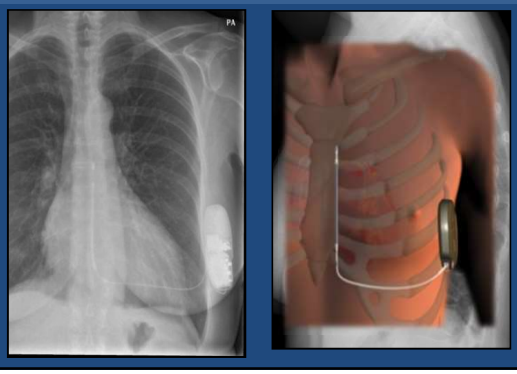
What type of device is this?



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Determination of the ICD Manufacturer

- Each Manufacturer has a characteristic CXR identifier—alphabetic or symbolic

Jacob et al, Heart Rhythm Vol 8 No 6 June 2011, p.918

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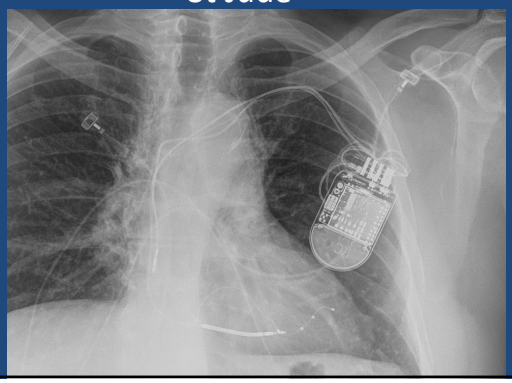
St Jude



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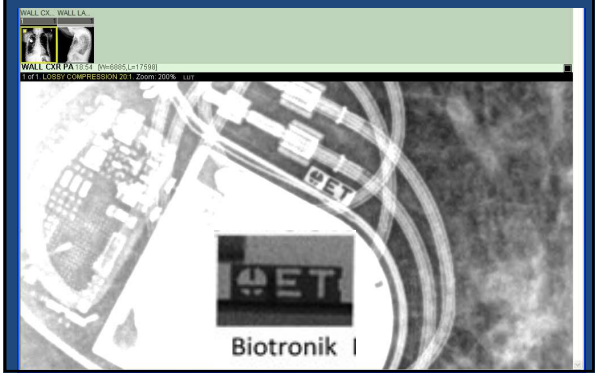
St Jude/Abbott

Ellenbogen, Clin Cardiac Pacing 4th ed., p.778

26

Biotronik



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Medtronic

28

Boston Scientific

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Key Concept #3

- A good quality CXR will help you:
  - Determine if the patient has an ICD or a pacer
  - Determine the ICD manufacturer

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Why do I care so much about the ICD Manufacturer?

- Must use a company specific programmer to interrogate the ICD
- ICD's magnet response depends on the manufacturer

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Magnets and ICDs

- You should know what a magnet will do to an ICD made by each of the primary suppliers of ICDs in the US

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Three General Concepts

- A magnet will inhibit the anti-tachy therapy (ATT) of essentially all ICDs for as long as the magnet is on the ICD
- Magnets will practically never affect the ICD's pacing component
- Two ICD brands will emit a tone when a magnet is applied, the other three will not

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ICD—Magnet Summary

Manufacturer	Response to Magnet	Effect on Pacer component of ICD	Tone Emitted?	*Can ICD be programmed to ignore magnet?	Miscellaneous
Boston Scientific	ICD inhibited until magnet removed*	None	Yes, persistent beeping tone synchronous with R-wave or every sec	Yes (Very rare)	ICDs that could be permanently deactivated with a magnet are essentially extinct. Sub Q ICDs have a separate programmer; magnet effect is limited to 60 secs
Medtronic	ICD inhibited until magnet removed	None	Yes, for 10-15 seconds Monotone=Normal High-Low=Malfunction	No	
St Jude/Abbott	ICD inhibited until magnet removed*	None	No	Yes (Very rare)	
Biotronik	ICD inhibited until magnet removed	None	No	No	Magnet will inhibit ICD for 8 hours only. Would have to remove and replace magnet to extend inhibition
Sorin	ICD inhibited until magnet removed	Converts pacer rate to 96->80 depending on battery life. Pacing mode unchanged	No	No	No option to convert to an asynchronous pacing mode even when the ICD is inhibited with a programmer

35

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Boston Scientific ICD

The Sub Q ICD emits the same tone, but only for 60 seconds

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Medtronic ICD Normal Tone

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Medtronic Device with Alert

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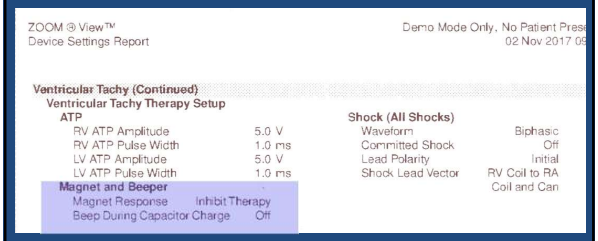
Boston Scientific ICD Magnet Response Programmed ON



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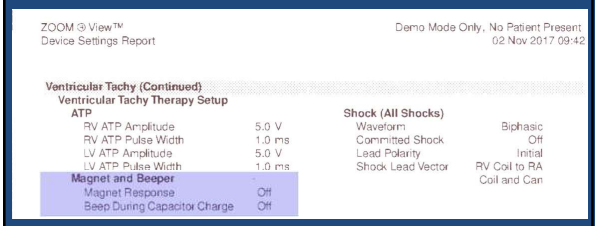
Boston Scientific ICD Magnet Response Programmed OFF



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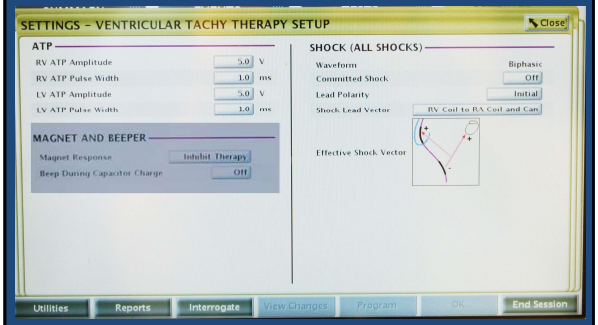
Boston Scientific ICD Programmer Typical Magnet Response Setting



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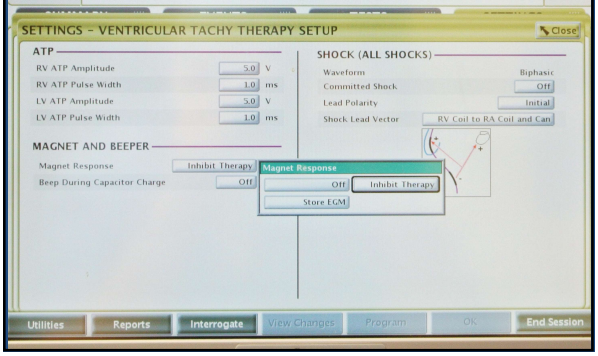
Boston Scientific Programmer Magnet Response Options



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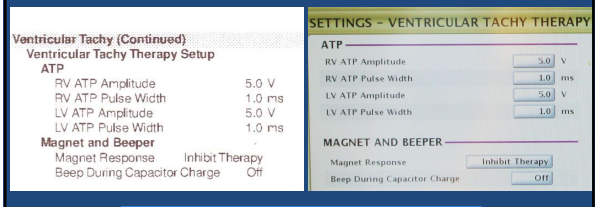
Boston Scientific ICD Magnet Response



Either of these findings will confirm that the magnet will inhibit the anti-tachy function of a Boston Scientific ICD

If you hear a beeping tone when you apply a magnet, by definition the magnet will be inhibiting the anti-tachy therapy

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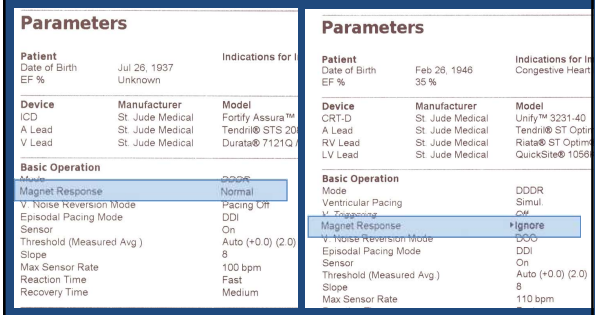
St Jude ICD Magnet Response Options



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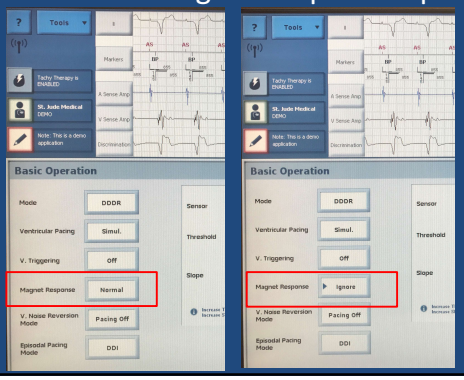
St Jude ICD Magnet Response Options



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St Jude ICD and Magnet

- If you want to know for absolute certainty that a magnet will inhibit the St Jude/Abbott ICD, you will need to confirm the magnet setting with a programmer print out or with the programmer itself

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ICD—Magnet Summary

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St Jude/Abbott	ICD inhibited until magnet removed*	None	No	Yes (Very rare)	
Biotronik	ICD inhibited until magnet removed	None	No	No	Magnet will inhibit ICD for 8 hours only. Would have to remove and replace magnet to extend inhibition

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ICD OFF and Asynchronous Pacing

Manufacturer	ICD Off /DDD	ICD Off + DOO
STM/Abbott	Easy	ICD off 1st then change to DOO
Medtronic	Moderate	ICD off 1st then change to DOO
Biotronik	Easy	Must turn off ICD individual settings then convert to DOO
Boston Scientific	Easy	Electrocautery Safe Mode

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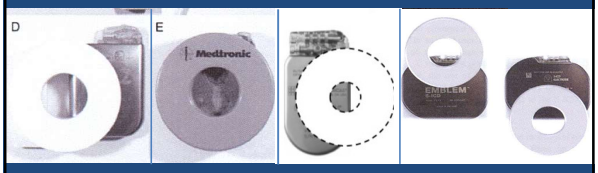
How to Position a Magnet



Sorin/ELA | Medtronic, Boston Scientific, Biotronik | St Jude | Bost Sci Sub-Q ICD

Jacob S, et al; Europace (2011) 13:1222-1230--modified

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Helpful Tips for using a magnet to inhibit an ICD in the OR:

- Define border of the ICD with marking pen
- Secure Magnet with tape or tegaderm
- Check the magnet position often
- Use a stethoscope for Bost Scientific ICDs

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Key Concept #4

- Magnets appropriately applied to ICDs will almost always inhibit the anti-tachy therapy, but will not affect the ICD's pacer component
- An emitted tone can identify Boston Scientific and Medtronic ICDs

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What Guidance is published for managing the patient with an ICD in the Perioperative Period?

- ASA Practice Advisory 2011—being updated
- HRS/ASA Expert Consensus Statement 2011

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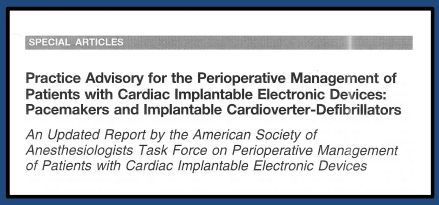
ASA Practice Advisory 2011



SPECIAL ARTICLES

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

- Key Statements:
  - If EMI, inhibit all anti-tachy therapy
  - Do not routinely use a magnet over an ICD

Anesthesiology Feb 2011; 247-261

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HRS/ASA Consensus Statement 2011

The Heart Rhythm Society (HRS)/American Society of Anesthesiologists (ASA) Expert Consensus Statement on the Perioperative Management of Patients with Implantable Defibrillators, Pacemakers and Arrhythmia Monitors: Facilities and Patient Management

This document was developed as a joint project with the American Society of Anesthesiologists (ASA), and in collaboration with the American Heart Association (AHA), and the Society of Thoracic Surgeons (STS)

George H. Crossley, MD, FHRS,[1] Jeanne E. Poole, MD, FHRS,[2] Marc A. Rozner, PhD, MD,[36] Samuel J. Asirvatham, MD, FHRS,[4] Alan Cheng, MD, FHRS,[51] Mina K. Chung, MD, FHRS,[6] T. Bruce Ferguson, Jr., MD,[78#] John D. Gallagher, MD,[86] Michael R. Gold, MD, PhD, FHRS,[98] Robert H. Hoyt, MD,[10] Samuel Irefin, MD,[118] Fred M. Kusumoto, MD, FHRS,[12] Liza Prudente Moorman, MSN, ACNP, FHRS,[13] Annemarie Thompson, MD[140]

- Excellent review of perioperative electrophysiology
- Provides guidance for all types of procedures

Heart Rhythm July 2011; 1114-1154

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Heart Rhythm Society/ASA Consensus Statement 2011

- Key Preoperative Statements:
  - Most recent ICD Interrogation should be within 6 months
  - The best prescription for perioperative management is for the EP team to communicate pertinent device information to the OR team

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Essential Information for OR Team

Table 5 Essential elements of the preoperative CIED evaluation to be provided to the operative team

- Date of last device interrogation
- Type of device—pacemaker, ICD, CRT-D, CRT-P, ILR, implantable hemodynamic monitor
- Manufacturer and model
- Indication for device:
  - Pacemaker: e.g., sick sinus syndrome, AV block, syncope
  - ICD: primary or secondary prevention
  - Cardiac resynchronization therapy
- Battery longevity documented as >3 months
- Are any of the leads less than 3 months old?
- Programming
  - Pacing mode and programmed lower rate
  - ICD therapy
    - Lowest heart rate for shock delivery
    - Lowest heart rate for ATP delivery
  - Rate-responsive sensor type, if programmed on
- Is the patient pacemaker dependent, and what is the underlying rhythm and heart rate if it can be determined?
- What is the response of this device to magnet placement?
  - Magnet pacing rate for a PM
  - Pacing amplitude response to magnet function
  - Will ICD detections resume automatically with removal of the magnet? Does this device allow for magnet application function to be disabled? If so, document programming of patient's device for this feature
- Any alert status on CIED generator or lead
- Last pacing threshold—document adequate safety margin with the date of that threshold

- Type of device
- Manufacturer
- Implant date
- Last interrogation
- Battery and lead status
- Pacing mode
- Pacing dependence
- Magnet response for SJM and BSc ICDs

Heart Rhythm July 2011; 1126

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Heart Rhythm Society/ASA Consensus Statement 2011

- Key Intraoperative Statements:
  - Surgery above the umbilicus:
    - Inhibit ICD
  - Surgery below the umbilicus:
    - "Oversensing in an ICD patient is unlikely when monopolar electrosurgery is applied below the umbilicus"
    - "May be unnecessary to inhibit an ICD with a magnet or programmer, but it is a reasonable alternative to no intervention"
  - Surgery on lower extremities:
    - "The risk of false arrhythmia detection is considered so low for surgical procedures on the lower extremities that neither re-programming nor magnet application is mandatory"

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ICD Cautery Study

- Friedman et al at Mayo Clinic
- 103 patients having non-cardiac surgery
- ICDs programmed to detect only
- Bovie return pad on thigh or buttock

J Interv Card Electrophysiol (2017) 48:21-26

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Brief Study Summary

- 11 patients had bipolar cautery—no issue
- 92 patients had monopolar cautery
  - 11 had EMI detected

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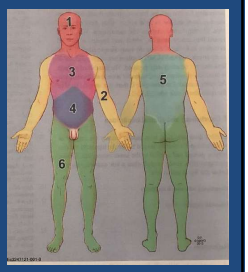
Results

Table 4 Surgery location and EMI detection

Surgical areas	Number	ICD detection, *n* (%)
Head, neck	7	3 (43)
Shoulder/upper extremity	23	2 (9)
Thoracic (non-cardiac surgery)	10	5 (50)
Abdomen, pelvic	34	1 (3)
Back, spine	5	0 (0)
Hip, lower extremity	24	0 (0)
Total	103	11 (11)

Dispersive grounding pad applied to lower extremities in all cases



This study supports the HRS recommendation that it is acceptable to leave ICDs on during lower extremity surgery

J Interv Card Electrophysiol (2017) 48:21-26

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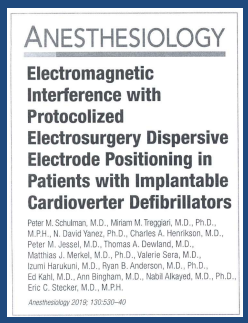
ICD-Cautery Study 2019


ANESTHESIOLOGY

Electromagnetic Interference with Protocolized Electrosurgery Dispersive Electrode Positioning in Patients with Implantable Cardioverter Defibrillators

Peter M. Schulman, M.D., Miriam M. Treggiari, M.D., Ph.D., M.P.H., N. David Yanez, Ph.D., Charles A. Henrikson, M.D., Peter M. Jessel, M.D., Thomas A. Dewland, M.D., Matthias J. Merkel, M.D., Ph.D., Valerie Sera, M.D., Izumi Harukuni, M.D., Ryan B. Anderson, M.D., Ph.D., Ed Kahl, M.D., Ann Bingham, M.D., Nabil Alkayed, M.D., Ph.D., Eric C. Stecker, M.D., M.P.H.

Anesthesiology 2019; 130:530–40

- Analyzed 144 patients with ICDs who were having surgeries in various parts of the body
- Determined what the ICDs were "seeing" during the surgery

Schulman et al, Anesthesiology April 2019

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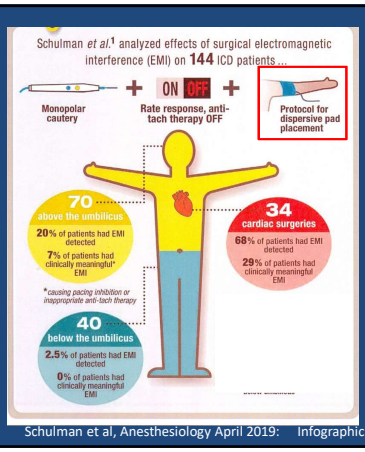

Schulman et al, Anesthesiology April 2019: Infographic: J Wanderer

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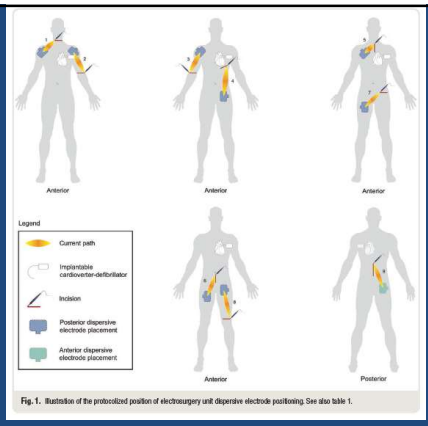

Schulman et al, Anesthesiology April 2019

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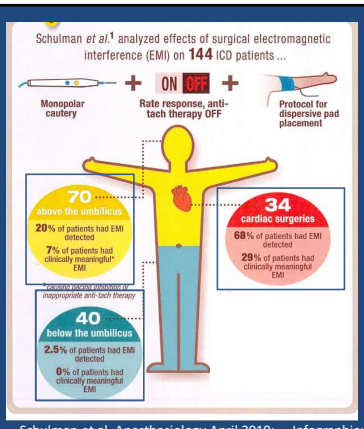

Schulman et al, Anesthesiology April 2019: Infographic: J Wanderer

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Key Concept #6

- If the surgeon will use monopolar electrocautery above the umbilicus, inhibit anti-tachy therapy
- If the surgery is below the umbilicus, the HRS Paper and Schulman's study gives support/evidence that you could leave the ICD on
- All three papers seem to support leaving ICDs on when patients are having lower extremity surgery, assuming appropriate return pad placement

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Hip Surgery and ICD

- 76 yo F having R hip surgery with GA
- Has Boston Scient ICD
- 5'2" 55 kg

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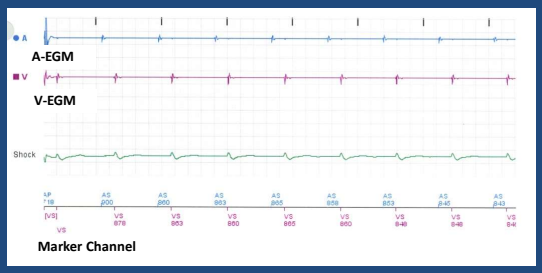
Baseline Programmer Report NSR and no Cautery



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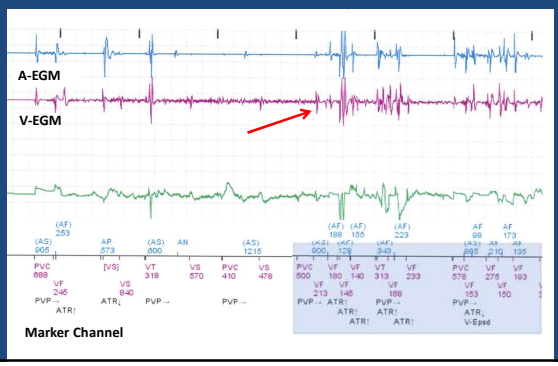
Electrocautery Sensed as VF



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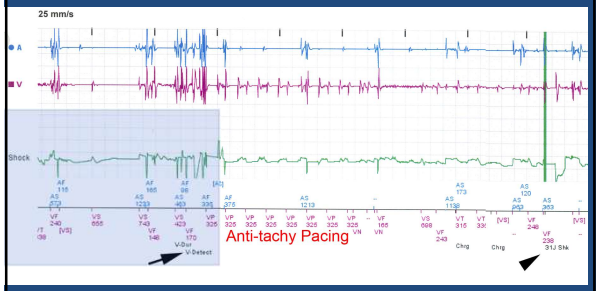
Hip Surgery and ICD Shock



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Hip Surgery and ICD

- Anesthesia team not aware of the shock
- Detected in post op assessment of ICD
- Why did the patient get the shock?
  - Small stature?
  - Bovie return pad placement?

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Hip Surgery and ICD Op Report

```
ELECTROSURGICAL - RISK FOR INJURY/POTENTIAL IMPAIRMENT

Electrosurgical Units 1: Y
     Cut:40                    Coag:40

     Pad Site: upper back

Electrosurgical Units 2: N
Bipolar Coagulator: N
Harmonic Scalpel: N
Argon Beam: N
```

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Key Concept #5

- Pay attention to bovie return pad placement
  - OR nurses may need guidance

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Lower Extremity Surgery

- Is there a risk of the patient getting a shock if the cautery return pad is placed appropriately?

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APSF NEWSLETTER June 2017 PAGE 10

Q&A

Unintended Discharge of an ICD in a Patient Undergoing Total Knee Replacement

- 82 yo M for R Total Knee Replacement
- 5'6" 146 lbs
- Spinal anesthesia and sedation
- Cautery return pad placed on contralateral leg
- Anesthesia team acted in accordance with HRS paper and did not inhibit ICD

Kleinman B, et al APSF Newsletter June 2017

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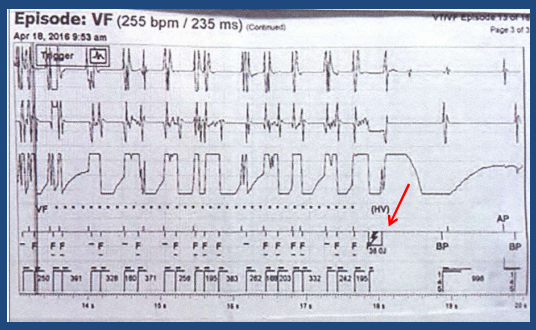
Intraop Shock



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Seven Aborted Charges and one ATP

VT/VF Episodes

Date / Time	Type	Rate (bpm)	Duration (M:S)	Therapy Delivered	Alerts
Apr 18, 2016 10:00 am	VF	342	00:09		x2
Apr 18, 2016 9:57 am	Non-sustained		00:06		
Apr 18, 2016 9:53 am	VF	315	00:11		x2
Apr 18, 2016 9:53 am	VF	255	00:13	36J	x1
Apr 18, 2016 9:47 am	Non-sustained		00:08		x1
Apr 18, 2016 9:47 am	VF	444	00:21		x3
Apr 18, 2016 9:39 am	VF	307	00:09		x2
Apr 18, 2016 9:27 am	Non-sustained		00:16		x1
Apr 18, 2016 9:17 am	VF	266	00:13		x2
Apr 18, 2016 9:13 am	VF	210	00:14	ATP	x1
Apr 18, 2016 9:07 am	Non-sustained		00:08		

102

Key Concept #7

- It appears unlikely that an ICD will shock a patient having lower extremity surgery if the bovie return pad is placed appropriately and the ICDs settings are typical.
- You just have to make the decision if you are comfortable with leaving the device on or not.
  - I think the best scenario for these lower extremity cases is when you are able to use a magnet to inhibit the ICD—this is easy to do and you will not forget to turn the ICD back on before the patient leaves

103

Practice Case from MGH

- Pt presents for emergency upper abdominal procedure:
  - PMHx
    - CAD s/p VF arrest
    - EF 31%
    - CIED NOS
    - Obesity

104

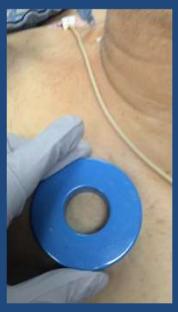
What is the Device, ICD or Pacer?

- CXR—patient did not have one
- Patient's rhythm---AV paced at 60

105

Magnet

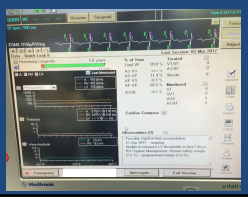
- Magnet Placed
  - No change in pacing rate
  - Monotone for 10-15 secs



106

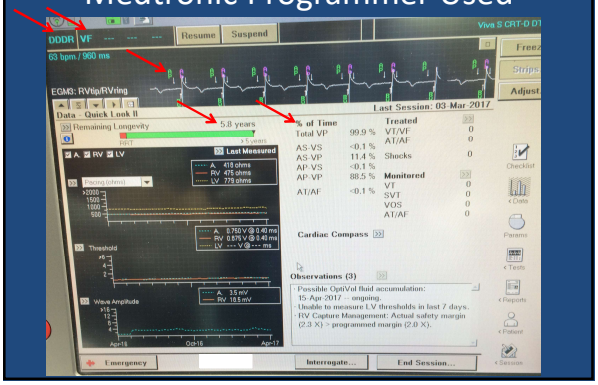
Utilized My Medtronic Programmer

- ICD therapy ON for VF
- DDDR at 60
- Present rhythm is AP-BiVP
- Patient V-pacing 99% of the time (CRT)
- Battery is adequate



107

Medtronic Programmer Used



108

How Should We Manage the ICD During the Abdominal Surgery

- Put a magnet on it
- Turn it "off" with a programmer
- ~~Leave it alone~~

109

Magnet Option

- Would likely work well to inhibit Anti-tachy therapy (ATT) in a supine patient
- The Medtronic tone would confirm good initial positioning of the magnet
- Would make it easy to turn the ATT back on at the end of the case
- Would not be able to adjust the pacing mode or turn off the RRM

110

Programmer Option

- Provides option to change the pacing mode
- Guarantees that patient will not get unnecessary shocks or charges
- Does require another programming session at end of case
- You become the patient's ICD

111

What is the Decision?

- Two good options—magnet or programmer
- In either case, ensure that cautery return pads placed on lower legs
  - Minimizes interference with the pacemaker
- Make sure that you have readily available external defibrillation equipment

112

I Reprogrammed the ICD

- Turned off the VF therapy
- Turned off the RRM
- Re-programmed the ICD to baseline settings after surgery

113

Do Magnets reliably inhibit the ICD?

Answer: Not Always

This is particularly the case in patients in the lateral or prone position, pts with obesity, and pts with the surgical site close to the ICD

115

Thoracic Procedure

- Pt booked for a VATS procedure
- CAD
- Patient has an ICD

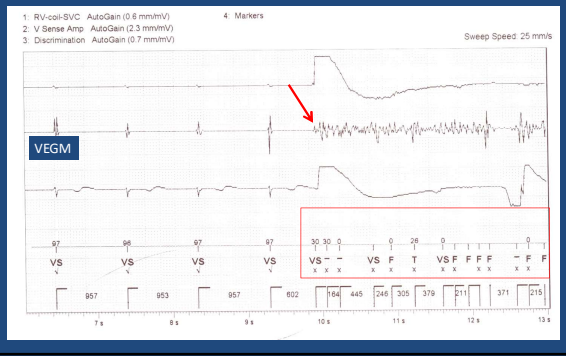
116

Intraop Course

- Pt placed in lateral position
- Magnet placed over the ICD securely
- Position checked intermittently

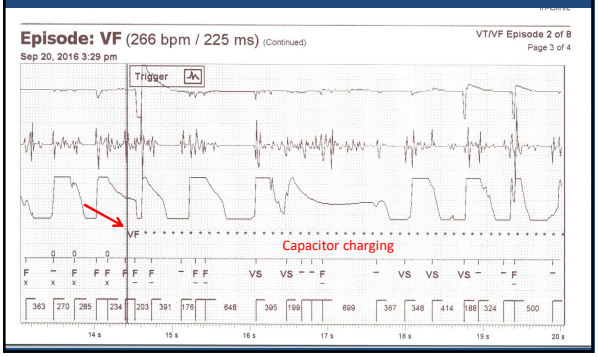
117

Cautery Detected as VF



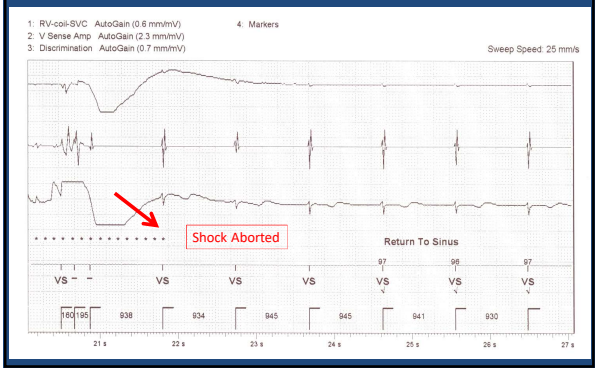
118

VF declared—charging starts



119

Charging ends…ICD attempts to confirm VF, but cautery stopped and VS intervals return..no shock



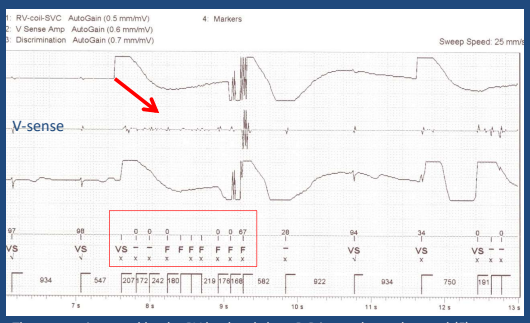
120

Is the Aborted Shock Benign?

- The ICD charging diminishes battery life even when the charge is not delivered.
- A full charge consumes approximately 30 days of the ICD's battery life

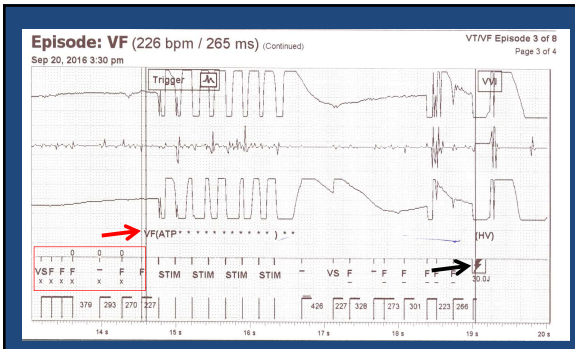
121

30 secs later Cautery again detected



The cautery is sensed by the RV lead and short R-R intervals are detected (F)
…when cautery is off, SR is detected (VS).

122



At the red arrow, the ICD detects VF after sensing 12 short R-R intervals classified as "F". The charging ensues as ATP is delivered. Charging is very short because the ICD had charged the capacitor at 3:29, but aborted. The ICD confirmed that VF was continuing and shocked with 30 J at the black arrow

123

Why is this so Bad?

- Unnecessary shocks can actually initiate VF
- Shocks are bad for the heart
- An awake patient would be "shocked"
- Shocks can also move the patient dangerously:
  - Delicate surgery
  - Head in pins

124

Surgery in Prone Position and Shocks

- Pt with St Jude ICD
  - Magnet enabled
- Pt placed prone in pins
- Magnet placed on ICD and secured with Tegaderm/Tape
- Patient relaxed with muscle relaxants

125

Intraop Issue

Therapy Summary

	VT	VF
ATP Delivered		11
Shocks Delivered		19
Max Energy Shocks		4
	VT Zone is Monitor Only	
Last HV Lead Impedance	57 Ω	
Total Aborted Shocks	29	

Results of ATP Delivery

	VT	VF
Episodes Terminated	0	5
Episodes Not Terminated	0	6
Accelerations	0	

- 11 rounds of ATP
- 19 shocks delivered
- 29 aborted shocks
- Battery Life reduced from 5.4 years to 3.8 years

127

Take Home Message

- Somehow the magnet was intermittently displaced from the ICDs in both cases despite being positioned and secured and monitored—
- It is probably a good idea to use a programmer to turn off an ICD in patients in the lateral or prone position

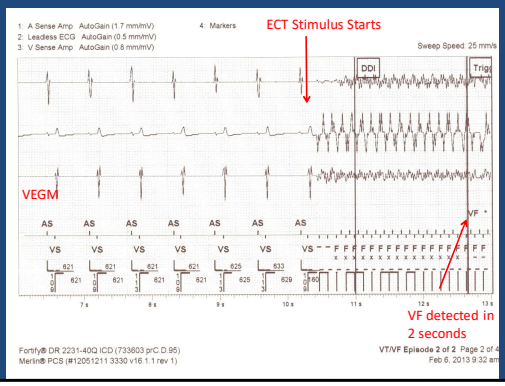
128

Magnet use may fail in Obese Patients: ECT and ICD Shock

- 49 yo somewhat obese pt with Depression
- St Jude ICD
- Anesthesia team used a magnet to inhibit ATT

129

ECT ICD Shock



130

ECT ICD Shock

131

Using Magnets near the Surgical Field:
Thyroid Surgery and ICD Shocks

- Patient had Biotronik ICD and a magnet was used to inhibit the tachy therapy
- Patient received 2 shocks

Recordings - Episodes

No.	Time	Zone	PP [ms]	RR [ms]	Description	PP [ms]	RR [ms]
90	01/10/17 09:43	VF	589	164	1 Shock	***	***
89	01/10/17 09:43	VF	219	147		965	973
88	01/10/17 09:42	VF	690	171	1 Shock	***	***
87	10/26/16 00:40	---	604	604	Periodic IEGM	***	***
86	09/16/16 12:23	ATR	180	779		690	696

132

Magnets are not so Reliable!

- During none of these cases did the anesthetists know for certain the shocks had occurred.
- I suspect this happens a lot more often than we would like to think

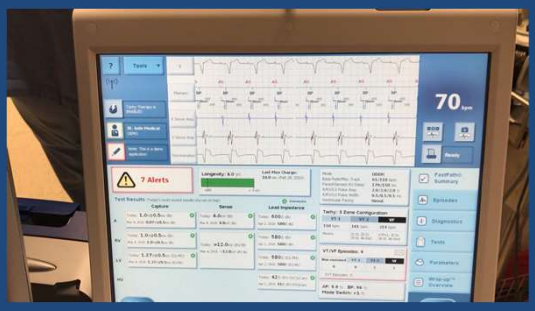
133

Programmers

- I recommend that several staff in your group learn how to use the programmers, even if only well enough to be able to turn off the ICD anti-tachy therapy (ATT)
- For three manufacturers' devices, turning off the ATT is usually relatively simple

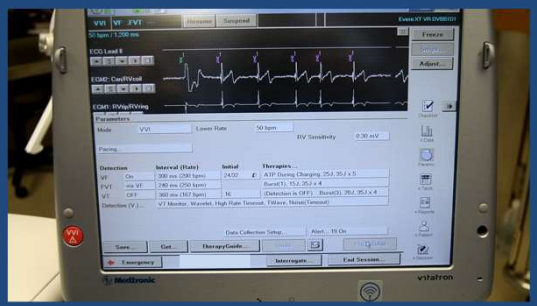
134

St Jude ICD Programmer



136

Medtronic ICD



137

If you decide to use a Programmer to turn off the ATT you…

- Need the company specific programmer
- You will become the patient's ICD
  - Must place extern defib pads
- Cannot forget to reprogram the ICD post op

138

Example of When Using A Magnet Makes Sense

- 79 yo M for Lap Colectomy
- Boston Scientific ICD
- Recent VT treated with anti-tachy pacing
- Patient thin and ICD easily palpable
- Going to be supine for entire case
- No need to reprogram pacer

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Intraop Recommendation

- Bovie return pad on right lower leg
- Use magnet to inhibit ICD
- If stable VT, remove magnet and let device anti-tachy pace +/- cardiovert
- If VF, use R2 pads
- In unlikely event that cautery interferes with pacer, contact me

141

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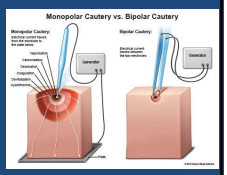
Important Question

- If the patient developed VF in the OR, what would you do?
  - Remove magnet and let ICD do the shock?
  - Shock the patient with Ext. Defib Pads?

143

How Do I Manage ICDs in the OR?

- No Cautery:
  - Leave ICD on
- Bipolar cautery:
  - Only disable ICD if cautery is close (w/i 10 cms) to the RV sensing lead
- Monopolar cautery:
  - Disable ICD's anti-tachy therapy



Permission granted from Amicus Visual Solutions

144

Disabling the ICD with a Programmer

Use a Programmer if:

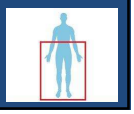
1. You are not sure how the ICD will respond to a magnet
2. The patient will need pacemaker reprogramming
3. The patient will be prone or lateral
4. Surgery will involve the chest, upper arm, shoulder, neck, or intracranial structure or any other surgery preventing easy access to the ICD
5. The ICD is not easy to palpate due to conditions such as obesity or recent device implant
6. The procedure is so long that a magnet could cause tissue necrosis

145

Disabling the ICD with a Magnet

Using a magnet reasonable if:

1. Pt will be supine and there will be easy access to the ICD throughout the procedure (see figure below)
   a. Procedure is below the xiphoid or below the elbows
2. The ICD is easy to palpate (patient not obese)
3. You know how the ICD will respond to the magnet
4. No change in the pacing mode or rate will be needed
5. You have no easy access to a programmer



146

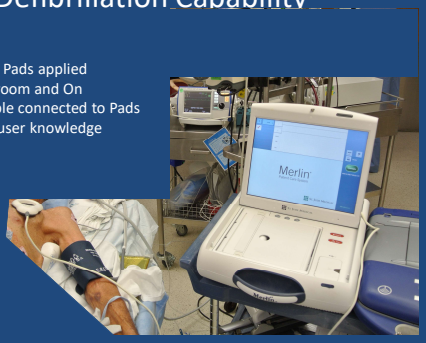
When do I turn off an ICD?

- Preferably when the patient is in the OR on the monitor with backup defibrillation equipment in place

147

My Definition of having backup Defibrillation Capability

1. Ext Defib Pads applied
2. Defib in room and On
3. Defib cable connected to Pads
4. Confirm user knowledge



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Does the ICD need Postop Interrogation: Three Types of Assessment

1. Needs EP interrogation prior to D/C from a monitored setting
2. Needs EP interrogation within 1 month of D/C from hospital
3. No need for follow up other than routine

Source: HRS/ASA Consensus Statement

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Post Op Management

1. Pt needs EP eval prior to DC from monitored setting:
   1. The ICD or pacer was reprogrammed preop
   2. Pt underwent cardiac, thoracic, open vase etc proc
   3. Pt had cardiac arrest, CV, CPR, temp pacing etc
   4. Pt had emerg surgery above umbilicus
   5. Pt had RFA or Ther Rad.
   6. Shock or unexpected movement noted
   7. Abnl tones emitted or apparent pacer dysfunction
   8. PA catheter inserted in patient with leads < 3 mos old

150

Post Op Management

2. If cautery or lithotripsy were used but the patient does not meet any of the previous 8 criteria, the patient's device should be interrogated within 1 month of DC by the cardiologist—in the office or remotely

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Post Op Management

3. If no cautery or lithotripsy were used, no additional EP evaluation is needed. Routine EP follow-up is sufficient.

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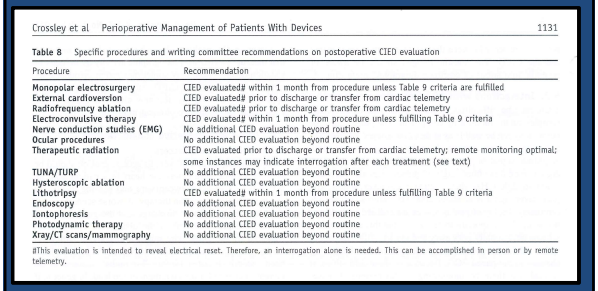
HRS/ASA Consensus Statement Post Op Management Rec's



Crossley et al Perioperative Management of Patients With Devices 1131

Table 8 Specific procedures and writing committee recommendations on postoperative CIED evaluation

Procedure	Recommendation
Monopolar electrosurgery	CIED evaluated# within 1 month from procedure unless Table 9 criteria are fulfilled
External cardioversion	CIED evaluated# prior to discharge or transfer from cardiac telemetry
Radiofrequency ablation	CIED evaluated# prior to discharge or transfer from cardiac telemetry
Electroconvulsive therapy	CIED evaluated# within 1 month from procedure unless fulfilling Table 9 criteria
Nerve conduction studies (EMG)	No additional CIED evaluation beyond routine
Ocular procedures	No additional CIED evaluation beyond routine
Therapeutic radiation	CIED evaluated prior to discharge or transfer from cardiac telemetry; remote monitoring optimal; some instances may indicate interrogation after each treatment (see text)
TUNA/TURP	No additional CIED evaluation beyond routine
Hysteroscopic ablation	No additional CIED evaluation beyond routine
Lithotripsy	CIED evaluated# within 1 month from procedure unless fulfilling Table 9 criteria
Endoscopy	No additional CIED evaluation beyond routine
Iontophoresis	No additional CIED evaluation beyond routine
Photodynamic therapy	No additional CIED evaluation beyond routine
Xray/CT scans/mammography	No additional CIED evaluation beyond routine

#This evaluation is intended to reveal electrical reset. Therefore, an interrogation alone is needed. This can be accomplished in person or by remote telemetry.

Heart Rhythm July 2011; 1131

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Cautionary Statement

- Not every case fits neatly into the aforementioned post op situations—if there is any question about post-op management, err on the side of safety and contact someone with EP experience

158

Final Review

1. It takes 3-4 secs of cautery to fool an ICD into believing a patient is in VF
2. Inappropriate shocks are bad, and even aborted charges deplete the battery
3. Magnets inhibit an ICD's anti-tachy therapy
4. Magnets do not affect an ICD's pacemaker function
5. The CXR can help you determine what device your patient has
6. And so can a Magnet—use your knowledge of tones and rate change
7. Preop device interrogation should be within 6 months of the surgery
8. Inhibit ATT if surgery includes cautery: consider the 3 zones
9. Pay close attention to the cautery return pad placement
10. Magnets may be unreliable for prone or lateral patients, obese patients, and surgeries close to the ICD
11. Programmers are very useful—consider learning how to use them
12. If you turn off a patient's ICD, you become the patient's ICD

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