Effects of Electrosurgery on St. Jude Medical Implantable Cardioverter Defibrillators (ICDs)

Background
The use of electrosurgery can affect the operation of implantable cardioverter defibrillators (ICDs). While all St. Jude Medical devices incorporate circuits and designs intended to prevent or minimize such effects, the high energy levels used in electrosurgery can produce electromagnetic interference (EMI) that can be sensed by the implanted device. When such signals are erroneously interpreted as cardiac activity by the implanted device, inappropriate therapy delivery or inhibition of pacing may occur. For this reason, the use of electrosurgery is contraindicated when the automatic tachycardia response of the patient’s ICD is enabled.

Potential Effects
A summary of potential effects is provided in the table below and is based on device testing at St. Jude Medical, clinical experience and a review of the scientific literature.

<table>
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<tr>
<th>Potential Effect</th>
<th>Estimated Frequency</th>
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<tbody>
<tr>
<td>Temporary loss of capture</td>
<td>Uncommon</td>
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<tr>
<td>Inappropriate delivery of therapy</td>
<td>Uncommon</td>
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<tr>
<td>Inhibition of pacing</td>
<td>Rare</td>
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<td>Failure to deliver antitachycardia therapy as a result of noise reversion</td>
<td>Rare</td>
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<tr>
<td>Circuit damage leading to erratic function or loss of therapy or pacing</td>
<td>Rare</td>
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Recommendations
Per the 2011 HRS perioperative consensus committee, an approach that limits electrosurgery usage to short bursts (4 to 5 seconds or less) may be a safer approach than either reprogramming or placement of a magnet over the pulse generator.

Also per the HRS committee, “Oversensing in ICDs results in inhibition of pacing and can result in the delivery of inappropriate ICD therapy.” “Despite these concerns, inappropriate ICD shock delivery to a patient under anesthesia will likely cause no adverse consequence other than, ICD shock-induced skeletal muscle contraction if the patient is not under anesthesia induced paralysis, although depending on the level of intraoperative paralysis, an ICD shock-induced skeletal muscle contraction could cause an undesired sudden movement of the patient.”

Before the procedure
If extended electrosurgery is necessary, reprogramming to an asynchronous mode and/or disabling high voltage therapy may be necessary.
• If electrosurgery will be used during an ICD explant, loss of capture may occur. To minimize the likelihood of loss of capture on a pacemaker dependent patient, the output can be programmed to a higher output prior to electrosurgery.
Although not required by the HRS committee, the device’s tachycardia detection and response features can be deactivated by:

- Placing a magnet over the device. This suspends tachyarrhythmia detection and response as long as the magnet is held in place over the device and the magnet response feature has not been disabled.
- Although generally not necessary, high voltage therapies may be indefinitely suspended via temporarily programming to “Tachy Therapy is Disabled” or “Tachy Zones Off” depending on the programmer options for each specific model. When antitachyarrhythmia therapies are disabled, monitor the patient and ensure that external defibrillation capabilities are available.

**During the procedure**

- Monitor the patient’s pulse and/or ECG during electrosurgery.
- Keep the electrosurgical tip more than 15 cm (6 inches) away from the ICD and leads.
- Providing intervals of 10 seconds or more between these (4 to 5 second) bursts will help prevent inappropriate ICD therapy.
- Position the electrosurgery system’s ground plate so that the current pathway does not pass through or near the ICD and leads.
- Where possible, use a bipolar electrosurgery system.

**After the procedure**

- If a magnet was placed over the ICD, normal programmed function resumes once the magnet is removed and the ICD does not require interrogation to validate reactivation.
- If the device was programmed to an asynchronous pacing mode, Tachy Therapy Off, or higher outputs, reprogram the device back to the desired settings.
- Electrosurgery used in the direct vicinity (typically less than 6 inches) of an ICD could potentially damage the device and further evaluation of the ICD system by the patient’s following physician should be considered.

If you have any questions on this topic, please contact St. Jude Medical Technical Services at 800-722-3774.

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