Effects of Arc Welding on St. Jude Medical Implantable Cardiac Rhythm Devices

Background
Electric arc welding produces intense electrical and magnetic fields that can affect the function of pacemakers and implantable cardioverter defibrillators (ICDs). This interference is caused by the device sensing extraneous signals from the welding equipment that have characteristics mimicking cardiac activity. While electromagnetic interference (EMI) from arc welding equipment will not damage the implanted device, it can inhibit pacing, trigger the device's noise response (typically leading to asynchronous pacing), or produce inadvertent antitachycardia pacing, cardioversion or defibrillation therapies. These effects are temporary, and will cease when the patient turns off or moves away from the arc welding equipment.

Pacemakers and ICDs programmed to a bipolar sensing configuration are less likely to be affected by such extraneous interference than those programmed to unipolar sensing.

Many patients with St. Jude Medical devices use or have been in close proximity to electric welders with no apparent problems. In addition, several reports have documented the absence of interference when patients with ICDs used arc welding machines. However, we cannot guarantee that a patient will not experience device interference associated with arc welding.

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>
<thead>
<tr>
<th>Potential Effect</th>
<th>Estimated Frequency</th>
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<tbody>
<tr>
<td>Inhibition of pacing</td>
<td>Uncommon</td>
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<tr>
<td>Noise reversion pacing</td>
<td>Uncommon</td>
</tr>
<tr>
<td>Pacing up to the maximum pacing rate (for devices programmed to a triggered or atrial tracking mode)</td>
<td>Rare</td>
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<tr>
<td>Inadvertent antitachycardia pacing or defibrillation therapies</td>
<td>Not applicable</td>
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<tr>
<td>Inhibition of ICD detection and therapy</td>
<td>Not applicable</td>
</tr>
</tbody>
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ICDs

Rare
Recommendations

Device recipients should not go near arc welding equipment until they have discussed the risks with their physicians. There is currently no apron, vest or other similar shield that will prevent EMI from arc welding equipment from interfering with device operation. If possible, other welding techniques should be used (i.e., acetylene or another non-electric welding process).

If a device recipient chooses to use arc welding equipment, the risk of interference can be reduced if the following recommendations are observed. Note that these are intended only for conventional electric welders. Welding at current settings above 400 Amperes or the use of automated spot welders, RF welders, induction welders or similar industrial equipment requires additional precautions. The patient should consult his or her physician regarding use of such equipment.

- Wear nonconductive gloves, such as dry leather, fireproof cloth, or rubber gloves. Dry shoes are also advised.
- Do not work in a wet or damp area.
- Ensure that all equipment is properly grounded.
- Do not use current settings that are higher than necessary. Never exceed 400 Amperes.
- Connect the "ground" clamp to the metal as close to the point of welding as possible.
- Keep the cables close together by twisting them around each other.
- Position the welding machine and excess cable away from the device wearer.
- Do not weld using rapid, repeated short bursts. Wait about 5 seconds between each weld. When having difficulty starting a weld on a dirty surface, do not strike the rod in a rapidly repeated manner. Wait about 5 seconds between each attempted start.
- If you feel lightheaded, dizzy or faint, immediately stop the weld, lay the rod down and move away from the welding machine.
- Arrange your work in advance so that if the handle and rod should be dropped because of a dizzy spell, they will not drop into the metal being welded. For similar reasons, do not work on a ladder or in a cramped, confined location.
- Do not work alone. Work only in the presence of someone who understands these recommendations.
- Avoid being near spot-welding equipment if it does not use more than five seconds between welds.

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