

Is Electrosurgery Safe for Patients with Internal or External Electronic Devices?

Several implantable, battery operated devices on the market are designed to assist with hearing, pain control, bone healing, urinary incontinence, and movement disorders such as dyskinesia and tremor. The Valleylab Clinical Information Hotline is frequently contacted about the use of electrosurgery on patients who have an implanted or external battery operated medical device. The use of isolated generators does significantly decrease the dangers of the electrosurgical current seeking an alternate pathway to ground; however, current leakage and direct coupling are still a danger that could ultimately injure the patient or permanently damage the device. It is important to consult the manufacturer of these battery operated medical devices and follow their recommendations. Also, consult the operator's manual supplied with the electrosurgical generator for additional information, contraindications, and warnings.

Cochlear Implants

The cochlear implant is an electronic device that is intended to restore a level of auditory sensation via the stimulation of the auditory nerve in children and adults. "Sound picked up by a microphone travels through a cable to a speech processor worn on a belt, in a pocket, or on the ear, that converts the signal into electrical pulses. The pulses travel back up the cable to a transmitter, fastened to the head, which sends the coded pulses through the skin to a receiver-stimulator implanted in bone directly beneath the transmitter. The stimulator relays the signal

down a bundle of tiny wires threaded directly into the cochlea, activating nerve fibers that in turn send the signal to the auditory nerve and on to the brain."¹

Electrosurgery warnings are associated with cochlear implants. Electrosurgical instruments are capable of inducing radio frequency currents that could flow through the electrode array. Monopolar electrosurgical instruments must **not** be used on the head or neck of a cochlear implant patient as induced currents could cause damage to cochlear tissues or permanent damage to the implant.

Bipolar electrosurgical instruments may only be used under the following conditions, according to Cochlear Corporation of Englewood, Colorado. "Bipolar electrosurgical instruments may be used on the head and neck of patients with implants that do not have extracochlear reference electrodes (Model: C122M, C122C), however, the cautery electrodes must not contact the implant. If the implant has extracochlear reference electrodes, bipolar electrosurgical instruments may be used if the cautery electrodes are kept more than 10 cm (4 inches) from the extracochlear electrodes."²

In Europe the word diathermy is interchangeable with the word electrosurgery. For the purpose of this article, diathermy is the controlled production of "deep heating" beneath the skin in the subcutaneous tissues, deep muscles, and joints for therapeutic purposes. There are basically two types of diathermy devices on the market



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today: radio or high frequency and microwave. Ultrasonic or ultrasound therapy is also a form of diathermy.

Diathermy must never be used over the receiver stimulator or electrode lead of the cochlear implant. High currents induced into the electrode can cause tissue damage to the cochlea or damage to the cochlear implant.

A certain amount of high and low radio frequency current leakage occurs in all electrosurgical equipment in the marketplace. There is concern about the effect of this high frequency current leakage when using electrosurgery on a patient with an implanted battery operated device.

As always, it is important to contact the manufacturer of the implanted medical device for specific precautions and warnings regarding the use of electrosurgery and its effect on their product.

Bone Growth Stimulators

A long bone nonunion occurs when a minimum of nine months has elapsed since injury and the fracture shows no visibly progressive signs of healing for a minimum of three months. Several companies manufacture bone growth stimulators for the treatment of nonunions. These solid state generators produce a constant direct current powered by a battery to aid in the healing of long bone nonunions. Electrosurgical instruments are capable of producing radio frequency voltages of such magnitude that direct coupling can occur between the electrosurgical instrument and lead system of the stimulators' generator. Direct coupling occurs when the user accidentally activates the generator while the active electrode is touching or near another metal instrument or device. As a result, the secondary instrument or device will become energized. This energy will seek a pathway to complete the circuit to the patient return electrode. To preclude the possibility of damage to the generator electronics or patient injury, electrosurgical equipment should not be used on the patient or in the immediate vicinity of the implanted stimulator.

Therapeutic diathermy should not be used in the treatment of a patient who has an implanted stimulator because this equipment can also produce voltages which may cause damage to the electronics. Diathermy must never be applied over the site of any bone growth stimulator because high currents induced in the electrode lead can cause burning of the tissues in contact with the electrode tip.

As previously stated, it is important to contact the manufacturer of the implantable device for specific precautions and warnings regarding the use of electrosurgery.

Monitoring Devices for Offenders

Ankle mounted devices are becoming more common as America's prison population grows and corrections agencies are focusing on community-based sanctions. The ankle mounted transmitter manufactured by BI, Incorporated of Boulder, Colorado is a radio frequency based electronic monitoring device that is connected to the existing power and phone lines in the offender's home. Using radio frequency technology, the receiver monitors the presence or absence of an offender within a specified range. BI, Inc. has not yet tested the effects of electrosurgery with their transmitter; however, BI recommends the removal of their monitoring device for patient safety as well as to preserve the components of their device.

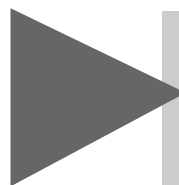
Healthcare manufacturers make it possible for patients to improve, restore, or control their health issues through a variety of today's technological advances. Electrosurgery has been around since the early twentieth century, and manufacturers of electrosurgical generators continue to improve their products for better patient outcomes and safer patient care. It is virtually impossible for electrosurgery generator companies to test every medical device on the market today for compatibility with electrosurgery. Therefore, it is important to consult with the manufacturers of the battery operated medical devices and follow their recommendations with regard to the use of electrosurgery.

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- 1) 2001 National Academy of Sciences
 - 2) Cochlear Corporation, Englewood, Colorado

References:

OsteoGen Bone Growth Stimulator System by EBI Medical Systems, Inc.

BI, Incorporated



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