

Valleylab Electrosurgical Generators: General Cautions and Warnings for Patient and Operating Room Safety

Electrosurgical generators, categorized as high-risk equipment by the Association of periOperative Registered Nurses (AORN), are routinely used in ORs, doctors' offices, ambulatory surgery centers, endoscopy suites, and other specialty areas. The surgeon, perioperative nurse, and other healthcare team members must be aware of the implications for use for each technology in order to ensure safe patient care and staff safety. In the 2004 *Standards, Recommended Practices and Guidelines for Electrosurgery*, AORN states that the electrosurgical unit and accessories should be used according to manufacturers' written instructions. "Equipment manuals assist in developing operational, safety, and maintenance guidelines, as well as serve as a reference for appropriate use"¹ and should be readily available to users. Many callers to the Clinical Information Hotline are not able to reference their generator user manual, because it has either been lost or misplaced. In a three-part series, the *Clinical Information Hotline News* will review Valleylab electrosurgical generator cautions and warnings to be considered before, during, and after surgery. The first article in this series will address general cautions and warnings.

GENERAL CAUTIONS AND WARNINGS²:

Read all warnings, cautions, and instructions provided with the generator before using.

- Warnings indicate a potentially hazardous situation, which, if not avoided, could result in death or serious injury.
- Cautions indicate a hazardous situation, which, if not avoided, may result in minor or moderate injury.

Warning

Always use the **lowest output setting** necessary that achieves the desired surgical effect. The active electrode should be utilized only for the minimum time necessary in order to lessen the possibility of unintended burn injury. Pediatric applications and/or procedures performed on **small anatomic structures** may require reduced power settings. The higher the current flow and the longer the current is applied, the greater the possibility of unintended thermal damage to tissue, especially during use on small structures.

Use electrosurgery with caution in the presence of **internal or external pacemakers**. Interference produced by the use of electrosurgical devices can cause devices such as a pacemaker to enter an asynchronous mode, or can block the pacemaker effect entirely. Consult the pacemaker manufacturer or hospital Cardiology Department for further information when use of electrosurgical appliances is planned in patients with cardiac pacemakers. If the patient has an **internal cardiac defibrillator (ICD)**, contact the ICD manufacturer for instructions before performing an electrosurgical procedure. Electrosurgery may cause multiple activations of ICDs.

(Refer to *Clinical Information Hotline News*, "Electrosurgery Safety Update – Pacemakers and Implantable Cardiac Defibrillators," November 2002, Vol. 7, Iss. 2.)

Valleylab recommends against the use of **laparoscopic** surgery on pregnant patients.



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Do not use electrosurgical equipment unless properly trained to use it in the specific procedure being undertaken. Use by physicians without such training has resulted in serious, unintended patient injury, including bowel perforation and unintended, irreversible tissue necrosis.

Hazardous Electrical Output – Electrosurgical equipment is for use only by trained, licensed physicians.

FIRE/EXPLOSION

Danger

Explosion Hazard – Do not use electrosurgery in the presence of **flammable anesthetics**.

Warning

Fire/Explosion Hazard – Sparking and heating associated with electrosurgery can be an ignition source. Keep gauze and sponges wet. Keep electrosurgical electrodes away from flammable materials and O₂ enriched environments.

Use of electrosurgery in oxygen (O₂) rich environments increases the risk of fire. Therefore, take measures to reduce the O₂ concentration at the surgical site.

Avoid enriched O₂ and nitrous oxide (N₂O) atmospheres near the surgical site. Both O₂ and N₂O support combustion and may result in fires and burns to patients or surgical personnel.

If possible, stop supplemental oxygen at least one minute before and during use of electrosurgery.

Do not activate the electrosurgical unit until flammable vapors from skin prep solutions and tinctures have dissipated.

Avoid the accumulation of naturally occurring flammable gases that may accumulate in body cavities such as the bowel.

Prevent pooling of flammable fluids and the accumulation of flammable or oxidizing gases or vapors under surgical drapes or near the surgical site.

Tissue buildup (eschar) on the tip of an active electrode may create embers that pose a fire hazard, especially in oxygen enriched environments. Keep the electrode clean and free of all debris.

Facial and other body hair is flammable. Water soluble surgical lubricating jelly may be used to cover hair close to the surgical site to decrease flammability.

Verify that all anesthesia circuit connections are leak free before and during use of electrosurgery.

(Refer to *Clinical Information Hotline News*, “OR Fires! Minimizing the Risk,” June 1999, Vol. 4, Iss. 1.)

FIRE HAZARD DURING OROPHARYNGEAL SURGERY

Warning

Verify endotracheal tubes are leak free and that the cuff seals properly to prevent oxygen leaks.

If an uncuffed tube is in use, pack the throat with wet sponges around the uncuffed tube, and be sure to keep sponges wet throughout the procedure.

Question the need for 100% O₂ during oropharyngeal or head and neck surgery.

If necessary, scavenge excess O₂ with separate suction. (Refer to *Clinical Information Hotline News*, “OR Fires! Minimizing the Risk,” June 1999, Vol. 4, Iss. 1.)

ELECTROSURGICAL SMOKE

Caution

Studies have shown that smoke generated during electrosurgical procedures can be potentially harmful to patients and the surgical team. These studies recommend adequately ventilating the smoke by using a surgical smoke evacuator or other means.³

(Refer to *Clinical Information Hotline News*, “Smoke Evacuation ...Is It Necessary?” December 1999, Special Edition.)

INADVERTENT RADIOFREQUENCY BURNS

Warning

Electrodes and **probes used with monitoring, stimulation, and imaging devices** (or similar equipment) can provide a path for high frequency current even if the electrodes or probes are isolated at 50-60 Hz, insulated, and/or battery operated.

To reduce the risk of an inadvertent electrosurgical burn at the electrode or probe site, place the electrode and/or probe as far away as possible from the electrosurgical site and/or patient return electrode. Protective impedances (resistors or RF inductors) installed in the monitoring leads may reduce the risk of such burns. Consult the hospital biomedical engineer for further information.

Do not use **needles as monitoring electrodes** during electrosurgical procedures. Inadvertent electrosurgical burns may result.

In some circumstances, the potential exists for alternate site burns at points of skin contact (e.g., between the arm and the side of the body). This occurs when electrosurgical current seeks a path to the patient return electrode that includes the **skin-to-skin contact** point. Current passing through small skin-to-skin contact points is concentrated and may cause a burn. This is true for grounded, ground referenced, and isolated output generators. (Refer to *Clinical Information Hotline News*, “Alternate Site Lesions,” December 2000, Vol. 5, Iss. 4.)

To reduce the potential for alternate site burns, do one or more of the following:

- Avoid skin-to-skin contact points, such as fingers touching leg, when positioning the patient.
- Place two to three inches of dry gauze between contact points to ensure that contact does not occur.
- Position the patient return electrode to provide a direct current route between the surgical site and the return electrode, which avoids skin-to-skin contact areas.
- In addition, place patient return electrodes according to the manufacturer’s instructions.

The potential for alternate site burns increases if the patient return electrode is compromised. Valleylab recommends the use of REM™ patient return electrodes and Valleylab generators with the REM™ system.

ENSURE PROPER CONNECTIONS

Caution

Examine all **accessories and connections** to the electrosurgical generator before using. Ensure that the accessories function as intended. Improper connection may result in arcs, sparks, accessory malfunction, or unintended surgical effects.

(Refer to *Clinical Information Hotline News, "Troubleshooting Electrosurgical Equipment and Accessories,"* July 2003, Vol. 8, Iss. 2.)

ACCESSORIES

Warning

Do not wrap accessory cords or patient return electrode cords around metal objects. This may induce currents that could lead to shocks, fires, or injury to the patient or surgical team.

1. AORN. *Standards, Recommended Practices and Guidelines*. Denver, CO; 2004, p. 246.

2. Valleylab. *Force FX™-C Electrosurgical Generator with Instant Response Technology User's Guide*. Boulder, CO; 1999.

3. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH). Control of Smoke from Laser/Electric Surgical Procedures. *HAZARD CONTROLS*. September 1996. publication 96-128.

SERVICING

Warning

Electric Shock Hazard – Do not remove the generator cover. Contact authorized personnel for service.

Notice

Refer to the appropriate generator service manual for maintenance recommendations, and function and output power verification procedures.

Electrosurgery has been used safely in numerous procedures. Before starting any surgical procedure, the **surgeon should be trained** in the particular technique and surgical procedure to be performed, should be familiar with the medical literature related to the procedure and potential complications, and should be familiar with the risks versus the benefits of using electrosurgery in the procedure.

The safe and effective use of electrosurgery depends to a large degree upon factors solely under the control of the operator. There is no substitute for a properly trained and vigilant surgical team. It is important that the operating instructions supplied with Valleylab or other manufacturers' electrosurgical equipment be read, understood, and followed. If an instruction manual does not accompany the electrosurgical generator, replacement of the manual is strongly recommended.