

## Issue Focus:

# Patient Safety During Laparoscopic Electrosurgery

In recent years, the number of laparoscopic surgeries performed has multiplied as patients and surgeons have increasingly recognized its advantages over open surgery. Despite the many benefits of laparoscopic surgery, such as reduced hospital stay, decreased recovery time, and lower cost, the procedure may present certain risks to patient safety that can have profound implications for physicians and hospitals. When radio-frequency electrical currents are used for cutting and hemostasis—as in approximately 86% of laparoscopic surgeries—inadvertent internal injuries can occur as a result of stray energy that emanates from the surgical instrument, outside the surgeon's view. Even the most skilled surgeon following the strictest safety procedures may inadvertently burn a patient during laparoscopic electrosurgery, due to the nature of the electrosurgical environment. Consequently, surgeons and hospitals run the risk of being targeted for liability.

## Potential Injuries

Injuries caused by stray electrical energy generally go undetected by the laparoscopic surgeon because 90% of the active electrode remains *outside* the restricted "keyhole" view of the laparoscope. Furthermore, symptoms of electrosurgical burns are usually delayed in onset for several days or weeks, making the cause of injury difficult to determine. Electrosurgical burns can cause peritonitis (inflammation of the membrane lining the abdominal cavity), hemorrhage, organ or vessel perforation, and contamination of the otherwise sterile abdominal cavity. If not detected soon enough, any of these complications can result in significant morbidity—requiring further surgery to repair tissue and organ damage—or even death.

## Medicolegal and Financial Risks

The medicolegal and economic consequences of inadvertent and undetected burns incurred during laparoscopic electrosurgery may be considerable, diverting resources and raising the costs of procedures and services. Although the prevalence of these injuries is difficult to calculate, due to lack of reporting and the difficulty of pinpointing the etiology of internal injuries, a substantial number of cases have been reported in recent years.

At the 1995 meeting of the Society of Laparoendoscopic Surgeons, 13% of members surveyed indicated that

they currently had one or more malpractice cases in litigation that involved a laparoscopic electrosurgical procedure. The increasing number of malpractice claims citing injury during laparoscopic surgery has prompted the formation of a Laparoscopic Litigation Group within the Association of Trial Lawyers of America. This Group has recognized that injury resulting from stray energy outside the surgeon's field of view provides a strong case for medicolegal liability. According to one of the Group's founders, surgeons and hospitals may be targeted for specific surgical errors as well as for choosing

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## The Medicolegal Consequences of Undetected Thermal Injury

In February 1989, a female patient underwent a cystoscopy and laparoscopy. Less than a week after surgery, the patient returned to the hospital with a distended abdomen and complaints of severe abdominal pain. An emergency laparotomy disclosed a ruptured ovarian cyst, but could not fully explain the patient's clinical state. Days later, pelvic fluid had accumulated, but it was not until over a week later that a urologist determined that damage to the left ureter and leakage of urine accounted for the fluid. The treating urologist diagnosed a thermal burn as the cause of the ureteral damage and the patient's complications. The burn was inflicted during the laparoscopy—outside the surgeon's viewfield—when an electrocoagulator was used to control the bleeding. The patient was initially hospitalized for 48 days, requiring a ureteral stent in the damaged ureter. After removal of the stent, the patient had scarring of the ureter and still runs the risk of losing

her left kidney as a result of the initial damage and the procedures required for treatment. The patient sued her surgeon for medical malpractice and a jury awarded her \$1.04 million.<sup>1</sup>

## Discussion

The majority of internal injuries incurred during minimally invasive electrosurgery go undetected at the time of surgery and their cause is never properly identified. Despite the difficulty of identifying electrosurgical burns, a growing body of evidence indicates that they indeed present a significant danger to patients. This case is one of dozens that demonstrate the dire medicolegal consequences that physicians, hospitals, insurance carriers, and equipment manufacturers face as a result of electrosurgical burns.

Currently, there is no standard procedure that all surgeons and operating room staff must follow prior to and during

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electrosurgery instruments that allow stray current to injure a patient.

### What Causes Laparoscopic Electrosurgical Injuries?

*Monopolar* electrosurgery is the most common electrosurgical method used in laparoscopic surgery. Though highly versatile, cost effective, and popular, monopolar instruments can endanger patient safety when stray electrical energy beyond the surgeon's limited field of view damages non-targeted tissues.

The stray currents that can cause patient injury outside the surgeon's laparoscopic view may occur via *insulation failure* or *capacitive coupling*. The shaft of the active electrode is covered by a layer of insulation designed to protect against the release of stray energy, but this insulation can break down over time, during a single laparoscopic procedure, or during the disinfection and sterilization processes. As a result, electrical currents can leak into non-targeted tissues and cause unobserved damage. Capacitive coupling is a mechanism by which energy is transferred from the active electrode to surrounding instruments and tissue, even when the insulation barrier is intact. The rapidly varying electrical field around the active electrode is unimpeded by electrical insulation and creates electrical currents by alternately attracting and repelling ions in surrounding conductors, such as metal instruments and body tissue. The movement of electrically charged ions in capacitively coupled tissue may cause currents that can heat tissue sufficiently to burn it. Currents may also arc from capacitively coupled instruments (such as the trocar cannula) to tissue, causing burns. (See attached graphic.)

### Protecting Patient Safety

Despite the risks, minimally invasive monopolar electrosurgery is an extremely valuable diagnostic and therapeutic procedure, and clinicians and patients should have the benefit of this surgical technique. The answer is not to avoid monopolar electrosurgery altogether, but rather to make it safer. Several physician malpractice carriers now offer no-cost, accredited post-graduate training courses in electrosurgery and risk management for their members who use laparoscopic electrosurgery. Some of these companies have reduced their rates by as much as 7% for surgeons who have attended these training sessions. Moreover, a *technological* solution to eliminate the problem of stray electrical energy already exists—*active electrode monitoring*. This safety device consists of a shield for the surgical electrode and a monitoring instrument that interfaces with electrosurgical units (ESUs) to help detect and manage stray electrical energy. Active electrode monitoring successfully satisfies the twin imperatives of protecting the patient's health and safety while minimizing the healthcare provider's financial and legal risk. ■

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minimally invasive electrosurgery to ensure patient protection against stray electrical energy outside the surgeon's field of view. Furthermore, surgeons are not required to be certified in order to perform laparoscopic electrosurgery. As the number of electrosurgical procedures performed continues to increase, a larger population of patients faces the risk of



For further information on the topic of safety during monopolar laparoscopic electrosurgery, consult the January 1995 issue of the Emergency Care Research Institute's (ECRI) *Health Devices: Focus on Laparoscopy*. The publication includes an in-depth discussion of the risks involved with laparoscopic electrosurgery and the problems presented by the few protective measures that may be followed. The report also presents an evaluation of active electrode monitoring, a technology designed to prevent the injurious effects of stray electrical energy. For additional information or to order reprints, contact ECRI at 610/825-6000.

The January 1995 AAGL (American Association of Gynecologic Laparoscopists) *Technical Bulletin* is another good resource for recommended practices to reduce the dangers of laparoscopic monopolar electrosurgery. Currently, there are no generally accepted or universally enforced safety guidelines in place; this report, however, provides a list of suggested guidelines to avoid complications during minimally invasive electrosurgery. For additional information, call the AAGL at 310/946-8774. ■

injury caused by stray energy. If physicians and hospital administrators fail to address the dangers of undetected electrosurgical burns, they compromise the safety of their patients and heighten their own risks of litigation and malpractice liability. ■

<sup>1</sup>Christine Abreu and Reuben Abreu v. David A. Nuñez, M.D., Essex County (NJ) Superior Court, Case No. ESX-L-1042-91.

*Laparoscopy Risk Report* is a publication dedicated to enhancing awareness about the dangers of unintended tissue burns during minimally invasive monopolar electrosurgery.

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