Laparoscopic Electrosurgical Complications: Stay Informed

By Vangie Dennis, RN, CNOR, CMLS

Objectives
1. Describe the frequency of laparoscopic electrosurgical complications.
2. Discuss the causes of these complications.
3. Describe preventive measures for avoiding complications.
The number of laparoscopic procedures being performed today continues to increase with more and more accidents being reported. For example, statistics reveal that 1.3 to 5 per 1,000 laparoscopic patients have experienced bowel complications while over 67 percent of laparoscopic injuries will go unnoticed at the time of surgery. Of the total general surgery malpractice claims in 2000, only 9 percent of the claims were from laparoscopic accidents but represented 39 percent of the monies paid out. Laparoscopic accidents continue to occur with medical malpractice claims awarding large sums of money for these incidents. The most common laparoscopic accidents are caused from instrument perforation, insufflation hazards, positioning problems, electrosurgery thermal burns, and inappropriate reprocessing. These accidents are all preventable with the appropriate knowledge, skill, and devices. In this article, laparoscopic accidents will be reviewed in detail while highlighting the required control measures to eliminate and minimize them.

The expected outcome of any surgical procedure is that the patient will be free from injury. Maximizing patient outcomes with minimal or no complications can be obtained through education, early recognition, and early intervention. Over the past 20 years, there has been a dramatic change in the technology to incorporate safety parameters. The advent of minimally invasive surgery has grown tremendously with the introduction and development of new technology. In the United States, nearly 4.9 million general and pelvic endoscopic surgery procedures were performed in 2003. The advantages of laparoscopic surgery over open surgery include lower overall treatment costs, reduced patient trauma, shorter hospital stays, and faster recovery times. These benefits have resulted in the conversion of many types of open surgery procedures to laparoscopic procedures, a continuing trend that is being driven by advancements in the array of products that includes access devices, access site closure devices, computer-aided instrument guidance systems, computer-aided training systems, endoscopes, hand instruments, and insufflation devices, among others. However, the overall majority of operative team and delivery care team have limited education necessary to ensure safe practices in performing minimal access surgery.

Electrosurgery

Electrosurgery in laparoscopic procedures is the preferred surgical device for controlling bleeding. It is an excellent tool for cutting, coagulating, and ablating tissue during all surgeries, and has been the standard surgical tool since the 1930s. Today, over 90 percent of all surgeries utilize electrosurgery. There are three specific considerations when thinking about minimally invasive surgery,

### QUESTIONS (true or false):

<table>
<thead>
<tr>
<th>Statement</th>
<th>T</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 80 percent of laparoscopic injuries are unnoticed during surgery.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Approximately 2 percent of laparoscopic procedures result in bowel complications.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Electrosurgery is the preferred method of controlling bleeding in laparoscopy.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Electrosurgery is used in approximately 60 percent of surgeries.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Bipolar electrosurgery is the method of choice for cutting/coagulating tissue.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Stray electrosurgical burns can be fatal.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Most surgeons are aware of insulation degradation on monopolar electrosurgical probes.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>The life expectancy of a reusable instrument is approximately two years.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Seventy-five percent of surgeons are aware of the concept of capacitive coupling.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Patients with thermal burns may not present with symptoms until a week after surgery.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>
Active electrode monitoring technology prevents stray energy burns to patients during laparoscopy due to instrument insulation failure and capacitive coupling.

For additional information about AEM, visit www.encision.com.
areas may be compromised by a secondary infection, making the identification of the primary cause difficult to diagnose. These complications may be erroneously attributable to some other injury, such as instrument laceration.

When an internal burn occurs, the infections are from the interaction of three elements: organisms, tissues, and host defense. Surgery reduces the resistance of the host. Coupled with this, the burned, necrotic, devitalized avascular tissue enhances infection by providing excellent media for microbial growth. The post-op systemic infection of bacteremia/septicemia is from the dissemination of microorganisms into the bloodstream from a distributing focus, the thermal burn.

The intestinal tract harbors many microorganisms. Leakage into the peritoneal cavity can be a source of generalized peritoneal sepsis. Anaerobic organisms thrive in an unoxygenated environment. The most common organisms from spillage of contaminants from the enteric flora are Escherichia coli and Bacteroides fragilis. Another contributing factor to high mortality, if left untreated, is Clostridium perfringens (a highly resistant, gas-producing spore-causing gas gangrene). Gram-negative bacilli are often resistant to long-established antibiotics (normally prescribed post-operatively). Because these infections carry a high risk of bacteremia, they require prompt interventions.

Tissue with a thermal injury usually presents 48-72 hours post-op. Because these patients are home within 24 hours, electrosurgical injuries occurring during laparoscopy often go unrecognized only to present three to seven days afterward with fever and abdominal pain. Only 20 percent of these injuries are recognized at the time of surgery, whereas 80 percent go unrecognized, with the average delay being 10 days. Fecal peritonitis resulting from the contamination of the abdominal cavity by bacteria from a bowel perforation is the most feared complication of thermal injury even with antibiotic therapy, with a mortality rate estimated at 25 percent.

These are unique electrosurgical issues specific to laparoscopic surgery. When comparing open surgery versus closed surgery, the atmosphere is moist, promoting conductivity of electrical current. There is limited access to the surgical tissue, and laparoscopy is still primarily rigid scope delivery. With normal laparoscopy, there is a technique referred to as the “last look” technique. The surgeon releases the gas from the abdomen slowly, while visually looking for injury or bleeding before removing the trocar. Unfortunately this is not a routine practice, even though it should be done. Commonly, the trocar sheath is removed after the gas is manually depressed from the abdomen. If an injury has occurred, the likelihood of it being noticed is minimized.

According to AORN’s Recommended Practices for Endoscopic Minimally Invasive Surgery, “Perioperative team members should monitor continually the functioning of equipment and the integrity of endoscopic instruments to ensure that hazards are minimized. Rationale: Use of active electrode monitoring (AEM) devices eliminates chance insulation failure, and capacitive coupling.”

The implementation of active electrode monitoring eliminates the chance of insulation failure and capacitive coupling and has brought us to the point of necessitating AEM as the emerging standard of care. AEM addresses patient complications due to unintended electrosurgical burns out of the surgeon’s field of view. AEM provides us with an efficacious, reusable, cost-effective system that brings about no change in surgical technique for the surgeon and essentially eliminates the chance of catastrophic patient injury from thermal damage to tissue. This technology has been recommended by organizations and in publications representing all the communities involved in laparoscopic surgery including nursing, surgical, risk management, ERCI, manufacturing and the biomedical field.

Under normal operating conditions, AEM delivers 100 percent of the power to the surgeon’s intended site. Capacitively coupled energy is continually drained safely back to the generator by the protective shield. Stray energy sensed through a primary insulation defect in the protective shield is the key to fail-safe operation. When primary insulation fails or capacitive coupling occurs, the AEM shuts off the generator, protecting the patient from a life-threatening burn. AEM alerts the perioperative staff and interrupts power to the active electrode upon evidence of stray energy. Unintended laparoscopic burns now are preventable with the introduction of AEM.

The Association of Trial Lawyers founded a laparoscopic surgery subgroup in 1994, making it clear that laparoscopy was a ripe area for liability claims. In 1995, a founding member of the group indicated that members had “identified stray electrical current during laparoscopy as a promising basis” for malpractice cases.

It is quite obvious that something must be done, not only for the safety of patients, but also for the safety of the surgical team. Data from the Physician Insurers Association of America (PIAA) showed an increase of burns in the year 2000, showing the rate of burns to be at 5.38 percent of 1,426 claims.

Change in technology does not necessarily require a change in technique or practice. To promote safety practices, perioperative personnel must make the change as transparent as possible. The perioperative professional has an opportunity to protect the patient from the dangers of stray electrosurgical burns incurred during laparoscopic surgery. Safe and effective practice requires a skilled and knowledgeable work force and appropriate equipment that operates reliably to reduce errors in our practice. The greatest factor in the safe and effective use of electrosurgery is adequately trained personnel.

Vangie Dennis is the manager for procedural nursing for Gwinnett Medical Center in Duluth, Ga., located in the metropolitan Atlanta area. Her departments are interventional radiology, endoscopy, sterile processing, cardioversion, outpatient treatment center, and the clinical educator for surgical services. She covers the advanced technology service for four surgery centers and is also the chair for the Advanced Technology Task Force for Partners Health Systems, which covers six hospital systems located within the metropolitan Atlanta area. For more information on this article, contact Vangie Dennis at vdennis@gwinnettmcdicalcenter.org.