

Use of Laparoscopy in Trauma at a Level II Trauma Center

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ABSTRACT

Background and Objectives: Enthusiasm for the use of laparoscopy in trauma has not rivaled that for general surgery. The purpose of this study was to evaluate our experience with laparoscopy at a level II trauma center.

Methods: A retrospective review of all trauma patients undergoing diagnostic or therapeutic laparoscopy was performed from January 2004 to July 2010.

Results: Laparoscopy was performed in 16 patients during the study period. The average age was 35 years. Injuries included left diaphragm in 4 patients, mesenteric injury in 2, and vaginal laceration, liver laceration, small bowel injury, renal laceration, urethral/pelvic, and colon injury in 1 patient each. Diagnostic laparoscopy was performed in 11 patients (69%) with 3 patients requiring conversion to an open procedure. Successful therapeutic laparoscopy was performed in 5 patients for repair of isolated diaphragm injuries (2), a small bowel injury, a colon injury, and placement of a suprapubic bladder catheter. Average length of stay was 5.6 days (range, 0 to 23), and 75% of patients were discharged home. Morbidity rate was 13% with no mortalities or missed injuries.

Conclusions: Laparoscopy is a seldom-used modality at our trauma center; however, it may play a role in a select subset of patients.

Key Words: Laparoscopy, Trauma, Therapeutic, Diagnostic.

INTRODUCTION

The use of laparoscopy in general surgery has expanded since the introduction and widespread adoption of the laparoscopic cholecystectomy. Laparoscopy has been applied to most abdominal surgical procedures and has become the standard of care for appendectomy, adrenalectomy, cholecystectomy, and splenectomy; however, the use of laparoscopy for trauma patients has been slower to evolve partly due to factors inherent in the trauma population and some limitations of the laparoscopic technique.

Initially, the evaluation of peritoneal violation in hemodynamically stable patients was seen as the greatest benefit of laparoscopy for trauma.^{1,2} Improvements in laparoscopic training and technology have enabled an increase in the use of diagnostic and therapeutic procedures in trauma patients.

The purpose of this study was to evaluate the use of diagnostic and therapeutic laparoscopy at a Level II trauma center and to gain a better understanding of the subset of patients who may benefit from these procedures.

METHODS

A retrospective review of all trauma patients undergoing diagnostic or therapeutic laparoscopy was performed at New Hanover Regional Medical Center from January 2004 to July 2010 following institutional review board approval. Our Level II trauma center services Southeastern North Carolina and has over 1400 admissions annually. The majority of admissions result from blunt trauma, including motor vehicle crashes (41%) and falls (33%) with penetrating trauma (14%) representing a smaller volume. Our trauma program is staffed by 8 general surgeons who serve as faculty for our general surgery residency program. Operations were performed with the trauma/general surgery personnel available or on call and not a specific dedicated laparoscopic team. Demographic information, mechanism and type of injury, operative details, and outcomes were documented. Descriptive statistics were calculated using standard methods.

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RESULTS

Laparoscopy was performed in 16 patients during the study period. The average age was 35 years (range, 16 to 55) with the majority of patients being Caucasian (69%) and male (75%). The most common mechanisms of injury were stab wounds and motor vehicle crashes (**Figure 1**). Computed tomography scanning was used for diagnosis in 81% of patients. Injuries included left diaphragm rupture (4), mesenteric injury (2), and singular lacerations to the vagina, liver, small bowel, kidney, urethra, and colon (6). Diagnostic laparoscopy was performed in 11 patients (69%) with 3 patients requiring conversion to an open procedure. Successful therapeutic laparoscopy was performed in 5 patients for repair of isolated injuries to the diaphragm (2), small bowel (**Figure 2**), colon, and for assistance with placement of a suprapubic bladder cath-

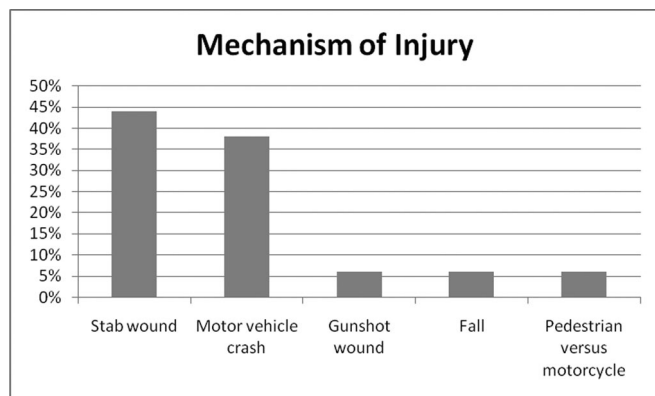


Figure 1. Mechanisms of injuries for patients undergoing laparoscopy.



Figure 2. Laparoscopic closure of small bowel enterotomy in blunt trauma from a motor vehicle crash.

eter. Overall mean operating room time was 91 minutes (range, 29 to 200). The average operating room time for the 5 therapeutic cases was 129 minutes. Average length of stay was 5.6 days (range, 0 to 23), and 75% of patients were discharged home. One patient, who underwent a laparoscopic-assisted suprapubic catheter placement, was subsequently transferred to a Level 1 trauma center for definitive management of an unstable pelvic fracture. Morbidity and mortality rates were 13% and 0, respectively. The 2 complications, unrelated to the surgical procedures, were pneumonia (1) and postoperative respiratory failure requiring tracheostomy (1). The latter occurred in a patient who had suffered significant left chest trauma with flail chest and pulmonary contusion. No patients who underwent diagnostic laparoscopy had missed injuries; however, one patient who had a negative diagnostic laparoscopy for suspected small bowel injury ultimately underwent a partial nephrectomy for persistent fever with urinary extravasation despite stent placement.

DISCUSSION

Accurate diagnosis of abdominal injuries in patients with traumatic torso injury remains challenging. Several modalities are available to assist in assessing intraabdominal injuries, which range from noninvasive methods, such as hemodynamic monitoring, physical examination, and imaging studies, to more invasive methods, such as paracentesis, diagnostic peritoneal lavage, diagnostic laparoscopy, and ultimately exploratory laparotomy.³ The role of laparoscopy in trauma has not paralleled the popularity for general surgery for several reasons, including the emergent nature of many of the operations, the lack of expertise and comfort level of surgeons, the added time for equipment setup, the difficulty assessing the retroperitoneum, and the fear of missed injuries.³

Ivatury et al⁴ was among the first to define the role of laparoscopy in trauma. In his prospective study of 100 patients, he reported that laparoscopy was accurate for the detection of hemoperitoneum, solid organ injuries, diaphragmatic lacerations, and retroperitoneal hematomas; however, it had a low sensitivity for gastrointestinal injuries and he concluded that the major role of laparoscopy in patients with penetrating abdominal trauma was in the avoidance of unnecessary laparotomies and in evaluation of the diaphragm.⁴ Since that time, concern has remained about the use of laparoscopy for the detection of bowel injuries; however, with improvements in technology and surgeons' skill, some of these concerns are waning. Kawahar and colleagues⁵ recently reported that

with a standard examination protocol for laparoscopic exploration, detection of small bowel injuries in penetrating trauma may be minimized to zero, as they noted in their series.

The current investigation demonstrated no missed injuries, bowel or otherwise, when laparoscopic evaluations were undertaken. Three of the patients in the series had to have their case converted to an open operation. Reasons for conversion included surgeon preference in 2 cases and patient inability to tolerate pneumoperitoneum in the third. One patient who underwent diagnostic laparoscopy to evaluate a possible small bowel/colon injury returned to the operating room to undergo partial nephrectomy for failure of nonoperative management of a right kidney laceration.

Overall, our experience with laparoscopy in trauma patients remains somewhat limited with the most common indication being the evaluation of stab wounds. Whether our results can be generalized to other trauma centers or surgeons taking care of trauma remains unknown secondary to our small sample size and our model of having general/laparoscopic surgeons taking trauma call. If, however, trauma centers or surgeons have the laparoscopic expertise and experience, there is no reason why laparoscopy should not be part of the treatment armamentarium for both the diagnosis and possible therapy of select trauma patients.

One limitation of our study is that, during the study period, there were no standardized treatment algorithms for the use of laparoscopy, and all decisions were based on attending surgeon preference and varied depending on the surgeon's comfort level and experience. This retrospective review has prompted us to better define patients who may benefit from laparoscopy at our hospital, with several caveats. First, all trauma patients considered for laparoscopy must be hemodynamically stable, and the surgeon and staff should be comfortable with the proposed procedure. Based on our small series, patients with suspected isolated bowel injuries and diaphragm injuries are good candidates for diagnostic laparoscopy and likely may be able to undergo a therapeutic procedure performed laparoscopically. Also, patients with stab wounds and equivocal findings on CT scanning may be candidates for diagnostic laparoscopy or admission with serial abdominal examinations based on the clinical situation and resources of the hospital/trauma team.

One interesting finding of our study relates to the number of therapeutic laparoscopic procedures performed including 2 cases of repair of isolated intestinal injuries and

suprapubic bladder catheter placement in a patient with a large pelvic hematoma from an extensive pelvic fracture, a technique that to our knowledge has not been described in the trauma literature. Despite a fair amount of literature on diagnostic laparoscopy for trauma, very few reports exist on therapeutic laparoscopy for traumatic bowel injuries with most being case reports or small case series.⁵⁻⁷ All of the 5 therapeutic laparoscopic procedures have occurred in the last 2 years. This may be related to adding a fellowship-trained laparoscopic surgeon who is involved with the trauma program to the faculty and increased awareness of the potential role for laparoscopy in trauma.

CONCLUSION

Although our small series shows laparoscopy to be a safe and effective diagnostic and therapeutic tool, particularly in patients with isolated bowel and diaphragm injuries, it must be used judiciously and by surgeons with expertise in advanced laparoscopic techniques. The complications of a missed injury by inadequate surgical exploration are much greater than the potential benefits of laparoscopy. Surgeons should not hesitate to convert to an open operation if there is concern that an adequate examination of the peritoneal cavity cannot be achieved.

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