

Open Laparoscopic Access Technique: Review of 2010 Patients

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ABSTRACT

Objective: We assessed safety and efficacy of an open laparoscopic entry technique.

Methods: A retrospective review of all patients undergoing laparoscopy via open laparoscopic access over an 8-year period from January 1, 1998 to December 31, 2006 is presented.

Results: During the study period, 2010 consecutive subjects underwent laparoscopy. Recorded intraoperative complications include enterotomy (0.1%) and failure to enter (0.1%). There were no instances of vascular injury related to entry. Recorded postoperative complications include hernia (0.9%), infection (2.5%), hematoma (0.05%), and noncosmetic healing (0.4%). A statistically significant association existed between obesity and postoperative hernia, and between previous abdominal surgery and postoperative infection.

Conclusion: Though typically straightforward, initial entry is one of the most common causes of injury in laparoscopy. The predominant entry method of entry in gynecologic surgery remains a closed technique. This technique has unfortunately been demonstrated in multiple series to have the potential for visceral and vascular injury due to its blind insertion of Veress needles and trocars. The open laparoscopic technique is a safe and effective method of obtaining access to the abdominal cavity with no associated vascular injury.

Key Words: Laparoscopic surgery, Insufflation, Pneumoperitoneum.

INTRODUCTION

The use of laparoscopy in gynecology has developed into a vital tool for the evaluation and treatment of pelvic pathology. The predominant method of entry in gynecologic surgery worldwide remains a closed technique, with or without pneumoperitoneum. This approach unfortunately has been demonstrated in multiple studies to have the potential for visceral and vascular injury due to the blind insertion of Veress needles or trocars. Complications reported in the literature from the closed entry technique range from 0.05% to 0.67%,¹ and include vascular injury, enterotomy, urinary tract injury, subcutaneous emphysema, and gas embolism. These complications arise due to the normal anatomic relationship of the periumbilical site to the underlying great vessels and viscera and are particularly problematic in patients with adhesions or at extremes of body weight. Additionally, delay in diagnosis of bowel injuries frequently sited with this closed technique² accounts for significant morbidity and mortality.

The open technique was first described by Hasson in 1970. This technique consists of creating a small umbilical incision under direct visualization to enter the abdominal cavity followed by the introduction of a blunt trocar. Pneumoperitoneum is then rapidly created. Hasson proposed its potential benefits to be the avoidance of blind insertion of the Veress needle and bladed trocar, prevention of preperitoneal insufflation and gas embolism, guaranteed pneumoperitoneum, and a more anatomical repair of the abdominal wall.^{3,4} Since that time, Hasson³⁻⁵ and others^{1,6-10} have corroborated these proposed benefits with data obtained from large case series.

This large chart review was undertaken to examine our experience with open laparoscopy and to determine whether preoperative characteristics can predict open laparoscopic entry complication.

METHODS

We completed a retrospective chart review of all patients who underwent laparoscopy via an open technique at the Mayo Clinic Arizona in the Department of Gynecology (8 surgeons) from January 1, 1998 through December 31, 2006. Data were extracted from a computer-generated

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search, and each electronic medical record was individually reviewed to ensure inclusion criteria and obtain end points. The above inclusion criteria were met by 2010 patients. All charts were reviewed from the point of surgery through the remainder of their care at our institution. Intraoperative complications (bowel and vascular injury, failure to enter), postoperative complications (hernia, hematoma, cellulitis, abscess, cosmetic issues), body mass index (BMI), number of previous abdominal surgeries, and length of follow-up were extracted from charts. Statistical analysis was performed using JMP 6.0 for Windows (SAS Institute, Cary, NC). This study was approved by the institutional review board.

The open laparoscopic technique used in this series is similar to that originally described by Hasson⁴ and is as follows: the umbilicus is held and everted with 2 Allis forceps. A vertical skin incision, 10-mm to 15-mm long, is created at the deepest portion of the umbilicus. The underlying fascia is grasped with 2 Kocher forceps, elevated, and incised in a vertical midline fashion. If the peritoneal cavity is still intact, it is grasped with Kocher or Allis forceps and entered with Metzenbaum scissors. Fascial sutures are placed and fastened to the 11-mm Hasson trocar after its insertion. High-flow insufflation is next attached. Finally, the laparoscope is introduced and the organs below the entry site are inspected as is the remainder of the abdominal cavity.

Closure of the umbilical entry site is performed with direct visualization and identification of the fascial layer. A 0-polyglactin suture on a #2 urologic needle is used for the fascial layer, and a 4-0 polyglactin suture is used for skin approximation. An occlusive dressing is removed from the site in the ensuing 24 hours to 36 hours.

RESULTS

We reviewed 2010 charts of patients who met the inclusion criteria. Mean patient BMI was 26.5 (range, 14 to 57), mean previous abdominal surgery was 1.3 (range, 0 to 18), and mean follow-up was 340 days (range, 0 to 3028).

At the time of entry with the open technique, we experienced 2 (0.1%) instances of enterotomy and 3 (0.1%) cases of failed entry. No instances of vascular injury occurred (Table 1). Of the enterotomies, in one patient dense adhesions from a previous debulking laparotomy (requiring over 3 hours of laparoscopic adhesiolysis) were present with jejunum adherent immediately under the umbilicus. The second patient had the transverse colon adherent to the umbilicus; she had had 4 previous lapa-

Entry	N (%)
Enterotomy	2 (0.1)
Failure to enter	3 (0.1)
Vascular injury	0
Postoperative	
Infection	51 (2.5)
Erythema, no exam	8 (0.4)
Cellulitis diagnosed by MD	36 (1.8)
Abscess requiring drainage	7 (0.3)
Hernia	19 (0.9)
Symptomatic	12 (0.6)
Asymptomatic	7 (0.3)
Cosmetic Issues	8 (0.4)
Hematoma	1 (0.05)

rotomies. Both of these enterotomies were noted immediately and repaired intraoperatively. Of the failed entries, the first patient had dense umbilical adhesions from 2 prior laparotomies, and the procedure was aborted. In the second patient, surgeons were unable to reach the peritoneal cavity due to the patient's pannus (BMI 43), and a left upper quadrant entry was chosen. The third patient had dense periumbilical adhesions from a previous colectomy, so the procedure was converted to a minilaparotomy.

Postoperative complications are listed in Table 1. Patients with umbilical infection were subclassified based on whether the diagnosis was made over the phone due to patient complaints of erythema or drainage, by examination and diagnosis of cellulitis, or an umbilical abscess requiring evacuation.

Patients with subsequent umbilical hernias were subclassified into symptomatic (noted by a physician or patient) or asymptomatic (discovered serendipitously at a subsequent surgery) (Table 1). All umbilical hernias were diagnosed between 4 months and 7 years postoperatively.

Fisher's exact test was used to determine the association between each of the recorded complications and the number of previous abdominal surgeries and obesity (BMI>30) (Table 2). A significant association was noted between umbilical infection and previous abdominal surgery (P=0.049), and between umbilical hernia and obesity

Table 2.

Complications According to Previous Surgery and BMI

Complication Type	Previous Surgery >0 (P Value)	BMI >30 (P Value)
Enterotomy	2/2 (0.54)	0/2 (1.0)
Failure to enter	3/3 (0.56)	2/3 (0.15)
Infection	39/48 (0.05)	15/48 (0.31)
Hernia	13/19 (0.81)	9/18 (0.02)
Cosmetic	4/7 (0.70)	3/8 (0.42)
Hematoma	1/1 (1.0)	0/1 (1.0)

($P=0.024$). All other complications were not significantly associated with either previous abdominal surgery or BMI.

DISCUSSION

This chart review confirms previous findings of case series, literature reviews, and meta-analyses^{1,2,5-10} of the complications associated with open laparoscopic entry. A large Dutch review⁶ of 12,444 cases of open laparoscopy culled from 6 previously published case series^{4,10-13} found a 0.048% rate of enterotomy and no cases of vascular injury or gas embolism. These rates contrast with an enterotomy rate of 0.083% and vascular injury rate of 0.075% from 489,335 cases of closed laparoscopic entries in this same review.

Similarly, an Australian meta-analysis¹ examined 22,465 cases of one published open laparoscopy series and 760,890 patients from 22 published closed laparoscopy series. They noted an enterotomy rate of 0.049% (11 patients) in open cases and 0.067% (515 patients) in closed cases (nonsignificant difference). No cases occurred of vascular injury in open cases, while the rate of vascular injury in closed cases was 0.044% (336 patients), which was statistically significant ($P=0.003$). Similar rates of umbilical infection and hernia occurred with both techniques.

To date, there are no reports of fatal vascular injuries and only 2 instances of nonfatal major vascular injuries in the literature associated with the use of the open technique.¹⁴ The first case occurred during the skin incision, when the scalpel directly entered the aorta (the Hasson trocar had not been used). The second case involved a damaged metal Hasson cannula with a protruding spike that caused an aortic laceration.

The lack of fatal vascular injuries noted in this and other large series is of utmost significance. Data from litigious allegations related to 135 laparoscopic procedures over a 19-year period¹⁵ revealed a disproportionate percentage of the cases involving vascular injuries. Additionally, these injuries are associated with a significant mortality risk, with 5 of 9 vascular injuries at closed laparoscopic entry reported to the Medical Defense Union¹⁶ resulting in death. Moreover, the morbidity incurred with major vascular injury includes transfusions, prolonged hospitalization, loss of limb, or other long-term sequelae.

Visceral injuries, in particular small bowel and colon, are also life-threatening, and because they are commonly missed during a closed entry, and injury may later be recognized only when symptoms of peritonitis develop. Although intestinal injuries occurred in this case series, a major advantage of the open technique is the immediate recognition and repair of the enterotomy. Neither of the 2 patients in this series suffered any long-term complications related to enterotomy.

We observed no association between failed entry or enterotomy and previous surgery or obesity. Previous abdominal surgery and obesity are therefore not contraindications to an open laparoscopic entry, and in fact the open approach may offer some advantage over the closed technique in these patients.

The noted association between umbilical hernia and obesity in this series is not surprising. Several series have reported lower hernia formation with the open technique,¹ perhaps because of the ability to easily identify the fascial layer during closure. The fact that none of the hernias occurred prior to 6 weeks postoperatively also suggests that a good primary reapproximation was achieved at surgery.

Although this is a retrospective review of patients presenting to a referral center with somewhat limited follow-up, the large number of procedures performed via a consistent technique enhances the strength of this study. Additionally, each case was hand reviewed for complications rather than using ICD-9 codes to assess for rate of complications. Finally, when available, patients' charts for the entire time they received care at our institution, in some cases up to 8 years, were reviewed.

CONCLUSION

The use of an open laparoscopic entry is advocated because it is a safe, simple means of accessing the peritoneal cavity. This case series confirms previous reports of the low risk of

enterotomy, absence of fatal vascular injury, and comparable rates of umbilical infection/hernia associated with an open entry technique. The rapid recognition of enterotomy with this entry technique, and the utility of this technique in obese patients or those with previous abdominal procedures are additional advantages.

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