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Retrospective Evaluation of Laparoscopic Versus Open Hartmann's Reversal: A Single-Institution Experience

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Abstract

Purpose—Restoration of intestinal continuity after Hartmann's procedure has significant associated morbidity. There has been a trend toward increasing utilization of laparoscopy in colorectal surgery, with improvements in short-term outcomes. This study evaluates our experience with laparoscopic Hartmann's procedure reversal.

Methods—All patients who underwent laparoscopic and open reversal of Hartmann's procedure between 2007 and 2010 were reviewed. Demographics, length of stay, postoperative morbidity, and mortality were compared between the 2 groups.

Results—Nineteen patients underwent laparoscopic Hartmann's reversal and 62 underwent open reversal. There were no statistically significant differences in demographics, comorbidities, mean operative times, blood loss, reoperation, and readmission rates between the groups. The laparoscopic group had a shorter length of hospitalization (5.7 vs. 7.9 d, $P < 0.01$).

Conclusions—Laparoscopic reversal of Hartmann's pouch is a safe and feasible alternative to the open reversal technique. Patients who undergo the laparoscopic technique have a shorter length of hospital stay.

Keywords

laparoscopy; Hartmann's; reversal; length of stay

Henri Hartmann first described Hartmann's procedure in 1923. The procedure entails a sigmoidectomy with end colostomy, leaving a closed rectal stump.¹ The procedure was initially intended for resection of the sigmoid colon for upper rectal cancers, but currently, Hartmann's procedure is often utilized as an emergency operation, performed most often for perforated sigmoid diverticulitis, perforated colonic malignancies, or ischemic colitis.²

Although colostomies are commonplace in colon surgery, they are not without significant morbidity. Furthermore, stoma closure is a fairly morbid procedure. Therefore, colostomy reversal should be considered once patients have fully recovered from their initial operation.

An open surgical approach remains the dominant surgical platform used for Hartmann's closure, with resultant high rates of wound infection, anastomotic dehiscence, stricture, sepsis, and fistula formation.^{2,3} Since the 1990s, there has been an increasing adaptation of laparoscopy in colorectal surgery, with resultant reduction in hospital length of stay and decreased postoperative morbidity.⁴ In contrast, adaptation of the laparoscopic technique for Hartmann's closure has been rather slow, primarily due to the technical complexity of the procedure. Most colorectal surgeons perceive laparoscopic closure of Hartmann's pouch as one of the most difficult laparoscopic procedures.⁵ The goal of this study is to show that laparoscopic Hartmann's reversal is technically feasible and is associated with lower complication rates when compared with its open counterpart.

METHODS

Patient Selection

After institutional review board approval from The Ohio State University Wexner Medical Center, the Ohio State patient medical records were queried retrospectively between 2007 and 2010 using International Classification of Disease 9 (ICD-9) codes and Current Procedural Terminology (CPT) codes. ICD-9 codes included "closure of intestinal stoma" (46.5, 46.50, 46.51, 46.52). CPT codes included "closure of enterostomy, large or small intestine; with resection and anastomosis other than colorectal" (44625) and "closure of enterostomy, large or small intestine; with resection and anastomosis (eg, closure of Hartmann type procedure)" (44626). All patients with ileostomies were excluded from the study. Only patients 18 years of age or older who underwent Hartmann's reversal at The Ohio State University were included. All surgeries were performed either by 1 of 3 board-certified colon and rectal surgeons or by general surgeons at The Ohio State University Wexner Medical Center. Some of the patients had their original Hartmann's procedure performed at other institutions and were referred to Ohio State for colostomy reversal.

The charts were reviewed for demographic information, comorbidities, length of stay, and perioperative course. Mortality and postoperative morbidity, including surgical site infection, need for reoperation, and need for readmission, were compared between the 2 groups. We stratified our data based on intention to treat, and laparoscopic cases that required conversion to open procedures were included in the laparoscopic group.

Statistical Analysis

Statistical analysis was performed using SAS 9.3. A Wilcoxon rank-sum test was used to determine the distribution difference between the laparoscopic and open groups for continuous clinical variables. The χ^2 test/Fisher exact test was used to assess the proportion difference between the laparoscopic and open groups for categorical variables. A *P*-value of <0.05 was used to determine statistical significance.

RESULTS

A total of 81 patients who underwent Hartmann's reversal were identified, of whom 19 patients underwent laparoscopic reversal and 62 underwent open reversal. There were 6 conversions to open technique due to dense adhesions or inability to advance the stapler through the rectal stump due to significant scarring. The groups were comparable in age, American Society of Anesthesiologists (ASA) Physical Status Classification, body mass index, and time to reversal after their initial operation. Patients in the open group had more prior abdominal operations ($P = 0.04$). The mean age for the laparoscopic group and the open group was 56.6 and 51.4 years, respectively ($P = 0.19$). There was no statistically significant difference in ASA status. However, the majority of patients in both groups were ASA 3, with 63.2% in the laparoscopic group and 53.2% in the open group ($P = 0.86$). Fewer patients were ASA 4, with 10.5% in the laparoscopic group and 11.3% in the open group. A complete summary of demographic data is listed in Table 1. There were no significant differences between patient comorbidities (Table 2). Mean time to Hartmann's reversal was 7.9 and 8.8 months in the laparoscopic and open groups, respectively ($P = 0.22$). The most common indication for initial colostomy creation was diverticulitis, which occurred in 12 (63.2%) patients in the laparoscopic group and 30 (48.4%) in the open group. Other indications for Hartmann's procedure included trauma, perforated viscous, ischemic colitis, and cancer (Table 3).

Mean total operative times were similar, 336.6 minutes laparoscopically and 316.9 minutes open ($P = 0.38$) (Table 4). Estimated blood loss was 134 mL in the laparoscopic group and 209 mL in the open group. However, this finding did not reach statistical significance ($P = 0.06$) (Table 4). There were no postoperative anastomotic leaks, fistulae, or mortalities in either group. The most common complication was surgical site infection, which occurred in 15.8% of patients in the laparoscopic group and 21.0% in the open group ($P = 0.75$) (Table 5). The laparoscopic group had a statistically significant shorter length of hospitalization (5.7 vs. 7.9 d, $P < 0.01$) (Table 4). There was no difference in reoperation rate or readmission rate between the 2 groups.

DISCUSSION

A colostomy can have a significant impact on a patient's quality of life, secondary to common complications such as skin irritation, rashes, prolapse, and leakage.^{6,7} Despite the morbidities associated with long-term colostomies, on average, only 40% to 52% of patients undergo Hartmann's reversal. Surgery is typically deferred secondary to high operative risk or patient refusal.^{2,8,9}

Colostomy reversal is a major abdominal operation that must be approached with caution. Open Hartmann's reversal is associated with high rates of reoperation, ileus, and prolonged hospitalization.¹⁰ Other common complications after open reversal include intra-abdominal abscess formation, ileus, and anastomotic leak.¹¹ Mortality rates after Hartmann's reversal can range from 0% to 7%.⁸ Despite the technical difficulty of laparoscopic Hartmann's reversal, it is associated with decreased complication rates, reoperation rates, and mortality as compared with open surgery.^{12–14} Although the rates of postoperative complications were

not statistically significant in our study, patients who underwent open surgery had a trend toward increased rates of wound infections (21.0% vs. 15.7%), postoperative ileus (18.8% vs. 5.3%), cardiac complications such as myocardial infarction (4.8% vs. 0%), respiratory complications such as pneumonia (8.1% vs. 5.3%), renal failure (1.6% vs. 0%), urinary tract infections (6.5% vs. 0%), and ICU stays (6.5% vs. 0%). Our findings were consistent with published literature. There were no mortalities in either group. Notably, 2 patients from the open group required reoperation for wound dehiscence and evisceration. There was 1 readmission in the laparoscopic group for small bowel obstruction.

Perhaps the most important finding of our study is that patients who underwent laparoscopic Hartmann's reversal had a statistically significant shorter overall length of hospital stay (5.7 vs. 7.9d, $P<0.01$). Similarly, Yang and Morgan¹³ found that laparoscopic Hartmann's reversal was associated with a shorter overall length of hospital stay (6.7 vs. 10.8d). Zimmermann et al¹⁴ found a shorter length of stay in the laparoscopic group versus the open group (10 vs. 15d), and a significantly lower rate of major complications including small bowel obstruction, anastomotic leak, and wound dehiscence (16.6% vs. 58.7%). In general, a shorter length of stay is associated with a significant hospital and patient cost savings. Although laparoscopic surgery may be associated with higher intraoperative cost, there are decreased overall in-hospital costs.¹⁵

Our study is limited by its retrospective nature and small number of laparoscopic cases during the study time period. The small sample size is the likely reason why we were not able to reach statistical significance when comparing blood loss and incidence of surgical site infection between the 2 groups, underscoring the need for larger, multicenter studies.

CONCLUSIONS

Laparoscopic reversal of Hartmann's procedure is a safe and feasible alternative to the traditional open reversal technique. Patients who undergo the laparoscopic technique have a significantly shorter length of stay and a trend toward decreased blood loss and infection rates.

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TABLE 1

Patient Demographic Data

	Laparoscopic (n = 19)	Open (n = 62)	P
Age [mean (range)] (y)	56.6 (35–83)	51.4 (25–77)	0.19
BMI (range) (kg/m ²)	28.5 (21.0–40.0)	30.8 (17.0–60.0)	0.53
ASA classification			0.86
[n (%)]			
II	5 (26.3)	22 (35.5)	
III	12 (63.1)	33 (53.2)	
IV	2 (10.5)	7 (11.3)	
Prior abdominal surgeries (n)	1.2	1.7	0.04 *
Time to reversal (range) (mo)	7.9 (2–37)	8.8 (2.5–31)	0.22

* Statistical significance reached at a *P*-value of <0.05.

TABLE 2**Patient Comorbidities**

	n (%)		P
	Laparoscopic (n = 19)	Open (n = 62)	
Hypertension	11 (57.9)	26 (41.9)	0.30
Gastroesophageal reflux disease	1 (5.3)	2 (3.2)	0.56
Tobacco use	12 (63.2)	38 (61.3)	0.43
Chronic obstructive pulmonary disease	2 (10.5)	9 (14.5)	1
Hyperlipidemia	2 (10.5)	8 (12.9)	1
Diabetes	0	10 (16.1)	0.11
Obstructive sleep apnea	1 (5.3)	7 (11.3)	0.67
Heart disease	5 (26.3)	16 (25.8)	1
Kidney disease	1 (5.3)	6 (9.7)	1
Liver dysfunction	0	2 (3.2)	1
Cancer	1 (5.3)	5 (8.1)	1
Alcoholism	1 (5.3)	1 (1.6)	0.42

TABLE 3

Indication for Hartmann's Operation

	n (%)	
	Laparoscopic (n = 19)	Open (n = 62)
Diverticulitis	12 (63.2)	30 (48.4)
Perforated viscus	0	6 (9.7)
Trauma	1 (5.3)	7 (11.3)
Ischemic colitis	1 (5.3)	4 (6.5)
Cancer	0	4 (6.5)
Other *	4 (21.1)	7 (11.3)

* Other indications include ovarian cancer, diversion for hidradenitis suppurativa, rectal prolapse, and Fournier gangrene.

TABLE 4

Perioperative Outcomes

	Laparoscopic (n = 19)	Open (n = 62)	P
Length of stay (mean) (d)	5.7	7.9	< 0.01 *
EBL (mean) (mL)	134 (22–300)	209 (25–700)	0.06
Operative time (mean) (min)	336.6	316.9	0.38

EBL indicates estimated blood loss.

* Statistical significance reached at a *P*-value of <0.05.

TABLE 5

Postoperative Complications

	n (%)		P
	Laparoscopic (n = 19)	Open (n = 62)	
Conversion to open	6 (31.6)	—	
Wound infection	3 (15.8)	13 (21.0)	0.75
Ileus	1 (5.3)	6 (18.8)	1
Bowel obstruction	1 (5.3)	1 (1.6)	0.42
Cardiac complications	0	3 (4.8)	1
Respiratory complication	1 (5.3)	5 (8.1)	1
Renal failure	0	1 (1.6)	1
UTI	0	4 (6.5)	0.57
ICU stay	0	4 (6.5)	0.57
30 d mortality	0	0	
30 d readmission	1 (5.3)	0	0.23
In-hospital reoperation	0	2 (3.3)	1

ICU indicates intensive care unit; UTI, urinary tract infection.