OPEN ACCESS

GAVIN PUBLISHERS

Archives of Gastroenterology and Hepatology

Morgan AB. Arch Gastroenterol Hepatol: AGEH-105.

Research Article

DOI: 10.29011/AGEH-105. 100005

Laparoscopy via the Stoma Site: A Novel Use for Laparoscopy During Diverting Loop Ileostomy Reversal

Andrew B Morgan[1*], John P Gaughan[2], Steven J McClane[3]

[1]Department of Surgery, Cooper University, Three Cooper Plaza, Camden, USA

[2]Department of Medicine, Biostatistician, Cooper Medical School of Rowan University, Camden, USA

[3]Department of Colorectal Surgery, Cooper University Hospital, Three Cooper Plaza, Camden, USA

[*]**Corresponding author:** Andrew B Morgan, Department of Surgery, Cooper University, Three Cooper Plaza, Camden, USA. Tel: +1-8562201266; Fax:+1-85636575823; Email: morgan-andrew@cooperhealth.edu

Citation: Morgan AB, Gaughan JP, McClane SJ (2018) Laparoscopy via the Stoma Site: A Novel Use for Laparoscopy During Diverting Loop Ileostomy Reversal. Arch Gastroenterol Hepatol: AGEH-105. DOI: 10.29011/AGEH-105. 100005

Received Date: 01 October, 2018; **Accepted Date:** 18 October, 2018; **Published Date:** 29 October, 2018

Abstract

Background: A protective ileostomy is often used for patients who undergo colorectal anastomosis. The ileostomy is then reversed with a peristomal incision but some patients may require laparotomy for reversal. In this report, we describe using laparoscopy through the stoma site as a safe and effective method for adhesiolysis instead of laparotomy.

Methods: We retrospectively reviewed the operative reports for patients who underwent closure of loop ileostomies. If intra-abdominal adhesions prevented evisceration of the ileum, patients needed either a midline laparotomy or laparoscopy for adhesiolysis. For laparoscopy, an Alexis Wound Protector (Applied Medical, Rancho Santa Margarita, CA) with laparoscopic port was placed through the ileostomy exit site and laparoscopy was used for adhesiolysis.

Results: Between January 2014 and October 2017, 78 consecutive loop ileostomy reversals were identified. 6 of these patients required laparoscopy, 1 required laparotomy, and 71 required no additional incisions. For the laparoscopic group, the average duration of the procedure was 132 minutes vs. 91 minutes for peristomal approach (p=0.07). The length of stay for laparoscopic assisted surgery was 4.8 days vs. 3.9 days (p=0.62). Only 1 patient in 78 required laparotomy, allowing 98.7% of patients to have their ileostomy reversed without laparotomy.

Conclusion: Laparoscopy via the stoma site is a safe and effective way to perform adhesiolysis during ileostomy reversal and avoid laparotomy. In this series, we found no significant clinical difference when laparoscopy was added compared to standard incision. Surgeons should consider this approach instead of laparotomy when adhesiolysis is needed for ileostomy closure.

Keywords: Alexis Wound Protector; Ileostomy Reversal; Laparoscopy Via Ileostomy Exit Site; Stoma Site Laparoscopy

Introduction

A protective ileostomy is often used to reduce the morbidity and mortality of anastomotic leakage for patients who undergo colorectal anastomosis. The ileostomy is then traditionally reversed with a peristomal incision, but some patients may require laparotomy and adhesiolysis for reversal. Reported rates of conversion to laparotomy for ileostomy closure are 3.7-5.3% [1,2]. To avoid the morbidity of a laparotomy, several studies have examined the role of laparoscopy in the reversal of a diverting loop ileostomy. Retrospective data has shown that when a laparoscopic approach is compared to a traditional open technique, this can lead to significantly longer operative times with equivalent rates of postoperative complications, overall morbidity, and length of stay [3,4]. In a recent randomized controlled trial, the use of laparoscopy after standard closure was compared to closure alone and found that patients who had complete adhesiolysis following closure had reduced length of stay and lower postoperative morbidity [5]. However, this study performed laparoscopy for all patients randomized to receive laparoscopy following standard ileostomy closure and led to patients who received a negative laparoscopy with no adhesions lysed [5]. Despite attempts to improve the technique and outcomes for patients undergoing diverting loop ileostomy reversal, current clinical practice guidelines continue to recommend an open appro-

ach with a peristomal circumferential incision and conversion to laparotomy if necessary for adhesiolysis [6].

Recently, some authors have reported a novel use of laparoscopy via the stoma exit site to accomplish concomitant procedures. Multiple case reports have described the role of using the ileostomy exist site as a novel way for abdominal access to perform laparoscopic cholecystectomy [7,8]. In these reports patients either had a diverting loop ileostomy created as a consequence of acute, necrotizing pancreatitis [7] or developed gallstone pancreatitis in the immediate postoperative period following major colorectal surgery with diverting ileostomy creation [8]. The decision was made to perform cholecystectomy with the ileostomy reversal using the ileostomy exit site to access the abdomen and then perform laparoscopy. This technique has also been described in a case report as a way to resect a metastatic lesion from the liver at the time to ileostomy closure in a patient with colorectal cancer [9]. In this paper, we describe a novel technique for using laparoscopy through the stoma site as a safe and effective method when needed to accomplish adhesiolysis during ileostomy reversal instead of performing a laparotomy.

Methods

This study was a retrospective review approved by the Institutional Review Board of Cooper University Hospital (Camden, NJ). Between January 2014 and October 2017, operative reports of ileostomy closures performed by a single colorectal surgeon at our institution were reviewed. Data from both the ostomy reversal operation and the index operation that created the ileostomy were collected. Following satisfactory analysis of the quality of the distal anastomosis by either gastrografin enema or sigmoidoscopy, patients underwent ileostomy reversal. Operative techniques were reviewed. All patients were placed under general anesthesia, and the planned procedure was to close the ileostomy without any incisions outside of the ileostomy exit site. A circumferential skin incision was made outside of the mucocutaneous junction using sharp dissection to the subcutaneous fat and continued until the rectus sheath was identified. The rectus muscle was then dissected from the serosa until the abdominal cavity is entered and the bowel able to be eviscerated. Limited intra-abdominal adhesions were lysed using this exposure. If intra-abdominal adhesions prevented adequate evisceration of the ileum for anastomosis, patients needed either a midline laparotomy or laparoscopy for adhesiolysis. Midline laparotomy was performed in standard fashion. For those requiring laparoscopy, a small capped wound protector (2.5-6 cm, Alexis Laparoscopic System, Applied Medical) was placed through the ileostomy exit site and a 12mm port was placed into the abdomen (Figure 1). Laparoscopic exploration was then begun and additional 5 mm ports were placed based on the location of adhesions. Following laparoscopic adhesiolysis, the limbs of the ileostomy were then eviscerated and a tension-free anastomosis was created. The fascia and port sites were closed in standard fashion. Data analysis was performed by department statistician using Wilcoxon scores for numeric data and Fisher's exact test for categorical data.

Figure 1: Alexis Laparoscopic System (Applied Medical, Rancho Santa Margarita, CA). Left: Alexis wound protector/retractor with cap. Right: Alexis laparoscopic system with 12 mm trocar introduced via cap entry port.

Results

Demographic data

We identified 78 consecutive patients who underwent loop ileostomy reversal for inclusion in this study. Of these patients, 6 underwent laparoscopy as previously described for ileostomy closure, and 72 underwent peristomal reversal. We found that those who underwent laparoscopic assisted reversal were 44.2 years old (range 25 - 66) compared to 56.7 years (range 26 - 84, p=0.07). The groups were similar in terms of gender, BMI, history of diabetes, and American Society of Anesthesiologists fitness score (Table 1). For patient diagnosis leading to the index operation, we found that inflammatory bowel disease was the most common indication in the laparoscopic group (n=3, 50%) *vs.* malignant disease (n=38, 52.8%) in the peristomal group, but this difference was not significant (p=0.37).

	Laparoscopic Assisted Reversal (n=6)	Peristomal Reversal (n=72)	P value
Age, years (range)	44.2 (25 - 66)	56.7 (26 - 84)	0.07*
Gender Ratio (M:F)	3 : 3	41 : 31	1.00
BMI, mean (range)	31.98 (23.4 - 44.9)	28.02 (16.8 - 58.0)	0.37*
Diabetes (count, % of total)	0 (0%)	17 (23.6%)	0.33
ASA Fitness Score			0.71
I	0	1 (1.4%)	
II	3 (50%)	29 (40.3%)	
III	3 (50%)	42 (58.3%)	
Index Operation Indication			0.37
Malignant Disease	2 (33.3%)	38 (52.8%)	
Diverticular Disease	1 (16.7%)	17 (23.6%)	
Inflammatory Bowel Disease	3 (50%)	13 (18.1%)	
Other	0	4 (5.6%)	

Table 1: Baseline demographic data. Values are Fisher's exact test, except for * Wilcoxon scores.

Index operation data: With consideration of the index operation performed with creation of the diverting loop ileostomy, there was no significant difference between the technique of the operation (laparoscopic *vs.* open) or the indication (cancer *vs*. benign pathology). The length of the index operation for the laparoscopic group was 376.0 minutes (range 207 - 445) compared to 375.7 minutes (range 147-658) in the peristomal group (p=0.70). We also found no significant difference between the groups during the index operation for intraoperative blood loss, intravenous fluids, urine output, or intraoperative vasopressor requirements (Table 2). The length of stay for the index operation for the laparoscopic group was 7.75 days (range 4 - 14) compared to 6.97 days (range 2 - 25) in the peristomal group (p=0.77).

	Laparoscopic Assisted Reversal (n=6)	Peristomal Reversal (n=72)	P value
Technique of Index Operation (% open/laparoscopic)	50.0% / 50.0%	40.3% / 59.7%	1.00*
Duration of Index Operation (minutes)	376.0 (207 - 445)	375.7 (147 - 658)	0.70
Intra-Operative Blood Loss (cc)	100.0 (50 - 150)	239.2 (20 - 1150)	0.28
Intra-Operative Intravenous Fluids (L)	3.7 (3.0 - 4.5)	3.9 (1.0 - 11.1)	0.93
Intra-Operative Urine Output (cc)	303.8 (240 - 375)	460.2 (75 - 1610)	0.45
Phenylephrine Use (mcg)	200.0 (0 - 700)	287.3 (0 - 2100)	0.85
Ephedrine Use (mcg)	3.8 (0 - 15.0)	9.9 (0 - 300)	0.84
Length of Stay (days)	7.75 (4 - 14)	6.97 (2 - 25)	0.77

Table 2*:* Index operation data for patients who underwent ileostomy reversal. Values are Wilcoxon scores, except for *Fisher's exact test.

Ostomy reversal operation data: The average time between the index operation and reversal operation was 141.4 days (range 39 - 358) for the laparoscopic group, and 103.6 days (range 7 - 557) for the peristomal group (p=0.70). For the laparoscopic group, the average duration of the procedure was 131.7 minutes (range 52 - 204), compared to 90.9 minutes (range 54 - 184) for peristomal approach. The laparoscopic operations were 41 minutes longer on average, however this difference was not statistically significant (p=0.07). There was also no significant difference during the ostomy reversal operation regarding intraoperative blood loss, intravenous fluids, urine output, or intraoperative vasopressor requirements between the two groups (Table 3).

	Laparoscopic Assisted Reversal (n=6)	Peristomal Reversal (n=72)	P value
Duration Between Index Operation and Reversal Operation (days)	141.4 (39 - 358)	103.6 (7 - 557)	0.70
Adjuvant Therapy Prior to Reversal (count, % of total)	0 (0%)	8 (11.1%)	1.00*
Duration of Reversal Operation (minutes)	131.7 (52 - 204)	90.9 (54 - 184)	0.07
Intra-Operative Blood Loss (cc)	19.2 (5 - 50)	24.7 (5 - 100)	0.50
Intra-Operative Intra-Venous Fluids (L)	1.7 (1.1 - 2.7)	1.4 (0.3 - 3.2)	0.12
Intra-Operative Urine Output (cc)	174.2 (40 - 400)	164.3 (0 - 2000)	0.48
Phenylephrine Use (mcg)	200.0 (0 - 700)	95.4 (0 - 1200)	0.81
Ephedrine Use (mcg)	3.8 (0 - 15)	3.2 (0 - 50)	0.29
Length of Stay (days)	4.83 (2 - 13)	3.94 (1 - 18)	0.37

Table 3: Intra-operative and post-operative data for patients who underwent ileostomy reversal. Values are Wilcoxon scores, except for * Fisher's exact test.

Ostomy reversal operation outcomes

The mean length of stay for patients who underwent laparoscopic assisted surgery was 4.8 days *vs.* 3.9 days in the peristomal approach group (p=0.62). Post-operatively the total complication rate was similar between groups at 16.7% for laparoscopic group *vs.* 18.1% in the peristomal group (p=0.60), (Table 4). The most common complication in the peristomal reversal group was ileus (n=8, 50%). In the laparoscopic assisted reversal group there were two complications: ileus (n=1) and urinary retention (n=1). The severity of complications was rated using the Clavien-Dindo classification system (Table 5). There was 1 grade 1 complication in the laparoscopic group compared to 6 in the peristomal group, and 1 grade 2 complication in the laparoscopic group compared to 4 in the peristomal group. There were zero grade 3 complications in the laparoscopic group, and a total of 4 in the peristomal group. The grade 3a complications were due to cardiac ischemia that underwent cardiac catheterization and an upper gastrointestinal hemorrhage that underwent upper endoscopy. The grade 3b complications were patients who required laparotomy, one for volvulus and the other for a bowel obstruction. These differences were not statistically significant (p=0.46).

	Laparoscopic Assisted Reversal	Peristomal Reversal	P value
Ileus	1	8	
Bowel Obstruction	0	0	
Volvulus	0	1	
Abdominal Abscess	0	1	
Cardiac Arrhythmia/Ischemia	0	3	

Acute Kidney Injury	0	1	
Urinary Retention	1	2	
Total	**2 (33.3%)**	**16 (22.2%)**	**0.60***

Table 4: Summary of post-operative complications following ileostomy closure. *P value calculated using Fisher's exact test.

		Laparoscopic Assisted Reversal	Peristomal Reversal	P value
Grade I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Allowed therapeutic regimens are drugs such as antiemetics, antipyretics, analgesics and diuretics, and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside	1	6	
Grade II	Requiring pharmacological treatment with drugs other than those allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included	1	4	
Grade III	Requiring surgical, endoscopic or radiological intervention			
III a	Intervention not under general anesthesia	0	2	
III b	Intervention under general anesthesia	0	2	
Grade IV	Life-threatening complication (including brain hemorrhage, ischemic stroke, subarachnoid bleeding, but excluding transient ischemic attacks) requiring ICU management	0	0	
IV a	Single organ dysfunction (including dialysis)	0	0	
IV b	Multiple organ dysfunction	0	0	
Grade V	Death as a result of complications	0	0	
Overall		2	14	*0.46

Table 5: Clavien-Dindo classification of 30-day surgical complications. *P value calculated using Fisher's exact test.

Discussion

The surgical technique for reversing a diverting ileostomy has remained largely unchanged despite advances in the use of laparoscopy throughout colorectal surgery. When standard peristomal reversal via a circumferential incision fails, a surgeon can decide to extend the incision around the ileostomy site or perform a laparotomy for repair. These methods are not ideal, as this subjects the patient to the morbidity and mortality of a laparotomy and surgeons often choose to create a diverting loop ileostomy when diversion is needed due to how relatively well tolerated the reversal is. In our report, we examined a novel use for laparoscopy via the stoma exit site to perform the necessary adhesiolysis without performing a laparotomy. In our cohort of a total of 78 consecutive diverting loop ileostomy reversals, only 1 patient required laparotomy, allowing 98.7% of patients to have their ileostomy reversed without laparotomy. Of these 78 patients, 6 of them (7.7%) had their ileostomy reversed with the assistance of laparoscopy via the stoma exit site instead of a laparotomy.

As this a retrospective review, our two groups are not randomized. They are also not equal in terms of size, with 6 patients in the laparoscopic assisted group and 72 patients in the peristomal group. However, we found no significant difference between the two groups in terms of age, BMI, gender, ASA fitness score, or underlying pathology requiring diverting ileostomy creation. Regarding the intraoperative data of the index operation (creation of the ileostomy), we also found no significant difference between the groups in terms of index duration, blood loss, vasopressor requirements, or postoperative length of stay. The operative tech-

nique (laparoscopic *vs.* open) and duration of time between the index operation and reversal operation was also not significantly different between the two groups.

In terms of the ostomy reversal operation, we found the groups to have similar intraoperative and postoperative outcomes. The laparoscopic assisted operations were 41 minutes longer on average, with mean duration of the procedure 131.7 (range 52 - 204) minutes, compared to 90.9 (range 54 - 184) minutes for peristomal approach. However, this difference was not a statistically significant finding (p=0.07), and the difference is partially due to the delay of time to convert the open procedure to laparoscopy. Because the intent for all of the reversal operations was to perform them using the open peristomal approach, laparoscopic equipment was not opened and prepared before the case was begun and this needed time likely contributed to the increased operative time. There was also no difference between the groups in terms of operative blood loss, intravenous fluids, urine output, or vasopressor requirements. The length of stay was also similar between the two groups (4.8 days in laparoscopic group *vs.* 3.9 days in the peristomal group, p=0.62). Complications were rated using the Clavien-Dindo classification of 30 day postoperative complications. There was 1 grade 1 complication in the laparoscopic group compared to 6 in the peristomal group, and 1 grade 2 complication in the laparoscopic group compared to 4 in the peristomal group. There were zero grade 3 complications in the laparoscopic group, and a total of 4 in the peristomal group. There were zero grade 4 or 5 complications in either group. These differences in complications were not found to be statistically significant (p=0.46).

When more extensive intra-abdominal access is required during ileostomy reversal, laparoscopy via the stoma site is a safe and effective way to perform adhesiolysis and avoids the morbidity of laparotomy. In this series, we have shown that this technique can aid in avoiding laparotomy in close to 99% of patients undergoing a loop ileostomy closure. We found no significant difference in operative duration, blood loss, fluids, length of stay, or postoperative complications, when laparoscopic adhesiolysis via the stoma site was added to standard peristomal technique. Surgeons should consider this approach instead of laparotomy when adhesiolysis is needed for protective ileostomy closure.

Acknowledgements: Images in (Figure 1) are used with written permission from Applied Medical (Rancho Santa Margarita, CA) on 4/26/18.

Conflicts of Interest

The authors declare that there is no conflict of interest.

References

1. Chow A, Tilney HS, Paraskeva P, Jeyarajah S, Zacharakis E, et al. (2009) The morbidity surrounding reversal of defunctioning ileostomies: a systematic review of 48 studies including 6,107 cases. Int J Colorectal Dis 24: 711-723.

2. Wong KS, Remzi FH, Gorgun E, Arrigain S, Church JM, et al. (2005) Loop ileostomy closure after restorative proctocolectomy: outcome in 1,504 patients. Dis Colon Rectum 48: 243-250.

3. Young MT, Hwang GS, Menon G, Feldmann TF, Jafari MD, et al. (2015) Laparoscopic Versus Open Loop Ileostomy Reversal: Is there an Advantage to a Minimally Invasive Approach? World J Surg 39: 2805-2811.

4. Russek K, George JM, Zafar N, Cuevas-Estandia P, Franklin M (2011) Laparoscopic loop ileostomy reversal: reducing morbidity while improving functional outcomes. JSLS 4: 475-479.

5. Royds J, O'Riordan JM, Mansour E, Eguare E, Neary P (2013) Randomized clinical trial of the benefit of laparoscopy with closure of loop ileostomy. Br J Surg 100:1295-1301.

6. Hunt SR, Silviera: Anastomotic Construction (2016) In: Steele SR, Hull TL, Read TE, Saclarides TJ, Senagore AJ, Whitlow CB: The ASCRS textbook of colon and rectal surgery. Cham: Springer International Publishing 2016: 141-144.

7. Borle DP, Agrawal N, Arora A, Kumar S, Chattopadhyay TK (2017) Ileostomy site approach for adhesiolysis and laparoscopic cholecystectomy in a hostile abdomen: A novel technique. J Minim Access Surg 14: 261-263.

8. Kulkarni GV, Sarker S, Eberhardt JM (2014) Combined laparoscopic cholecystectomy with ileostomy reversal: A method of delayed definitive management of postoperative gallstone pancreatitis. J Minim Access Surg 10: 48-50.

9. Røsok BI, Edwin B (2011) Single-Incision Laparoscopic Liver Resection for Colorectal Metastasis through Stoma Site at Time of Reversal of Diversion Ileostomy: A Case Report. Minim Invasive Surg 1: 502176.