Value of Routine Colonic Evaluation Prior To Ileostomy Closure

Nir Horesh MD, Aviad Hoffman MD, Yaniv Zager MD, Mordechai Cordoba MD, Marat Haikin MD, Danny Rosin MD, Mordechai Gutman MD and Alexander Lebedeyev MD

Department of Surgery and Transplantation, Sheba Medical Center, Tel Hashomer, affiliated with the Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

ABSTRACT: **Background:** Evaluation of low rectal anastomosis is often recommended prior to ostomy closure, but the efficacy of such evaluations is uncertain.

Objectives: To assess whether routine colonic preoperative evaluation has an effect on postoperative ileostomy closure results.

Methods: We performed a retrospective study evaluating all patients who underwent ileostomy closure over 9 years. Patient demographics, clinical, surgical details, and surgical outcomes were recorded and analyzed.

Results: The study comprised 116 patients who underwent ileostomy closure, of them 65 were male (56%) with a mean age of 61 years (range 20–91). Overall, 98 patients (84.4%) underwent colonic preoperative evaluation prior to ileostomy closure. A contrast enema was performed on 61 patients (62.2%). Abnormal preoperative results were observed in 12 patients (12.2%). The overall complication rate was 35.3% (41 patients). No differences in postoperative outcome was observed in patient gender (P = 1), age (P = 0.96), body mass index (P = 0.24), American Society of Anesthesiologists score (P = 0.21), and the Charlson Comorbidity Index score (P = 0.93). Among patients who had postoperative complications, we did not observe a difference between patients who underwent preoperative evaluation compared to those who did not (P = 0.42). No differences were observed among patients with preoperative findings interpreted as normal or abnormal (P = 1). The time difference between ileostomy creation and closure had no effect on the ileostomy closure outcome (P = 0.34).

Conclusions: Abnormal findings in preoperative colonic evaluation prior to ileostomy closure were not associated with worse postoperative outcome.

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KEY WORDS: colonoscopy, contrast enema, ileostomy, postoperative complications, preoperative evaluation

Fecal diversion is a common surgical technique used both in emergency and elective surgical procedures [1]. The most common ileostomy is in the form of a loop, used for fecal diversion mainly in patients undergoing colorectal procedures with low anastomosis placed in the deep pelvis [2]. The increased leak rate and the difficult access in case of an anastomotic leak, causes surgeons to divert the fecal stream for improved recovery and anastomosis protection [3]. Following recovery and after completion of oncological treatments, restoration of bowel continuity is usually performed, and the ileostomy is closed, preferably at least 3 months from the surgical creation of the ileostomy [4].

The timing of bowel continuity restoration can vary among patients. Most surgeons prefer to wait a few months prior to ileostomy closure, despite growing debate about the feasibility of an early ileostomy closure in selected patients [5]. Several factors determine the timing of ileostomy closure, including oncological status, the clinical condition of the patient, and most importantly, the integrity of the low pelvic anastomosis [6]. There are several methods to examine the integrity. The methods include a physical examination, a rectal digital exam, endoscopic evaluation, and radiologic studies, such as gastrografin enemas, and computed tomography (CT) [7].

Following recovery from the index surgery, many surgeons advocate for anastomotic and colonic evaluation prior to ileostomy closure [8]. Abnormal preoperative findings can delay ostomy closure significantly, leaving the patient prone to ostomy complications, including electrolyte loss and dehydration often requiring hospital admission (9). In addition, it has been long established that patients with ostomies report lower quality of life due to ostomy related issues, both physical and mental. Close to 50% of the patients with an ostomy have some degree of depression, anxiety, and a reduction in pleasurable activities [10]. Conversely, many surgeons fear that an abnormal anastomosis, quiescent due to the fecal diversion, will cause patients to have significant suffering once bowel continuity is restored after the ostomy is reversed [11].

There are conflicting results in the literature regarding the value of studies used to evaluate surgical outcome following ostomy closure. Therefore, using our clinical experience at a large tertiary medical center, we examined whether routine preoperative evaluation plays a role in the postoperative outcome following ileostomy closure.

PATIENTS AND METHODS

The study was approved by the local institutional review board prior to collection of data.

This retrospective study comprised all patients who underwent rectal resection and anastomosis with a protective ileostomy that was reversed with restoration of bowel continuity, in our tertiary medical center between January 2009 and January 2018. Medical files were reviewed for demographic, pre-surgical, oncological, operative data, and postoperative course and complications. Admission data, length of stay in the hospital, and re-admissions were also recorded and analyzed. Postoperative complications were analyzed based on the Clavien-Dindo score, which is used to classify surgical complications based on their severity and the level of intervention they require. The cohort was divided into two groups according to whether they underwent preoperative evaluation of the low anastomosis prior to ileostomy closure or not. We analyzed the outcomes based on the groups and on preoperative evaluation results.

STATISTICAL ANALYSIS

Qualitative variables were compared using Fisher's exact test or the chi-square test and quantitative variables were compared using Student's *t*-test. A *P* value of < 0.05 was considered significant. Statistical analyses were performed by using SAS/STAT for Windows version 9.4 (SAS Institute Inc., Cary, NC, USA).

RESULTS

During the study period, 116 patients underwent ileostomy closure, 65 were males (56%) with a mean age of 61 years (range 20–91 years). Patient demographics are detailed in Table 1. In all patients the cause for creating an ileostomy was protection of a low pelvic anastomosis by diverting the fecal stream. Loop ileostomies were performed on 95 patients (81.9%). A neoplastic cause was the reason 82 patients (70.7%) underwent ileostomy. Oncological treatments were performed on 51 patients (44%) prior to ileostomy creation and 46 patients (39.7%) following ileostomy creation. The clinical and surgical data are detailed in Table 2. Mean time from ileostomy creation to bowel continuity restoration and ileostomy closure was 304.77 days (range 31–1773 days). Mean patient follow-up period was 4.13 years (20–3614 days).

Overall, 98 patients (84.4%) underwent preoperative colonic evaluation prior to ileostomy closure and restoration of bowel continuity. The majority of patients (61 patients, 62.2%) underwent gastrografin enemas, 16 patients (16.3%) were evaluated using computerized tomography, 9 patients (9.1%) underwent both CT and gastrografin enema, 8 patients (6.8%) underwent endoscopy (either rectoscopy or full colonoscopy), and 4 patients (4%) underwent endoscopy and gastrografin enema.

An abnormal study result was observed in 12 patients (12.2%). Abnormal findings included 4 patients with a suspected fistula, 4 patients with a contrast leak, 2 patients with anastomotic stenosis, and 2 patients with diversion colitis.

Table 1. Patient demographics

		Mean
Gender (Male/Female)	65/51	
Age, years	20–91	61
Body mass index	17.8–46.2	0.266
Charlson co-morbidity index score	0–9	4.3
ASA score	1–4	2.3
Smoker, Yes/No	15/101	

ASA = American Society of Anesthesiologists

Table 2. Clinical and surgical data

	Number	%
Ileostomy Type		
Loop ileostomy	95	81.9%
End ileostomy	10	8.6%
Double barrel	11	9.5%
Cause for ileostomy creation		
Neoplastic	82	70.7%
Non-Neoplastic	34	39.3%
Diverticular disease	4	
Anastomotic leak	11	
Trauma	1	
Inflammatory bowel disease	6	
Ischemic colitis	2	
Perforation following colonoscopy	2	
Other	8	
Oncological treatment prior to ileostomy creation	51	44%
Radiation therapy	15	
Chemotherapy	6	
Combined chemoradiation	30	
Oncological treatment after ileostomy creation	46	39.7%
Radiation therapy	12	
Chemotherapy	29	
Combined chemoradiation	5	

Of the group of patients with abnormal findings, 8 patients underwent surgery despite the radiologic and/or endoscopic findings, as these abnormal findings were considered clinically irrelevant. Two patients underwent further evaluation that contradicted the abnormal findings of the first study performed, and 2 patients with suspected strictures underwent endoscopic dilatations prior to ileostomy closure.

Following ileostomy closure, postoperative complications were observed in 41 patients (35.3%) and classification based on the Clavien-Dindo score showed 29 minor (grade 1–2) complications (25%) and 10 major complications (grade 3a–4b) (8.6%). Following ileostomy reversal, 2 patients died (1.7%) due to severe cardiovascular events following surgery, without evidence of sepsis as the trigger.

Analysis of postoperative outcome was based on patient clinical and demographic data. Patient gender ($P = 1$), patient age ($P = 0.96$), body mass index ($P = 0.24$), American Society of Anesthesiologists score ($P = 0.21$), active smoking ($P = 0.77$), and Charlson Comorbidity Index score ($P = 0.93$) showed no differences among patients who had postoperative complications following ileostomy closure and those who did not. The

correlations between demographic data and postoperative outcome are detailed in Table 3.

Analysis based on postoperative outcome including complications showed no significant difference between the group of patients who underwent preoperative colonic evaluation and those who did not (33 patients, 33.6% vs. 8 patients, 44.4%, $P < 0.42$). In addition, analysis of patients with abnormal findings (12 patients, 12.2%) compared to patients with normal preoperative findings (86 patients, 87.8%) did not show a difference in postoperative outcome ($P = 1$). Furthermore, analysis of patients who underwent ileostomy closure and suffered from postoperative complications directly related to anastomotic dehiscence (5 patients had an anastomotic leak, 3 patients had intra-abdominal abscess, 6 patients did not have an abnormal study, and 2 patients did not perform preoperative evaluations prior to ileostomy closure). Non-neoplastic cause for ileostomy creation was associated with increased postoperative complication rate ($P < 0.01$). Additional analysis of patient outcome was performed based on whether the patients received oncological treatment prior to or after ileostomy creation. Oncological treatment before ($P = 0.7$) or after ($P = 0.07$) ileostomy creation were not associated with increased postoperative complications.

We analyzed whether the time difference from ileostomy creation to restoration of bowel continuity was correlated with postoperative outcome. Despite a difference in the time interval among patients who developed postoperative complications (271.6 days) and those who did not (322.9 days), the difference was not statistically significant ($P = 0.34$). In addition, there was no significant difference between patients, with neoplastic cause as the reason for creating an ileostomy, who underwent preoperative colonic evaluation prior to ileostomy closure or not ($P = 0.56$) and whether this evaluation was found to be abnormal ($P = 0.23$). The main study outcomes are listed in Table 4.

Table 3. Correlation between demographic data and postoperative outcome

	No postoperative complications (n=75)	Postoperative complications (n=41)	*P* value
Gender Male/Female	42/33 (56%/44%)	23/18 (56.1%/43.9%)	1
Age, in years, mean ± SD	60.95 ± 15.06	61.07 ± 13.8	0.96
Body mass index, mean ± SD, kg/m^2 ASA score, mean ± SD	26.2 ± 3.99 2.23 ± 0.71	27.1 ± 4.67 2.39 ± 0.63	0.24 0.21
Active smoking Yes/No	9/67 ± 12%/88%	6/35 ± 14.6%/85.4%	0.77
Charlson score, mean ± SD	4.29 ± 2.97	4.34 ± 2.75	0.93

ASA = American Society of Anesthesiologists, SD = standard deviation

Table 4. Correlation between oncological data and postoperative outcome

	No postoperative complications (n=75)	Postoperative complications (n=41)	*P* value
Cause for ileostomy creation Neoplasia / Non-neoplasia	59/16 (78.6%/21.4%)	23/18 (56%/44%)	0.01
Oncological treatment prior to ileostomy creation Yes / No	34/41 (45.3%/54.7%)	17/24 (41.4%/58.6%)	0.7
Oncological treatment after ileostomy creation Yes / No	25/50 (33.3%/66.7%)	21/20 (51.2%/48.8%)	0.07
Time difference between ileostomy creation and ileostomy closure mean ± SD	322.9 days ± 318.4	271.6 days ± 173.86	0.34

SD = standard deviation

DISCUSSION

Diverting ileostomies are performed to reduce postoperative co-morbidities due to a colonic anastomotic leak [12]. These ostomies, specifically diverting loop ileostomies [13], have a significant impact effect on the quality of life. Despite this outcome, they are often the procedure of choice as a temporary measure due to a relatively simple reversal procedure that commonly does not involve significant violation of the abdominal cavity to restore bowel continuity [14]. In many patients, diverting ileostomies are performed as a routine part of a larger colorectal resection, allowing low pelvic anastomosis to heal with a significantly reduced microbial load in the anastomosed bowel [15]. As there is no clinical evidence for the functionality of the pelvic anastomosis it is acceptable to perform a preoperative study to evaluate its integrity. Many surgeons evaluate the anastomosis prior to restoration of bowel continuity with closure of the ileostomy [16]. Most surgeons use contrast enema studies as the primary diagnostic tool to evaluate the anastomosis prior to reversal [17]. Other methods include endoscopy and/or computerized tomography, with or without rectal contrast.

There is an ongoing debate regarding the clinical significance and results of abnormal radiological studies, caused by an abnormal anastomotic healing process. Hrung et al. [9] examined 39 patients who underwent a routine preoperative contrast enema finding clinically silent leaks in 3 patients (8%), delaying their ileostomy closure and suggesting that contrast studies play an important role in determining postoperative outcome. Khair and colleagues [16] reviewed 69 patients who underwent gastrografin enema prior to ileostomy closure. In their study, 4 patients (5.8%) presented with a positive leak test. Of these, 2 underwent a repeat gastrografin enema that denied an anastomotic leak and 2 underwent ileostomy closure despite the positive test, with no complications. Lim et al. [19] examined 138 patients who underwent low rectal anastomotic procedures with a routine water soluble contrast enema. They found 13 patients (9%) with a radiologically evident leak and 10 patients (8%) with a subclinical leak, demonstrating that all patients with a subclinical leak and some of the patients with an evident radiologic leak can undergo ileostomy closure without significant complications. In a meta-analysis, Habib and colleagues [17] found 1142 contrast enemas with an occult radiological leak rate of 5.7%, which demonstrated that contrast enemas are effective at excluding clinically significant anastomotic problems, but also that false positive results can

be observed in asymptomatic patients, without an effect on reversal outcomes [18].

These contradicting results and recommendations are the basis for this study, in which we examined, from our own clinical experience in a large tertiary medical center, whether routine preoperative colonic evaluation plays a role in the postoperative outcome following ileostomy closure. Our study found no significant difference in postoperative outcomes between patients who underwent preoperative colonic evaluation and patients who did not ($P = 0.42$). However, our study did not show any linkage between abnormal preoperative colonic evaluation and postoperative outcome ($P = 1$), contradicting the assumption that an abnormal preoperative study increases the risk for postoperative complications. Moreover, the results of our study demonstrated no relation between timing of ileostomy closure, oncological treatment prior or after ileostomy closure, to postoperative complication rate.

LIMITATIONS

The main drawbacks of our study are its retrospective nature and the heterogeneous study population including patients operated on for various causes. In addition, we did not analyze patients that remained with an ileostomy during the same time period. Nonetheless, this study is important mainly due to the relatively large cohort and the analysis of additional factors possibly related to the link between preoperative factors and postoperative outcome following ileostomy closure.

CONCLUSIONS

In our series, minimal and clinically silent abnormal findings in preoperative colonic evaluation prior to ileostomy closure were not associated with worse postoperative outcome. Further studies are needed to establish which patients should undergo preoperative evaluation.

Correspondence
Dr. N. Horesh
Dept. of Surgery and Transplantation B, Sheba Medical Center, Tel Hashomer, 52621, Israel
Fax: (972-3) 530-2316, **email:** nir_horesh@hotmail.com

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Capsule

Autoimmunity shows its CARDs

Both the adaptor protein CARD9 and loss of the kinase Lyn are associated with autoimmune disease, notably colitis and inflammatory bowel disease. **Ma** et al. found in mice that CARD9 amplified Toll-like receptor signaling and cytokine production in Lyn-deficient dendritic cells but not macrophages. Deleting the *Card*9 gene or genes encoding Src-family kinases in dendritic cells prevented the development of Lyn deficiency–associated colitis in mice. Targeting CARD9 or its associated kinases may be a way to relieve inflammation in patients with autoimmune disease.

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Eitan Israeli