

Complications after Loop Ileostomy Closure: A Retrospective Analysis of 132 Patients

Eligijus Poskus^{a,b} Edvinas Kildusis^{a,b} Edgaras Smolskas^a Marijus Ambrazevicius^b
Kestutis Strupas^{a,b}

^a Faculty of Medicine, Vilnius University, Vilnius, Lithuania

^b Center of Abdominal Surgery, Vilnius University Hospital ‘Santariskiu Klinikos’, Vilnius University, Vilnius, Lithuania

Keywords

Loop ileostomy · Closure of ileostomy · Postoperative complications

Schlüsselwörter

Protektives Ileostoma · Ileostoma-Verschluss · Postoperative Komplikationen

Summary

Background: Closure of a loop ileostomy is a relatively simple procedure although many studies have demonstrated high morbidity rates following it. Methods to reduce the number of complications, such as timing of closure or different surgical closure techniques, are investigated. The aim of this study was to evaluate the experience of the Abdominal Surgery Center at Vilnius University Hospital (VUH) ‘Santariskiu klinikos’ to review the complications after closure of loop ileostomy and to identify potential risk factors for postoperative complications. **Methods:** Data from 132 patients who underwent closure of loop ileostomy from 2003 to 2013 at the Abdominal Surgery Center of VUH were collected, including demographics, causes of ileostomy formation, additional diseases, time from creation to closure of ileostomy, anastomotic technique, duration of the operation, postoperative complications, and hospital stay after surgery. The operations were performed by 15 surgeons with varying experience assisted by surgical residents. Experience in ileostomy closure was defined by the number of procedures performed. **Results:** Complications occurred in 24 patients (18.2%), with 20 of them having surgical complications: bowel obstruction (9 (6.8%)), wound infection (4 (3.0%)), peritonitis due to anastomotic leak (3 (2.3%)), intra-abdominal abscess (2 (1.5%)), anastomotic leak with enterocutaneous fistula (1 (0.76%)), and bleeding (1 (0.76%)). 4 patients had non-surgical complications: postoperative diarrhea (2 (1.5%)), urinary retention (1 (0.76%)), and deep vein thrombosis (1 (0.76%)). Most complications were classified as group II according to the Clavien-Dindo classification. 2 patients died (1.5%). The anastomotic technique used did not affect the outcome. The experience of the surgeon as judged by the frequency of the procedure was the main factor affecting postoperative morbidity significantly ($p = 0.03$). **Conclusion:** Our study revealed that the rate of postoperative complications and a smooth postoperative course after the closure of ileostomy was influenced by surgical experience.

Zusammenfassung

Hintergrund: Der Verschluss eines protektiven Ileostomas ist ein relativ einfaches Verfahren, wenngleich viele Studien hohe nachfolgende Morbiditätsraten aufzeigen konnten. Die Methoden zur Verringerung der Anzahl an Komplikationen, wie z.B. zeitliche Planung des Verschlusses oder verschiedene chirurgische Verschlussstechniken, werden untersucht. Das Ziel dieser Studie war es, die Erfahrungen des Abdominal Surgery Center am Vilnius University Hospital (VUH) «Santariskiu klinikos» zu evaluieren, um die Komplikationen nach Verschluss eines protektiven Ileostomas darzustellen sowie die potenziellen Risikofaktoren für postoperative Komplikationen zu identifizieren. **Methoden:** Die Daten von 132 Patienten wurden gesammelt, die zwischen 2003 und 2013 mit einem Verschluss eines protektiven Ileostomas im Abdominal Surgery Center des VUH versorgt worden waren. Hierzu gehörten auch die Demografie, Ursachen für die Ileostoma-Bildung, zusätzliche Erkrankungen, die Zeit von der Anlage bis zum Ileostoma-Verschluss, die Anastomosentechnik, die Dauer der Operation, postoperative Komplikationen und der Krankenhausaufenthalt nach dem Eingriff. Die Operationen wurden von 15 Chirurgen mit unterschiedlichem Erfahrungsgrad, unterstützt von chirurgischen Assistenzärzten, durchgeführt. Expertise im Ileostoma-Verschluss wurde anhand der Anzahl der durchgeführten Eingriffe definiert. **Ergebnisse:** Komplikationen traten bei 24 Patienten (18,2%) auf. 20 von ihnen hatten chirurgische Komplikationen: Darmverschluss (9 (6,8%)), Wundinfektion (4 (3,0%)), Peritonitis infolge von Anastomoseninsuffizienz (3 (2,3%)), intraabdominaler Abszess (2 (1,5%)), Anastomoseninsuffizienz mit enterokutaner Fistel (1 (0,76%)) und Blutungen (1 (0,76%)). 4 Patienten hatten nichtchirurgische Komplikationen: postoperative Diarrhö (2 (1,5%)), Harnretention (1 (0,76%)) und tiefe Venenthrombose (1 (0,76%)). Die meisten Komplikationen wurden der Gruppe II gemäß der Clavien-Dindo-Klassifikation zugeordnet. 2 Patienten verstarben (1,5%). Die verwendete Anastomosentechnik hatte keinen Einfluss auf das Resultat. In signifikanter Weise hauptverantwortlich für die postoperative Morbidität (0,03) war die Erfahrung des Chirurgen, die auf Basis der Anzahl der durchgeführten Eingriffe bestimmt wurde. **Schlussfolgerung:** Unsere Studie zeigte, dass die Rate der postoperativen Komplikationen und des reibungslosen postoperativen Verlaufs nach Ileostomie-Verschluss von der chirurgischen Erfahrung beeinflusst wird.

Background

Loop ileostomies are generally formed in colorectal surgery in order to defunction distal enteric disease or anastomoses [1, 2]. Diverting loop ileostomy is useful for reduction of the consequences of an anastomotic leak and is considered by some authors to reduce the incidence of anastomotic complications [3]. Although the mortality rate after the reversal of ileostomy is 0.1–4% [4–6], wound infection and small bowel obstruction remain the most common and irritating complications [6, 7]. In particular, complications increase medical costs, prolong hospitalization time, and increase the need for outpatient care as well as the risk of late complications such as incisional hernia. The aim of our retrospective analysis was to assess the experience of the Abdominal Surgery Center, Vilnius University Hospital (VUH) ‘Santariskiu klinikos’, in order to identify potential risk factors of a complicated postoperative course and to review the complications of loop ileostomy closure.

Patients and Methods

This is a retrospective analysis of 132 patients who underwent reversal of loop ileostomy under the care of any one of 15 surgeons in the Abdominal Surgery Center, VUH ‘Santariskiu klinikos’, during the period from 2003 to 2013. Those patients who underwent additional procedures during the closure of ileostomy were excluded from the study. The data was extracted from medical records on demographics, causes of ileostomy formation, additional diseases, time from creation to closure of ileostomy, anastomotic technique, duration of operation, postoperative complications, and length of stay after the surgery. The operations were performed by 15 surgeons with varying experience assisted by surgical residents. Experience in ileostomy closure was defined by the number of procedures performed.

Closure of the loop ileostomy was carried out under general anesthesia. Systematic prophylactic antibiotics (cefuroxime 1.5 g and metronidazole 0.5 g) were administered to all patients prior to the operation. Hand-sewn anastomosis without a short small bowel resection was performed by mobilizing the small bowel as much as needed for closing the stoma. The skin edges of the stoma were excised. In hand-sewn anastomosis with a short small bowel resection, the small intestine was mobilized from the abdominal wall in similar fashion and the exteriorized stomal part was resected. The abdominal wall was closed using continuous suture for the anterior fascia with 2–0 PDS® (Ethicon Endo-Surgery (Europe) GmbH, Norderstedt, Germany). The complications were assessed within the first 30 days after surgery. Postoperative deaths were defined as deaths within 30 days of the procedure or during the same hospital stay. The time period from ileostomy creation to closure was greater than 10 days in all cases (range 33–1,078 days).

The statistical analysis was performed with SPSS 20.0. Assuming that data were not normally distributed, non-parametric testing was performed. Pearson’s chi-square, Fisher exact test, and the Mann-Whitney U analysis were used; results are presented as median values with interquartile range (IQR) in parentheses. $P < 0.05$ was considered as statistically significant.

Results

A total of 132 patients who underwent reversal of loop ileostomy during the 10-year period were included. There were

Table 1. Distribution of the surgical complications according to the Clavien-Dindo classification

	n	% of total
I	2	1.5
II	11	8.3
III	5	3.8
IV	0	0
V	2	1.5
No complications	112	84.8

Table 2. Distribution of patients according to primary pathology

Pathology	n	Complications
Colorectal cancer	97	16 (16.5%)
Colon fistula	8	2 (25%)
Gynecological cancer	4	0 (0%)
Necrotizing pancreatitis	3	1 (33.3%)
Diverticulitis	3	1 (33.3%)
Small bowel perforation	3	0 (0%)
Recto-perineal fistula	1	1 (100%)
Non-specific ulcerative colitis	1	0 (0%)
Multiple rectal adenomas	1	0 (0%)
Other causes	7	3 (42.9%)
Unknown causes	4	2 (50%)
<i>Total</i>	<i>132</i>	<i>26 (19.7)</i>
<i>Benign</i>	<i>31</i>	<i>10 (32.3)^a</i>
<i>Malignant</i>	<i>101</i>	<i>16 (15.8)</i>

^a $p = 0.044$

47 (35.6%) females and 85 (64.4%) males, with a median age of 61.5 years (IQR = 52.75–70 years). Neither the age of patients nor gender affected the outcome ($p > 0.05$). 9 patients (6.82%) had diabetes mellitus, 3 of them had postoperative complications, and 2 (1.52%) showed anemia, of whom neither had complications, and none of the patients had renal insufficiency. The most common primary diagnosis was colorectal cancer (97 patients (73.5%)). A total of 101 patients had their ileostomies created as part of surgery for malignancy and 31 for benign pathology of which the majority was colon fistula.

The most experienced surgeon, defined by the number of ileostomy closures, performed 41 (31%) of the procedures, whereas the rest of the surgeons completed a median of 5 ileostomy closures (IQR 3–7).

Complications occurred in 24 patients (18.2%), with 20 of them having the following surgical complications: bowel obstruction (9 (6.8%)), wound infection (4 (3.0%)), peritonitis due to anastomotic leak (3 (2.3%)), intra-abdominal abscess (2 (1.5%)), anastomotic leak with enterocutaneous fistula (1 (0.76%)), and bleeding (1 (0.76%)). 4 patients had non-surgical complications: postoperative diarrhea (2 (1.5%)), urinary retention (1 (0.76%)), and deep vein thrombosis (1 (0.76%)). For 20 patients with postoperative complications, conservative treatment was sufficient; however, 4 (3.0%) patients re-

Table 3. Variables related to closure procedure

	Ileostomy closure			Surgeons		
	without spout resection (n = 45)	with spout resection (n = 87)	p	experienced (n = 41)	other (n = 91)	p
Surgical complications	5 (11.1%)	15 (17.2%)	>0.05	2 (4.9%)	18 (19.8%)	0.03
Bowel obstruction	3 (6.7%)	6 (6.9%)	>0.05	2 (4.9%)	7 (7.7%)	>0.05
Wound infection	0	4 (4.6%)	>0.05	0	4 (4.4%)	>0.05
Anastomotic leak with peritonitis	0	3 (3.4%)	>0.05	0	3 (3.3%)	>0.05
Anastomotic leak with enterocutaneous fistula	1 (2.2%)	0	>0.05	0	1 (1.1%)	>0.05
Intra-abdominal abscess	1 (2.2%)	1 (1.1%)	>0.05	0	2 (2.2%)	>0.05
Bleeding	0	1 (1.1%)	>0.05	0	1 (1.1%)	>0.05
Clavien-Dindo classification						
I	1 (2.2%)	1 (1.1%)	>0.05	0	2 (2.2%)	>0.05
II	3 (6.7%)	8 (9.2%)	>0.05	1 (2.4%)	10 (10.9%)	>0.05
III	1 (2.2%)	4 (4.6%)	>0.05	1 (2.4%)	4 (4.4%)	>0.05
IV	0	0		0	0	
V	0	2 (2.3%)	>0.05	0	2 (2.2%)	>0.05

Table 4. Distribution of the complications by the time from creation of ileostomy to closure and operation time

	N	Complications
Time from creation to closure, weeks ^a		
<12	41	7 (17.1%)
≥12 and ≤24	51	12 (23.5%)
>24	40	7 (17.5%)
Operation time, min ^b		
30–59	40	6 (15.0%)
60–89	60	14 (23.3%)
>89	32	6 (18.8%)

^ap = 0.679.
^bp = 0.583.

quired reoperation. There were 2 (1.5%) postoperative deaths: 1 patient died due to pulmonary embolism; the other death was caused by sepsis secondary to anastomotic leak and multiple organ dysfunction syndrome. Surgical complications (n = 20) were divided into groups using the Clavien-Dindo classification of complications (table 1). Most complications were rated as group II according to this classification.

The effect of primary pathology on complications is shown in table 2. Malignancy was associated with a statistically significantly lower complication rate after closure compared to benign pathology (p = 0.044).

Table 3 demonstrates the effect of variables related to the closure itself. 45 (34.1%) ileostomy closure operations were performed without spout resection and 87 (65.9%) with resection. The anastomotic technique (with or without spout resection) did not affect the outcome.

There was a significant variation of the complication rate among surgeons performing the ileostomy closure: one of

the surgeons, who performed 41 (31%) of the procedures, had a surgical complication rate of 4.9% in contrast to the remaining 14 surgeons where complications occurred in 18 of 91 cases (19.8%, p = 0.03). There were more wound infections (4 vs. 0), anastomotic leaks with peritonitis (3 vs. 0) and enterocutaneous fistula (1 vs. 0), intra-abdominal abscesses (2 vs. 0), and bleeding (1 vs. 0) in the less experienced surgeon group. The surgeon with a lower complication rate performed more closures without spout resection, i.e. 27 of 41 (65.9%) vs. 18 of 91 cases (19.8%) (p < 0.0001).

The median time from creation of ileostomy to closure was 115.5 days (IQR = 69–186 days). The patients were divided into three groups based on the time from creation of ileostomy to closure: i) up to 12 weeks, ii) ≥12 and ≤24 weeks, and iii) >24 weeks. There was no statistically significant difference among the groups. The median length of the procedure was 65 min (IQR = 55–86.25 min). Based on the duration, operations were divided into three groups: group I included the operations that lasted from 30 to 59 min, group II those from 60 to 89 min, and group III those with more than 89 min. Again, no statistically significant difference was found (table 4).

Hospitalization after surgery ranged from 4 to 39 days (IQR = 6–9 days), and the median length of stay in hospital was 8 days. Predictably, the patients who experienced postoperative complications were treated longer in the hospital, i.e. 10.25 versus 7.15 days (p = 0.005).

Discussion

A low rectal anastomosis is associated with a substantial risk of leakage [8], and the consequences of anastomotic leakage are severe [6]. The creation of a temporary diverting loop

ileostomy is a surgical tool to divert stool after colorectal surgery, thereby defunctioning distal anastomosis and reducing the rate of pelvic sepsis [9, 10]. Furthermore, loop ileostomies are used in salvage surgery after a complication and as a palliative measure [11]. Despite the debate for routine use of an ileostomy [12], it is an effective method to protect pelvic anastomosis due to relative ease of the technical construction as well as reduction of the need for reoperation after anastomotic leakage [8, 13, 14]. However, the second operation, i.e. ileostomy closure, has its own potential risk of morbidity and mortality [8, 13, 14]. The overall complication rate worldwide ranges between 3 and 38.5%, with mortality ranging from 0 to 6.9% [6]. Unfortunately, these studies include heterogeneous patient groups which are analyzed using a variety of methods; this could explain the discrepancy between the rates of postoperative complications in our study and those cited above.

The three main surgical closure techniques that can be performed for the closure of loop ileostomy are enterotomy suture, resection, and hand-sewn or stapled anastomosis. Loop ileostomy construction and takedown is associated with a considerable incidence of morbidity, which is mostly minor [15]. Kaidar-Person et al. [7] reviewed 26 studies evaluating the complications of loop ileostomy closure and reported rates for wound infections of 0–18.3%, for small bowel obstruction of 0–15%, and for anastomotic leaks of 0–8%, while enterocutaneous fistula occurred in 0.5–7% of the patients. This data is compatible with our study [7]. A very small percentage of serious complications after ileostomy closure in this study suggests that the fear of complications should not deter surgeons from performing loop ileostomy.

The natural history of ileostomies for colonic disease is not well described [16]. It is often declared that reversal of a loop ileostomy is a simple and safe procedure. However, our review of the literature discovered studies which demonstrated high morbidity rates following loop ileostomy closure [6], and up to 1 in 5 patients will have a permanent stoma [11]. Naturally, the reversal of a temporary ileostomy has a low mortality but a non-negligible morbidity [10]. Nonetheless, studies exist which advocate the reversal of ileostomy as a daycase procedure [17], reducing the length and cost of hospitalization [18]. Ileostomy closure is associated with a low rate of serious, major grade III and IV complications according to Clavien-Dindo (5% or less) [14] and should be reserved for patients who have a predicted postoperative major complication rate of 5% or more without diversion [19].

Methods to reduce the rate of complications after loop ileostomy closure are also offered, e.g. distal limb irrigation techniques [12] and purse-string skin closure to reduce wound-related complications [20], although conventional linear skin closure (primary skin closure) is described in the literature as a safe and effective technique which avoids long healing times [21].

Some authors report that no statistically significant differences exist between techniques used for closure of the loop

ileostomies or the baseline pathology of the patient [15]; however, various randomized and non-randomized studies have shown that the rate of postoperative bowel obstruction is affected by the anastomotic technique [22]. Mobilizing the ileostomy spout and closing the enterotomy rather than resecting the spout and performing an anastomosis reduces the risk of postoperative small bowel obstruction as well as anastomotic leaks and shortens the operating time when performing a stapled side-to-side anastomosis rather than a sutured end-to-end anastomosis. Therefore, closure by enterotomy suture is preferred over resection and sutured anastomosis [14, 22, 23], whereas the latter may result in a significant increase in morbidity and mortality [24]. In our study, bowel obstruction occurred in 3 of 45 cases without spout resection and in 6 of 87 cases with spout resection ($p > 0.05$). This suggests that the operation technique had no influence on the incidence of postoperative bowel obstruction. However, it has to be emphasized that in most cases it is not a free decision between closure by enterotomy sutures or resection as the technique is dictated by the bowel condition after adhesiolysis.

In the literature, other significant risk factors for complications after ileostomy reversal are described, e.g. male gender and surgical site infections (independent risk factors for the development of wound infections) [4], longer time from creation to closure, operation for diverticular disease with significant peritoneal contamination [21, 24], age, race, type of ileostomy (end vs. loop) [10, 16], general condition of the patient [13], and small bowel resection [21]. In this study, the median time from creation to closure of the ileostomy was almost 4 months. The most likely reason for the delay was adjuvant chemotherapy. Nevertheless, the increased time from creation to closure of the stoma was not the significant risk factor in our study. Our data also suggest that operating time did not affect the complication rate.

The rate of postoperative complications was lower in the malignancy group. The benign disease group (necrotizing pancreatitis, colon fistula, diverticulitis, small bowel perforation) is associated with a higher incidence of adhesions and a difficult anatomy, therefore reducing the chance of safe ileostomy closure.

Some studies showed that an operation performed by trainees was not associated with an increased complication rate [25]. The results of this study indicate that less experience and practice of the surgeon as reflected by the frequency of the procedure is a statistically significant risk factor for complications ($p = 0.03$). The experienced surgeon, however, performed more ileostomy closures without spout resection. This can be explained by a more meticulous preparation technique allowing enterostomy closure in more cases than less experienced surgeons could realize. To maximize the benefit of creating the defunctioning stoma, the morbidity and mortality from the ileostomy takedown itself should be minimal.

Conclusion

In summary, our study revealed that the rate of postoperative complications and uneventful postoperative course after the closure of ileostomy was influenced by surgical experience. Another important finding was that complications occurred independently of sex, age, type of surgery, and timing of closure.

Disclosure Statement

No conflict of interest.

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