



Feasibility of Single-Port Reversal of Left-Sided Colostomy in the Presence of Incisional Hernia; Promising Results

© Yu-Ting van Loon¹, © Stefan H.E.M. Clermonts^{1,2}, © Daria K. Wasowicz¹, © Joos Heisterkamp¹, © David D.E. Zimmerman¹

¹Department of Surgery, Elisabeth – TweeSteden Hospital, Tilburg, The Netherlands

²Department of Surgery, Zuyderland Hospital, Heerlen and Sittard, the Netherlands

ABSTRACT

Aim: Stoma reversal in patients with concomitant abdominal wall defects can be cumbersome with the risk of many postoperative complications. Present study was conducted to evaluate feasibility and safety of single port restoration of left-sided colostomy in patients with concomitant incisional hernia.

Method: All patients with concomitant incisional hernia undergoing single-port reversal of left-sided colostomy between 2012 and 2020 were included. Primary outcomes were surgical success rate and 30-day postoperative complication rate. Secondary outcome was subsequent hernia repair after successful stoma reversal.

Results: Twelve patients were included for analysis. Single-port reversal was possible in five patients, conversion to open surgery was needed in one patient and conversion to multiport laparoscopy in six patients. There was no postoperative mortality, reoperations or anastomotic leakages. Seven patients (58%) encountered no postoperative complications, superficial surgical site infection occurred in four patients, pneumonia in one patient. Median postoperative stay was 4 (range 3-12) days. Two patients pursued hernia repair after successful stoma reversal.

Conclusion: Single-port reversal of left-sided colostomy is feasible and can be considered as an attractive alternative to open approach in patients with a colostomy and concomitant incisional hernia. It can be considered as a step-wise approach for future abdominal wall repair.

Keywords: Single-port, Hernia, Ventral/surgery, Incisional Hernia, Colostomy

Introduction

Hartmann's procedure is often used for surgical emergencies of colorectal, gynecological or vascular nature (1). Feared and common complications are superficial or deep site infections, wound dehiscence with subsequent laparostomy or incisional hernia, all resulting in significant morbidity and impaired quality of life. Repair of these hernias results in higher risk of postoperative complications due to the possibility of bacterial contamination (2, 3). Classic or laparoscopic stoma reversal in patients with incisional hernias cannot be performed without extensive adhesiolysis, which can be cumbersome and harbors the risk of advertent or inadvertent enterotomies, potentially resulting in enterocutaneous fistulas (4, 5). Moreover, possible contamination of prosthetic devices or dissection planes in case of mesh placement or component separation, makes simultaneous abdominal wall reconstruction unattractive due to increased infectious risks. A combined procedure with stoma reversal and complex hernia repair can result in a higher risk of anastomotic leakage (6). These considerations result in a high threshold for stoma reversal in those patients.

Recently, a novel application of the single-port laparoscopy access system was described. By inserting this device in the abdominal fenestration of the colostomy, stoma reversal can be performed minimally invasive in a safe and controlled manner with favorable results (7, 8). By utilizing this technique, adhesiolysis of the midline is unnecessary, therefore the stoma can be reversed without extensive mobilization or adhesiolysis and moreover, without the necessity of performing simultaneous repair of the ventral hernia. The present study was conducted to assess feasibility and safety of single port reversal of left-sided colostomy (SPRLC) in patients with concomitant incisional hernia. We postulate that SPRLC is feasible and safe in patients with a left-sided colostomy combined with a moderate to complex hernia.

Materials and Methods

All consecutive patients undergoing SPRLC between November 2012 and March 2020 were assessed for inclusion in the present study. During this period all stoma procedures of end colostomies were performed utilizing the single-port technique. All procedures were performed or supervised

Address for Correspondence/Yazışma Adresi: Yu-Ting van Loon, Department of Surgery, Elisabeth – TweeSteden Hospital, Tilburg, The Netherlands

Phone: +31610365629

Received/Geliş Tarihi: 29.02.2021 Accepted/Kabul Tarihi: 19.02.2021

by experienced colorectal surgeons or consultants with extensive skills in laparoscopy and minimally invasive surgery.

Inclusion criteria for this study were patients with a left-sided colostomy and concomitant incisional abdominal wall hernia undergoing SPRLC. Exclusion criteria were single-port reversal of right-sided (ascending) colostomy or ileostomy procedures.

The operative procedure of the SPRLC has been described in detail previously.⁷ In short, the colostomy was mobilized beyond the fascia into the abdomen and the anvil for the CDH29 circular stapler (Ethicon Endo-Surgery, Cincinnati, OH, USA) was placed in the descending colon before returning it to the abdominal cavity through the original colostomy site. A pneumoperitoneum was established after placement of the GelPOINT Path Access Platform (Applied Medical, Los Angeles, CA, USA). Where necessary, the splenic flexure or transverse colon was mobilized and adhesiolysis was performed under direct vision. Continuity was restored after adhesiolysis and proper visualization of the rectal stump with the use of the CDH 29 circular stapler. All wounds were closed intracutaneously.

All patients were treated within an established Enhanced Recovery After Surgery (ERAS) protocol. Patients were discharged from the hospital when they were able to tolerate normal food, pass stool, were able to mobilize at a level that was similar to preoperative levels of mobilization and had adequate control of pain with use of oral analgesia. Minimum follow up period consisted of 30 days postoperatively.

Patient characteristics (sex, age, body mass index), index surgery characteristics (reason for surgery and initial postoperative complications), surgical details (time interval between index surgery and SPRLC, duration of SPRLC and conversion) were collected using the electronic patient database.

Primary outcomes were surgical success rate defined as technical success rate of single-port approach for stoma reversal and 30-days postoperative complication rate. Postoperative complication was defined as infections (surgical site, intra-abdominal abscess), urogenital complications (urinary tract infection, urine retention), ileus or gastroparesis, pulmonary complications (pneumonia, exacerbation of COPD) and blood-related complications (rectal blood loss, thrombosis or hematoma in wound or anastomosis). Anastomotic leakage, reinterventions under local or general anesthesia and intensive care unit (ICU) admission were considered major complications in this analysis. Secondary outcome was subsequent hernia repair after SPRLC.

All patients gave informed consent during outpatient clinic counseling for SPRLC. Approval of the institutional review board or ethics committee was not required because of the observational character of this study. This report was prepared in concordance with the STROBE guidelines (<http://www.equator-network.org/reporting-guidelines/strobe/>).

Results

A total of the 105 patients underwent single-port reversal of continuity in Elisabeth-TweeSteden Hospital, Tilburg, the Netherlands. Of them, 93 patients did not meet the inclusion criteria, for more details see Figure 1. Twelve patients were included in the present study; 7 men and 5 women with a median age of 60.9 years (range 27.6-76.9), median body mass index of 29.0 kg/m² (range 22.7 - 61.1) and median and mean abdominal wall defect of 120 cm² and 173.6 cm² (range 49-450) respectively. Most common indications for index surgery were complicated diverticulitis and malignancy. The mean time between the index surgery and SPRLC is approximately two years, median time was 536 (range 190-2384) days. Overview of patient characteristics and surgical and postoperative outcomes can be found in Table 1 and 2.

Surgical Details

Of the 12 procedures, 42% (n=5) were technically successful by solely using the single port approach. Six patients needed additional placement of one or two 5mm trocar. Reasons for the extra trocar placement were needed for extensive laparoscopic adhesiolysis (n=5), mobilization of the splenic flexure (n=1) or for suture reinforcement of the anastomosis after positive air leak testing (n=1). Conversion to open midline laparotomy was needed in one patient due to iatrogenic injury to adhesive small bowel during placement of the single port device. All procedures were technically successful in restoring intestinal continuity. Mean duration of operation was 137 minutes (range 85-197), duration of operation was not recorded in one patient. See Figure 2 for photos of abdomen before and after SPRLC.

Postoperative Results

No 30-day postoperative mortality, reoperations or anastomotic leakage was encountered in these patients. Seven patients (58.3%) encountered no postoperative complications whatsoever within 30 days after surgery, five patients encountered one postoperative complication. Four patients (33.3%) developed a surgical site infection (SSI), all were treated conservatively by removing the sutures and regular wound dressings. One patient suffered from a major complication and needed ICU observation due to postoperative pneumonia and recovered without other postoperative adverse events. Median postoperative stay was 4.0 (range 2-16) days.

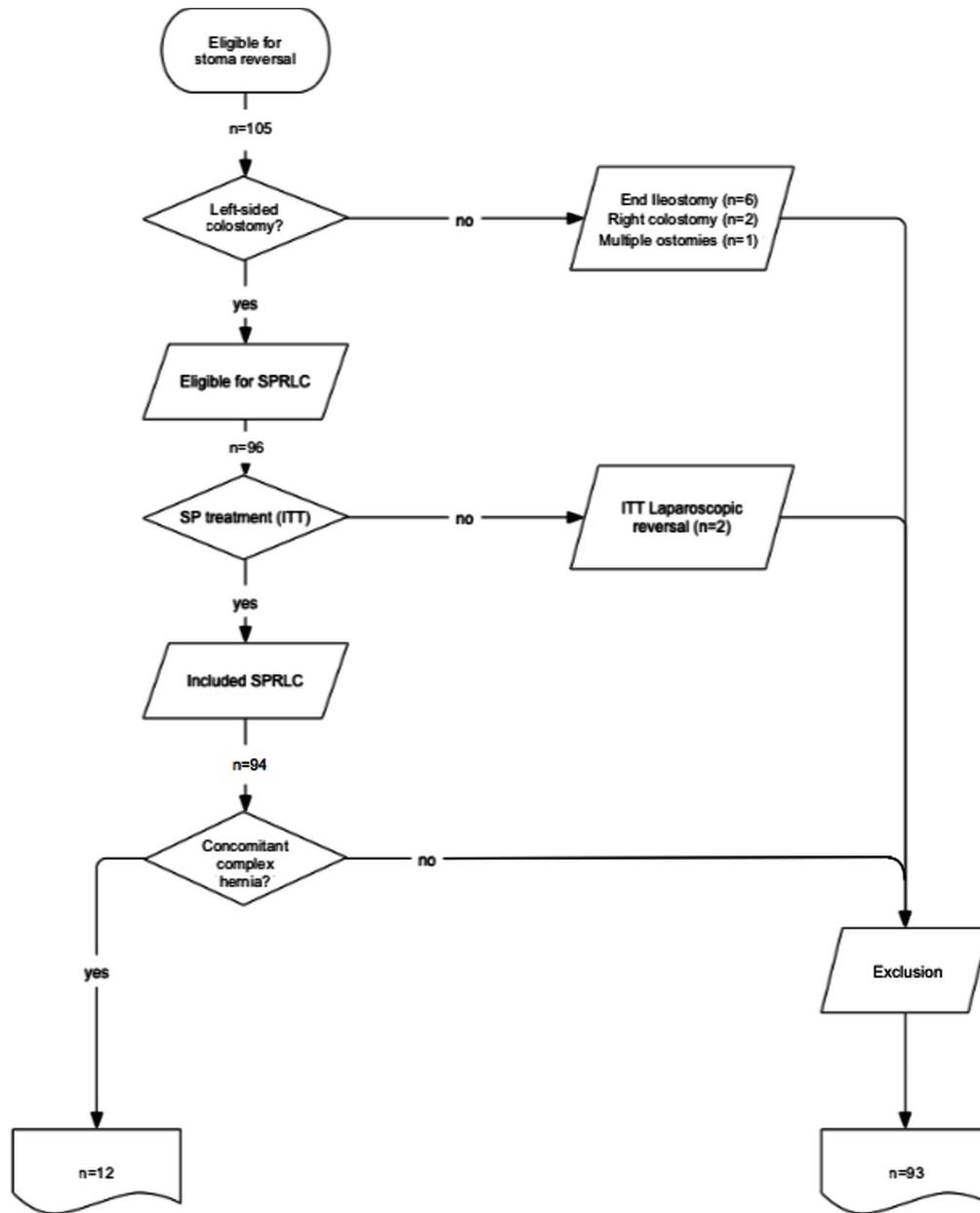
Hernia Repair

Two patients pursued abdominal wall reconstruction due to persisting symptoms of their incisional hernias and underwent abdominal wall repair after recovery from SPRLC. One patient died due to peritoneal metastases while considering hernia repair. Most of the other patients (n=7) reported to be satisfied with their abdomen and life after SPRLC. Two patients expressed their wish to pursue abdominal wall repair for purely cosmetic reasons without symptoms of their hernia, and therefore withheld from surgery. They declined abdominal wall reconstruction after counseling and shared decision making.

Discussion

This study shows that SPRLC is a feasible, safe and effective technique for stoma reversal in patients with a left-sided colostomy and a concomitant incisional hernia. Median length of stay is short with 4.0 days (range 2-16 days), there was no anastomotic leakage or need for reoperations or reinterventions. Postoperative complication rate was acceptable. Postoperative pneumonia was the only major complication in this study, which is considered inherent to intra-abdominal operations and not specifically linked to the use of the single-port approach. We believe that the minimally invasive character of these procedures resulted in the short postoperative length of stay and low postoperative morbidity. To the best of our knowledge, this is the first study evaluating the single-port approach reversing left-sided colostomy in patients with concomitant incisional hernia.

Upon reviewing available literature, reported postoperative complication rates of reversal of left-sided colostomies vary between 3 – 50% (4, 9, 10), most common complication is SSI in over 25% of the patients (11). Although no differences are found in postoperative mortality after laparoscopic or open reversal of left-sided colostomy (which can be up to 5%), laparoscopic approach results in lower postoperative minor and major complications such as SSI, cardiopulmonary complications, anastomotic leakage and need for reoperations (11). Furthermore, it is important to appreciate the difference in severity of SSI of the



SPRLC = Single-Port Reversal of Left-sided Colostomy, SP = Single-Port, ITT = Intention To Treat

former stoma fenestration, which is relatively small compared to SSI of a laparotomy wound. Moreover, SSI of laparotomy wound in the presence of prosthetic devices or after component separation can have catastrophic results.

Complex hernias have great impact on perceived quality of life (12) No investigations are available that show whether the presence of a hernia, the presence of a stoma, or the combination of the two are most bothersome. Many patients pursue repair, however, because of the high rates of postoperative morbidity, most surgeons are hesitant to offer restorative surgery. We found a surprising low rate of subsequent hernia repair after SPRLC in merely two patients so far. This may suggest that patients suffer more from the presence of the colostomy (albeit combined with the hernia) than from the hernia per se. This may be an interesting avenue for further research.

Complex hernias are challenging and difficult to repair – the optimal reconstructive strategy remains unclear (13). Some studies have



Figure 2. picture of a patient with a left-sided colostomy and complex hernia before SPRLC
SPRLC= Single-Port Reversal of Left-sided Colostomy

Table 1. Patient characteristics

Number	Sex (M/F)	BMI (kg/m ²)	Age* (years)	ASA class	Indication and type of index surgery	Year index surgery	Adverse events in initial postoperative course	Dimensions abdominal wall defect [@]
1	F	26.3	66.0	3	Malignancy, open left hemicolectomy	2012	Relaparotomy for anastomotic leakage	7 x 7 cm [#]
2	F	61.1	47.3	3	Complicated diverticulitis, open sigmoidectomy	2012	Relaparotomy for anastomotic leakage, superficial and deep SSI	30 x 15 cm [@]
3	F	25.1	61.1	3	Complicated diverticulitis, open sigmoidectomy	2013	Multiple relaparotomies for wound dehiscence	18 x 13 cm [#]
4	M	24.8	65.6	1	Sigmoidvolvulus, converted sigmoidectomy	2015	Relaparotomy for anastomotic leakage, superficial and deep SSI	15 x 8 cm [#]
5	M	30.2	61.8	3	Complicated diverticulitis, open Hartmann's Procedure	2015	Superficial SSI	10 x 10 cm [#]
6	M	22.7	76.9	2	Complicated diverticulitis, open sigmoidectomy	2013	Relaparotomy for anastomotic leakage, superficial and deep SSI	8 x 15 cm [#]
7	M	32.9	59.3	3	Endovascular Aorta Aneurysm Repair	2015	Laparotomy for sigmoid ischemia, superficial SSI	20 x 17 cm [@]
8	F	30.5	72.4	2	Complicated diverticulitis, laparoscopic sigmoidectomy	2018	Laparotomy for anastomotic leakage, superficial and deep SSI	18 x 15 cm [@]
9	M	31.5	56.3	2	Malignancy, converted left hemicolectomy with stoma	2013	Superficial SSI	11 x 10 cm [@]
10	F	27.8	60.8	2	Malignancy, open left hemicolectomy with stoma	2016	Relaparotomy for stoma revision	7 x 7 cm [@]
11	M	32.1	27.6	1	Complicated diverticulitis, laparoscopic lavage	2014	Relaparotomy for Hartmann's procedure	7 x 7 cm [@]
12	M	27.8	62.2	1	Open iliac aneurysm repair	2012	Relaparotomies for tromboembolism and sigmoid ischemia, superficial SSI	16 x 12 cm [@]

*Age at time of the single-port left-sided colostomy reversal

[@]Defect measured using CAT-scans

[#] Defect measured during physical examination

BMI = Body Mass Index, ASA class = American Society of Anesthesiologists Classification, SSI = Surgical Site Infection

shown that concomitant stoma reversal with hernia repair can result in unacceptable high rates of postoperative morbidity and increased length of hospital stay compared to patients without stoma reversal (6, 13). Either mesh infection or refraining from mesh enhancement might lead to higher recurrence rates and postoperative complications compared to two separate procedures. After successful stoma reversal, the abdominal wall can be restored with optimal mesh reinforcement without the possible risk of contamination. Therefore single-staged reversal of the complex hernia and stoma reversal might not be advised as primary choice of treatment.

We postulate that by using the single-port approach, stoma reversal is possible without dissection of the midline and therefore without the

necessity to repair the incisional hernia during the same procedure. SPRLC results in lesser adhesiolysis, shorter duration of the procedures and thus reducing the patients' surgical trauma. All these factors result in lower rates of postoperative morbidity compared to conventional open procedures (7, 8). After successful restoration of continuity, the patient can subsequently choose whether or not additional reconstruction of the abdominal wall is desirable, without the additional risk of the presence of the stoma or stoma reversal.

The small number of patients in this study is a major limitation. Neither were we able to compare our results to open stoma reversal procedures in patients with incisional hernia, also due to the very specific character

Table 2. Surgical and postoperative outcomes

Number	Sex (M/F)	Age at SPRLC	Year SPRLC	Days until SPRLC	Surgical time (min)	Extra 5mm trocar	Reason for extra trocar placement	LOS (days)	Postoperative complication	Calvien Dindo	Hernia repair after SPRLC
1	F	66.0	2014	760	85	1	Mobilisation splenic flexure	12	Pneumonia	4	No
2	F	47.3	2015	1193	91	1	Extensive adhesiolysis	4	Superficial SSI (stoma wound)	1	Yes
3	F	61.1	2017	1294	133	1	Extensive adhesiolysis, anastomosis suture reinforcement	5	No	-	No
4	M	65.6	2016	481	128	0	-	3	Superficial SSI (stoma wound)	1	No
5	M	61.8	2015	246	128	0	-	2	No	-	No
6	M	76.9	2014	255	-	0	-	5	No	-	No
7	M	59.3	2017	706	115	1	Extensive adhesiolysis, aiding visibility small pelvis	4	No	-	No
8	F	72.4	2019	359	163	1	Extensive adhesiolysis	3	No	-	No
9	M	56.3	2015	591	174	*	-	5	Superficial SSI (both wounds)	1	No
10	F	60.9	2017	331	197	0	-	3	No	-	No
11	M	27.6	2015	190	149	0	-	3	Superficial SSI (stoma wound)	1	No
12	M	56.9	2014	508	148	2	Extensive adhesiolysis	3	No	-	Yes

* Conversion to open

SSI = Surgical Site Infection

of this small subgroup of patients. In our opinion, open stoma reversal with or without hernia repair is not desirable and is not our primary approach. Our experience with open stoma reversal with concomitant repair of incisional hernia is therefore limited.

The results of this new technique show favorable results in postoperative complication rate and length of stay, thus lowering our threshold to offer this approach in our patients with a stoma combined with abdominal wall defects. We believe that the single-port approach is a feasible and effective solution for stoma reversal in patients with left-sided end colostomy with a complex hernia. SPRLC could be part of the staged treatment for patients with incisional hernia and colostomy and could be safely offered and performed by (colorectal) surgeons with sufficient laparoscopic experience. Further research should be done to evaluate the results in a larger cohort and to evaluate the applicability of this technique for the reversal of other types of stomas.

Conclusion

Single-port reversal of left-sided colostomy is feasible and can be considered as a serious and attractive alternative to an open approach in patients with a left-sided end colostomy in the presence of concomitant incisional hernia. It shows promising results in postoperative complication rate and length of stay and can be safely offered and performed by surgeons with sufficient laparoscopic experience.

References

1. Barbieux J, Plumereau F, Hamy A. Current indications for the Hartmann procedure. *J Visc Surg.* 2016;153(1):31-8.
2. Slater NJ, Montgomery A, Berrevoet F, et al. Criteria for definition of a complex abdominal wall hernia. *Hernia.* 2014;18(1):7-17.
3. Kanters AE, Krpata DM, Blatnik JA, et al. Modified hernia grading scale to stratify surgical site occurrence after open ventral hernia repairs. *J Am Coll Surg.* 2012;215(6):787-93.

4. Toro A, Ardiri A, Mannino M, et al. Laparoscopic Reversal of Hartmann's Procedure: State of the Art 20 Years after the First Reported Case. *Gastroenterol Res Pract*. 2014;2014:530140.
5. Lucchetta A, De Manzini N. Laparoscopic reversal of Hartmann procedure: is it safe and feasible? *Updates Surg*. 2016;68(1):105-10.
6. Baastrup NN, Hartwig MFS, Krarup PM, et al. Anastomotic Leakage After Stoma Reversal Combined with Incisional Hernia Repair. *World J Surg*. 2019;43(4):988-97.
7. Clermonts SH, de Ruijter WM, van Loon YT, et al. Reversal of Hartmann's procedure utilizing single-port laparoscopy: an attractive alternative to laparotomy. *Surg Endosc*. 2016;30(5):1894-901.
8. van Loon YT, Clermonts S, Wasowicz DK, et al. Reversal of left-sided colostomy utilizing single-port laparoscopy: single-center consolidation of a new technique. *Surg Endosc*. 2019.
9. van de Wall BJ, Draaisma WA, Schouten ES, et al. Conventional and laparoscopic reversal of the Hartmann procedure: a review of literature. *J Gastrointest Surg*. 2010;14(4):743-52.
10. Horesh N, Rudnicki Y, Dreznik Y, et al. Reversal of Hartmann's procedure: still a complicated operation. *Tech Coloproctol*. 2018;22(2):81-7.
11. Roig JV, Cantos M, Balciscueta Z, et al. Hartmann's operation: how often is it reversed and at what cost? A multicentre study. *Colorectal Dis*. 2011;13(12):e396-402.
12. van Ramshorst GH, Eker HH, Hop WC, et al. Impact of incisional hernia on health-related quality of life and body image: a prospective cohort study. *Am J Surg*. 2012;204(2):144-50.
13. Mericli AF, Garvey PB, Giordano S, et al. Abdominal Wall Reconstruction with Concomitant Ostomy-Associated Hernia Repair: Outcomes and Propensity Score Analysis. *J Am Coll Surg*. 2017;224(3):351-61 e2.