The Reversal of Stoma Following Open Abdomen Management

Fahri Yetişir¹ · AkgünEbru Şarer² · H. Zafer Acar³ · Erdinç Çiftçiler¹

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Abstract Bowel stoma formation is very often required during open abdomen (OA) management; we aim to report our stoma reversal series following OA management retrospectively. A retrospective analysis of 31 patients who underwent the reversal of the stoma created during OA management between January 2008 and September 2014 was performed. Twenty-eight of these 31 patients were included in this study. The stoma-related complications are more common after OA management during waiting time interval for reversal. At this time interval, patients with jejunostomy had more stoma-related complications than patients with ileostomy ($p=0.008$) and colostomy ($p=0.001$). Waiting time interval was shorter for reversal of jejunostomy than reversal of ileostomy ($p=0.014$) and colostomy ($p=0.001$). Operation time for jejunostomy ($p=0.016$) and colostomy reversal ($p=0.001$) were significantly longer than the ileostomy reversal. There was no difference between early and late reversal of stoma regarding morbidity and mortality. The stoma-related complications are more common following OA management during waiting time interval for stoma reversal. The reversal time is more critical for this kind of patients especially with life-threatening complicated jejunostomy. For loop stoma created during OA management, the reversal may be performed after average 50 days without increasing morbidity and mortality. The reversal of end stoma created during OA management has

high morbidity. If it is possible, loop stoma should be preferred during OA management.

Keywords Stoma reversal · Open abdomen · Stoma-related complication · Early reversal

Introduction

The creation of a stoma is a common procedure performed as a part of the treatment for lots of bowel surgeries. There is not only one type of stoma. The most common stoma classification can be done according to bowel part where they are created (jejunostomy, ileostomy, colostomy). They are also classified as end or loop ostomy. Stoma can be permanent or temporary and elective or part of emergent operations. Sometimes, it is performed as a part of challenging operations as well [1, 2]. More recent studies have shown stoma-related complication rates remain widely distributed, ranging from 10 to 82 % [2–4]. Complications associated with stomas can be minor, requiring only local care or can be devastating, leading to multiple reoperations and significant morbidity as well as mortality [2]. Complication rate of stoma increases, when reversal time of stoma is delayed. Reversal of the temporary stoma is the optimum solution of stoma-related complications and resulted in improvement in quality of life [5]. For temporary stoma, the reversal time is so important [1]. In old reports, reversal time more than 8 weeks was accepted for temporary ileostomy created during low anterior resection for rectum carcinoma. However, during this time, stoma-related complications occur in a quarter of patients, with adverse effects on quality of life [6, 7]. In the last four decades, it has been the subject of debate. It has been showed that early reversal within 1 month and even within 10 days can be done without increasing morbidity and mortality [8, 9].

✉ Fahri Yetişir
drfahriyetisir@hotmail.com

¹ General Surgery Department, Atatürk Research and Training Hospital, Ankara, Turkey

² Anesthesiology and Reanimation Department, Research and Training Hospital, Ankara, Turkey

³ General Surgery Department, Bozok University, Yozgat, Turkey

OA management is a life-saving and challenging strategy in situations such as the abdominal compartment syndrome (ACS), damage-control surgery in severe generalized peritonitis [10, 11]. During OA management, sometimes, stomas have to be created to overcome enteroatmospheric fistula (EAF), intra-abdominal sepsis, and distal bowel obstruction. These stomas which may be opened at anywhere of the bowel (from more proximal jejunum to sigmoid colon) are usually temporary. Since survival of OA patients are dramatically increased because of technological developments and improvements in OA management strategies, new questions arise after delayed closure of OA patients. The most important one of them is when the stoma created during OA management period should be reversed without any increase in morbidity and mortality in this very complicated group of patients.

According to our knowledge, there is no any comprehensive data about reversal of stoma created during OA management in literature; we therefore aim to report our stoma reversal series following OA management retrospectively.

Materials and Methods

A retrospective analysis of 31 patients who underwent the reversal of stoma created during OA management between January 2008 and September 2014 was done. Three of them were excluded from the study, two of them did not come to control, and the other one had insufficient data. Twenty-eight cases were included into the study. All data from the patients were retrieved from medical records and included in a database. Last control of all patients was done in December 2014. Written informed consent was obtained from all patients.

Analyzed variables were as follows: patients' demographics, the American Society of Anesthesiologists (ASA) classification for operative risk score, body mass index (BMI), type of stoma (jejunostomy, ileostomy, colostomy, with end or loop), waiting time interval for reversal (time interval between the end of the delayed abdominal closure and stoma reversal), stoma-related complications during this time interval, surgical technique employed, length of hospital stay, surgical complications after reversal, and mortality rate.

Surgical Technique

A contrast radiograph via stoma or endoscopic intervention was performed to all patients before stoma reversal, to assess the integrity of the distal bowel. Irrigation of the distal bowel was usually performed with 500–1000 cm³ saline 1 or 2 days before reversal. All reversal surgeries were performed under general anesthesia with antibiotic prophylaxis (ceftriaxone) prior to surgery by the same surgeon. Some stomas especially proximal jejunostomies have to be reversed earlier due to

stoma-related complications such as severe liquid and electrolyte imbalance, stoma prolapsus, and necrosis of stoma.

Loop stoma reversal Regarding reversal, a peristomal oval skin incision was performed around the stoma. End-to-end or side-to-side isoperistaltic anastomosis with resection by a hand-sewn or stapled anastomoses was performed. Double-barrel ostomy was also accepted as loop ostomy.

End stoma reversal Midline incision was used. The distal and proximal end of the bowel was visualized with gentle dissection. A peristomal oval skin incision was performed around the stoma to release the proximal end. Anastomoses were performed like loop stoma. Closure of the abdominal fascial wall was performed with absorbable sutures (PDS), and the skin was closed with interrupted sutures.

If there was giant hernia with loop stoma, first of all, stoma reversal was performed, and hernia repair with mesh was planned 2–3 months later. If there was a small hernia which could be repaired without a mesh, it was repaired during stoma reversal.

Outcomes

All stoma reversal patients came to last control at December 2014. The primary end points were morbidity and mortality rates related with reversal of stoma type. The secondary end-points were operation time, length of hospital stay, and stoma-related complications during waiting time interval for reversal.

Results

Average follow-up period was 17.3±11.2 months. Twenty-eight (90.3 %) of 31 stoma reversal patients were included into the study. The demographic values, BMI, and patient distributions according to ASA are seen in Table 1. Fifty per-cent of patients have malignancy.

Waiting Time Interval for Reversal

Waiting time interval for reversal was seen in Table 2. Waiting time interval was shorter for reversal of jejunostomy than

Table 1 Demographic values and the distribution of the patient according to American Society of Anesthesiologists (ASA) classification

Age (years)±SD	60.7±15.0
Man/woman	12/16
Body mass index	27.9±8.0
ASA I/II/III/IV	2/9/17/0

Table 2 The waiting time interval for reversal, length of operation, and hospital stay

	Jejunostomy <i>N</i> =7	Ileostomy <i>N</i> =13	Colostomy <i>N</i> =8	Total <i>N</i> =28
Mean hospital stay (days)	5.9±2.0	6.1±2.34	9.6±6.2	7.1±4.1
Mean time interval between the end of delayed abdominal closure to stoma reversal (days)	50.7±19.5	91±39.0	145±57.4	96.4±53.1
Mean operation time (min)	99.1±17.1	74.3±21.2	135.6±39.6	98.1±37.4

reversal of ileostomy ($p=0.014$) and colostomy ($p=0.001$). The longest time interval was especially for colostomies.

Operation Time Operation time for jejunostomy ($p=0.016$) and colostomy reversal ($p=0.001$) were significantly longer than the ileostomy reversal (Table 2).

Stoma-Related Complications During Waiting Time Interval During this time interval, patients with jejunostomy had more stoma-related complications than patients with ileostomy ($p=0.008$) and colostomy ($p=0.001$). Dehydration, stoma herniation, and prolapsus were the most common complications (Table 3).

Complications of Stoma Reversal Fifteen (53.5 %) of the 28 patients developed complications. The most common was surgical wound infection, which occurred in eight patients (28.6 %), and the second one was intestinal obstruction in five patients (17.5 %), resolved in all cases with conservative treatment; one intra-abdominal abscess was resolved by radiological intervention; and one anastomotic leak (3.5 %) occurred after colostomy reversal and this patient underwent reoperation. The entire abdomen was irrigated and a new ileostomy was created. There was no hospital and 30-day mortality after reversal (Table 4). The distribution and percentage of complications according to the Clavien-Dindo classification are shown in Table 5. It was seen that 86.8 % (13/15) of complications were grade I. There was no statistical difference in complication rate after reversal between the patients with jejunostomy, ileostomy, and colostomy reversal (Table 4).

There were 6 end colostomies and 22 loop ostomies. After reversal of the 6 end colostomies, complication developed in 83 % (5/6) of patients: four of them minor complication and one of them was anastomosis leakage. After loop stoma reversal, minor complications developed in 45 % (10/22) of patients. Patients with end stoma have significantly more reversal complications than patients with loop stoma ($p=0.001$).

Mean Length of Hospital Stay The mean length of hospital stay was 7.0 ± 4.1 days (3–25). There was no relation between length of hospital stay and stoma type (Table 2).

Statistical Analysis

In this study, standard deviation, median, and minimum and maximum values were used to summarize the numeric variables of patients. The statistically significant variables of the two groups were compared with Mann-Whitney *U* test after Bonferroni correction.

Discussion

In this retrospective case series study, the stoma related complications, morbidity, mortality and the waiting time interval of the reversal of the stoma created during OA management were analyzed in detail according to stoma type.

There are some important differences between stomas created following OA management and the others. One of them is that many interventions to the abdomen have to be performed

Table 3 Stoma-related complications before stoma reversal

	Jejunostomy <i>N</i> =7	Ileostomy <i>N</i> =13	Colostomy <i>N</i> =8	Total <i>N</i> =28
Prolapsus	2	2	0	4
Stoma herniation	3	2	1	6
Ischemia/necrosis of stoma	1	1	0	2
Stoma retraction	1	1	0	2
Peristomal skin complications	2	1	1	3
Mucocutaneous separation	1	1	0	2
Dehydration/electrolyte abnormalities	5	2	0	7
TPN nutrition requirement	2	0	0	2
Total stoma-related complication number/total patients	17/7 (242.8 %)	10/13 (76.9 %)	2/8 (25 %)	29/28 (103.5 %)

Table 4 The complication distribution according to stoma type following the stoma reversal

		Jejunostomy <i>N</i> =7	Ileostomy <i>N</i> =13	Colostomy <i>N</i> =8	Total <i>N</i> =28
Overall morbidity		0	0	0	0
Requiring radiological intervention	Intra-abdominal abscess	1 (14 %)	0	0	1 (3.5 %)
Requiring reoperation	Anastomotic leakage	0	0	1 (12 %)	1 (3.5 %)
No any intervention	Wound complications	2 (28 %)	3 (24 %)	3 (37.5 %)	8 (28.5 %)
	Small-bowel obstruction	1 (14 %)	3 (22.6 %)	1 (12.5 %)	5 (17.5 %)
Total complication rate		4 (57 %)	6 (46 %)	5 (62 %)	15 (53 %)

during OA management to overcome peritonitis or to achieve source control. Because of that, intra-abdominal adhesions may be more common after OA management and stoma reversal may be more difficult. The second one is that stoma-related complications are more likely to be encountered in OA patients because of the fact that stoma formation have to be performed in a more challenging situation during OA management. Both subjects make reversal time of stoma following OA management much more critical. If reversal is delayed, the patients would have more stoma-related complications; on the other hand, if reversal is performed early, complication after reversal might increase due to intra-abdominal adhesions.

There are many predisposing risk factors for the development of stoma-related complications based on three main categories: patient, operation, and disease-specific issues. Commonly reported patient-specific parameters include age, gender, BMI, nutritional status, ASA score, and corticosteroid use. The stoma creations in emergency increase the complication rate and the type of stoma may also affect the result. Malignancy, obesity, and comorbid disease also increase the complication rate [1]. Our patients have most of these risk factors; they were elderly, 50 % of them had malignancy, and the creation of the stoma in OA patients was performed in edematous, fragile bowel with short mesentery under emergent conditions. Because of that, stoma was matured very hardly. Necrosis, mucocutaneous separation, and retraction may occur more than the elective stoma due to high tension between the bowel mucosa and skin. There were more stoma herniation and prolapsus compared to literature in our series because opening the fascia and skin was opened larger, so that edematous bowel could be inserted through it. Thus, after

resolution of edema, prolapsus and herniation developed more likely. During OA management period, if stoma is required, colostomy or distal ileostomy is preferred, but in some conditions, jejunostomy, even proximal jejunostomy, has to be created. In our series, jejunostomy had to be created in seven of them. These seven patients with jejunostomies had more stoma-related complications due to the creation condition of jejunostomy was worse than others.

In patients with intestinal ostomy especially with proximal jejunostomy, dehydration, electrolyte abnormalities, and need of TPN are more common. As waiting time interval for reversal of proximal jejunostomy prolongs, a life-threatening organ failure might develop [1]. Usually to overcome this challenging problem, early stoma reversal may be the only option, although early closure may be more dangerous in such patients. In our cases, the reversal of jejunostomies had to be performed earlier than ileostomy and colostomy (Table 2) to avoid stoma-related complications. There was no difference in morbidity and mortality between the early and the late reversal patients. Operation time was longer due to dissection and exploration took more time in the early reversal patients.

One of the controversies in literature is the uncertainty about optimum time interval between the creation of the stoma and the reversal time of it. Recently, there is an incline towards early closure [12]. Alves et al. reported an early closure on postoperative 8 days during same hospital admission with a view to improving the patients' quality of life and preventing possible stoma-related complications with good results [8]. Mengaux et al. also reported similar results with early ileostomy reversal within 10 days [9]. However, some favors a late reversal later than 8.5 weeks after surgery; they encounter a higher morbidity rate in early reversal before 8.5 weeks, due to edema of the ileostomy and still-firm intra-abdominal adhesions [13]. In this study, for the waiting time interval, starting point was taken as a delayed abdominal closure time instead of stoma formation. Because after stoma formation, several intra-abdominal entries have to be performed and intra-abdominal adhesions will change.

It was reported that the waiting time interval between the creation and the reversal of Hartmann's procedure was between 50 and 330 days [14]. Mean operative time of the reversal of Hartman procedure reported in literature is 167 min [15]. The

Table 5 The distribution and percentage of complications according Clavien-Dindo classification

	Patient number 28 (100 %)
Grade I	12 (42 %)
Grade II	0
Grade III	1 (3.5 %)
Grade IV	1 (3.5 %)
Grade V	0

morbidity with Hartmann's reversal is reported at 4–43 % [16], and the mortality rate ranges from 4 to 10 % [17]. In our series, waiting time interval for the reversal of the six end stoma, mean operative time, and morbidity were average 156 days, 135 min, and 83 %, respectively, and without mortality.

During this pre-closure waiting period, an imaging test or endoscopic evaluation was performed to check the integrity of the distal bowel. We do not recommend any stoma reversal without checking distal bowel integrity, although some authors report that it is not strictly necessary in all cases [18].

Although there are lots of data about stoma reversal after colorectal surgery, there is no any data about stoma reversal following OA management. According to our knowledge, this is the first report about the stoma created during OA management in respect of stoma-related complications, the reversal time and complications after reversal of it.

One limitation of our study is that it is not a prospective randomized study; the study group includes patients with many different kinds of stoma created at different parts of the bowel with different surgical techniques in distinct challenging clinical situations. However, because of the scarcity of patients with stomas created following OA management, we think that our findings may be pivotal in the subject.

Conclusion

The stoma-related complications are more common following OA management during waiting time interval for stoma reversal. The reversal time is more critical for this kind of patients especially with life-threatening complicated jejunostomy. For loop stoma created during OA management, the reversal may be performed after average 50 days without increasing morbidity and mortality. There is no need to wait more than 8 weeks even if it is following OA management. The reversal of end stoma created during OA management was performed with high morbidity. If it is possible, loop stoma should be preferred during OA management.

Conflict of Interest The authors declare that they have no competing interests.

References

- Kwiat M, Kawata M (2013) Avoidance and management of stomal complications. *Clin Colon Rectal Surg* 26:112–121
- Harris DA, Egbeare D, Jones S, Benjamin H, Woodward A, Foster ME (2005) Complications and mortality following stoma formation. *Ann R Coll Surg Engl* 87(6):427–431
- Formijne Jonkers HA, Draaisma WA, Roskott AM, van Overbeeke AJ, Broeders IA, Consten EC (2012) Early complications after stoma formation: a prospective cohort study in 100 patients with 1-year follow-up. *Int J Colorectal Dis* 27(8):1095–1099
- Nastro P, Knowles CH, McGrath A, Heyman B, Porrett TR, Lunniss PJ (2010) Complications of intestinal stomas. *Br J Surg* 97(12):1885–1889
- Engel J, Kerr L (2010) Quality of life in rectal cancer patients. A four-year prospective study. *Ann Surg* 238:203e13
- O'Leary DP, Fide CJ, Foy C, Lucarotti ME (2001) Quality of life after low anterior resection with total mesorectal excision and temporary loop ileostomy for rectal carcinoma. *Br J Surg* 88:1216–1220
- Thalheimer A, Bueter M, Kortuem M, Thiede A, Meyer D (2006) Morbidity of temporary loop ileostomy in patients with colorectal cancer. *Dis Colon Rectum* 49:1011–1017
- Alves A, Panis Y, Lelong B, Dousset B, Benoist S, Vicaute E (2008) Randomized clinical trial of early versus delayed temporary stoma closure after proctectomy. *Br J Surg* 95(6):693–698
- Menegaux F, Jordi-Galais P, Turrin N, Chigot JP (2002) Closure of small bowel stomas on postoperative day 10. *Eur J Surg* 168(12):713–715
- Salman AE, Yetişir F, Aksoy M, Tokaç M, Yildirim MB, Kiliç M (2014) Use of dynamic wound closure system in conjunction with vacuum-assisted closure therapy in delayed closure of open abdomen. *Hernia* 18(1):99–104
- Yetişir F, Salman AE, Aygar M, Yaylak F, Aksoy M, Yalçın A (2014) Management of fistula of ileal conduit in open abdomen by intra-conduit negative pressure system. *Int J Surg Case Rep* 9:385–388
- Danielsen AK, Correa-Marinez A, Angenete E, Skullmann S, Haglind E, Rosenberg J, SSORG (Scandinavian Outcomes Research Group) (2011) Early closure of temporary ileostomy—the EASY trial: protocol for a randomised controlled trial. *BMJ Open* 1(1), e000162
- Perez RO, Habr-Gama A, Seid VE et al (2006) Loop ileostomy morbidity: timing of closure matters. *Dis Colon Rectum* 49(10):1539–1545
- Toro A, Ardiri A, Mannino M et al (2014) Laparoscopic reversal of Hartmann's procedure: state of the art 20 years after the first reported case. *Gastroenterol Res Pract* 2014, 530140
- Okolica D, Bishawi M, Karas JR, Reed JF, Hussain F, Bergamaschi R (2012) Factors influencing postoperative adverse events after Hartmann's reversal. *Colorectal Dis* 14(3):369–373
- Mazeh H, Greenstein AJ, Swedish K et al (2009) Laparoscopic and open reversal of Hartmann's procedure a comparative retrospective analysis. *Surg Endosc* 23:496–502
- Golash V (2006) Laparoscopic reversal of Hartmann procedure. *J Minim Access Surg* 2(4):211–215
- Mengual-Ballester M, García-Marín JA, Pellicer-Franco E et al (2012) Protective ileostomy: complications and mortality associated with its closure. *Rev Esp Enferm Dig* 104(7):350–354