Extraperitoneal staged stapling closure of the double-barreled stomas: a new modification of the old technique

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Introduction
One distinct disadvantage of Paul Mikulicz double-barreled colostomy is the need to apply an enterotome to the stoma for several days to crush the intervening spur before the double-barreled colostomy is closed. A new modification of the old technique was applied to omit the usage of the enterotome and avoid the riskiest complications of colostomy closure.
Aim
The aim of this study was to evaluate the efficacy and safety of this new technique, staged stapling closure of the double-barreled stomas, to publicize its use for all temporary stomas.
Patients and methods
Being a new technique, only 20 patients were included in this study. They all were old patients of both sexes. This new technique is accomplished in three stages: stage I is to perform the original double-barreled enterostomy in its native manner, stage II: 1 week later after in the outpatient clinic without the need for anesthesia, sterilization, or bowel preparation, where the spur between the two limbs of the enterostomy is divided using GIA stapler, and stage III: where 2 weeks later, under local or spinal anesthesia, extraperitoneal closure of the stoma was done with double-layer sutures.
Results
This study was carried out between November 2018 and January 2020 on 20 patients, aged 64–86 years, comprising 12 males and eight females. Only one (5/%) case was complicated with leakage and wound gaping. She had another trial of closure 2 weeks later, which succeeded. At the end, all patients were discharged home, with open bowel, normal defecation, and surgically stable. There was no mortality throughout our study.
Conclusion
Extraperitoneal staged stapling closure of the double-barreled enterostomy is a safe and easy technique to close temporary stomas with no need for another laparotomy and without the risk of peritonitis or obstruction.

Keywords:
double-barreled stoma, GIA stapler, staged closure

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Introduction

Construction of a temporary stoma is a relatively common surgical procedure. A transient stoma should lower the operative risk and should be closed as soon as possible, but in the literatures, the morbidity and mortality rates after ileostomy or colostomy closure are rather high [1–8].

Restoring intestinal continuity can be a challenging procedure, and many factors are involved in its timing. The attending physician should consider it as a complex surgery [9,10]. Besides that, patients have a high risk of developing complications owing to their comorbidities and prior surgery [11].

One distinct disadvantage of Paul Mikulicz double-barreled colostomy is the need to apply an enterotome to the stoma for several days to crush the intervening spur before the double-barreled colostomy is closed [12]. A new modification of the old technique was applied to omit the usage of the enterotome and avoid the most risky complication of colostomy closure.

Patients and methods

Being a new technique, only 20 patients were included in this study. This research was performed at the Department of General Surgery, Zagazig University, Ethical Committee approval and written, informed consent were obtained from all participants. They all were old (above 60 years old) of both sexes who

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underwent urgent exploration that ended in double-barreled enterostomy because of fear of anastomotic leak. This study was conducted between November 2018 and January 2020, and we are still recruiting new cases for a bigger study on a larger scale of patients.

Inclusion criteria

The following were the inclusion criteria:

(1) Patients over 60 years.
(2) Patients admitted for urgent laparotomy and needed temporary stoma.
(3) Patients consented to join our study and try the new technique.

Exclusion criteria

The following were the inclusion criteria:

(1) Patients refused to join our research.
(2) Distal colonic or rectal resection where the distal stump could not be exteriorized to the skin and Hartmann's technique was applied.
(3) Patients lost during the follow-up period.

This new technique is accomplished in three stages.

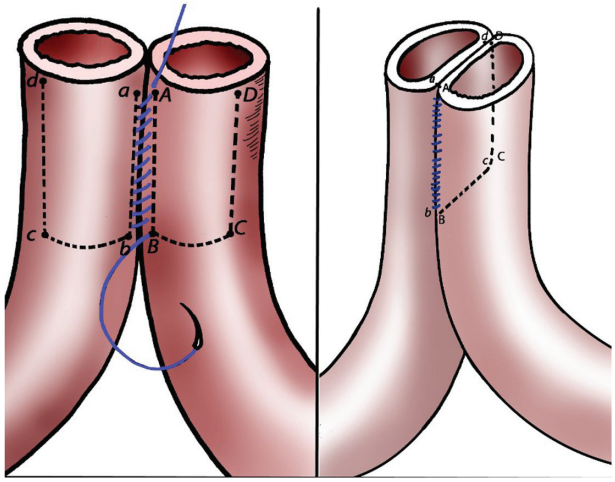
Stage I

It is to perform the original double-barreled enterostomy in its native manner by suturing the antimesenteric borders of the two limbs of the enterostomy, the afferent and efferent limbs, with continuous sutures in a 10-cm long U-shaped line without interfering with their vascularity (Fig. 1). The aim of these sutures is to create a spur between the two limbs without intervening loops of intestines in between that would endanger the second stage. The mesenteric window is closed, and the operation is ended with completion of the enterostomy as usual with adequate nippling.

Stage II

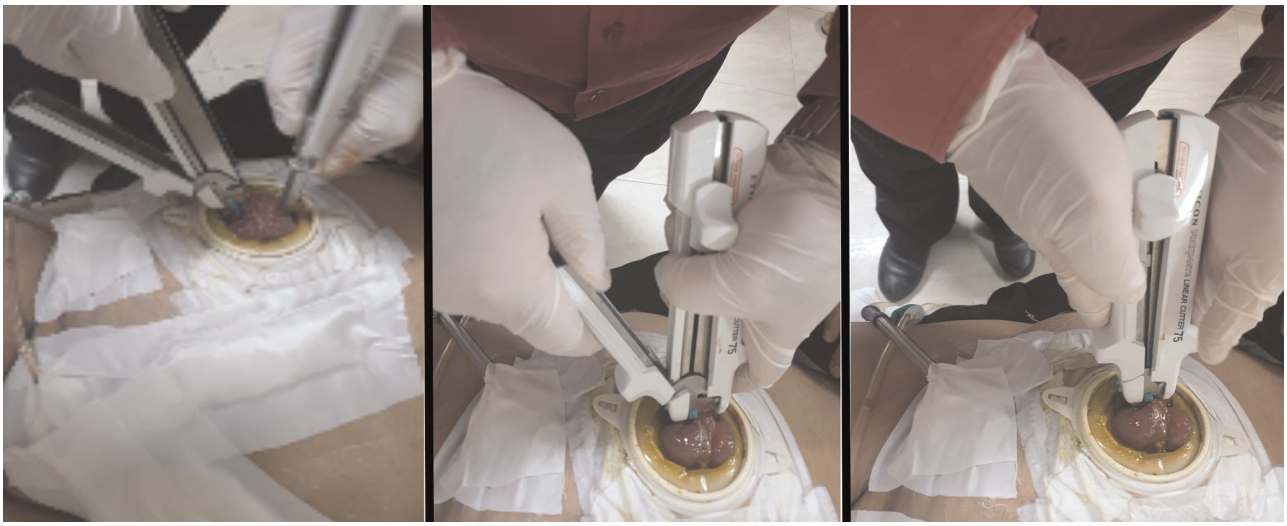
One week later after stabilization of the general condition of the patient and resolution of local edema and congestion of the tissues, a distal loopogram is done to test for integrity of the distal bowel, and then in the outpatient clinic, without the need for anesthesia, sterilization, or bowel preparation, the spur between the two limbs of the enterostomy is stapled-divided using GIA stapler (Fig. 2). This stage is totally painless owing to the fact that the intestine is insensitive to cutting. Only 7-cm length of the spur is shuttered to anastomose the afferent and efferent

Figure 1



Creation of a spur between the two limbs by U shaped.

Figure 2



Application of the GIA stapler to the enterostomy.

limbs, leaving a sufficient length of them still attached to each other by sutures below and leaving their top ends anchored to the skin to act as a decompressing fistula till distal patency is assured (Fig. 3). After firing of the stapler, we examined the staple line for bleeding, good tissue opposition, and lack of dehiscence. The patients usually started to pass stool per anus although they still output a reduced amount of intestinal contents through the stoma.

Stage III

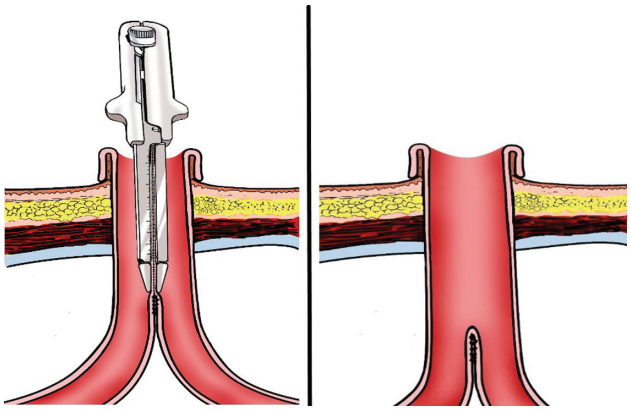
Two weeks later, after exclusion of internal leakage and confirmation of distal patency and integrity, 1-day rapid preparation of bowel was taken down, then under local or spinal anesthesia, extraperitoneal closure of the stoma was done with double layers of polyglactin 2/0 suture, then closure of the muscle layers over it, and then closure of the skin with interrupted sutures over a subcutaneous drain (Fig. 4).

Local anesthesia used in our cases is ultrasound (US)-guided regional anesthesia done by injecting the local anesthetics in the subcutaneous, intermuscular, and properitoneal spaces under guidance of US. This usually provides adequate anesthesia for the procedure. Most patients chose spinal anesthesia, but two patients who chose local anesthesia experienced pain during the procedure and needed additional sedations.

Oral fluids were allowed on the second postoperative day, then soft diet is introduced on the third postoperative day, and then the patient gradually resumed his or her traditional diet. The patients were monitored postoperatively for signs of leakage, and the bowel motions per day were recorded. Moreover, the patients were followed up for 4 weeks for late leakage, wound infection, dehiscence, obstruction, and incisional hernia.

The idea of this technique is summarized in that elderly patients who underwent urgent laparotomy that necessitated temporary stoma for the fear of leakage and peritonitis are hoped not to undergo another laparotomy to have their stomas closed because they might not withstand a new major operation and the persistent risk of leakage and peritonitis. The ancient technique of double-barreled colostomy was innovated to solve this problem, and this modification is through replacing the enterotome by the linear stapler, providing easier, faster, and more secure anastomosis between the afferent and the efferent limbs. Moreover, the extraperitoneal closure can be done without the need for general anesthesia, and it provides a safe closure of the stoma, such that if there is complication with leakage, it will be external without the risk of peritonitis and with little harm to the general condition of the patient.

Figure 3

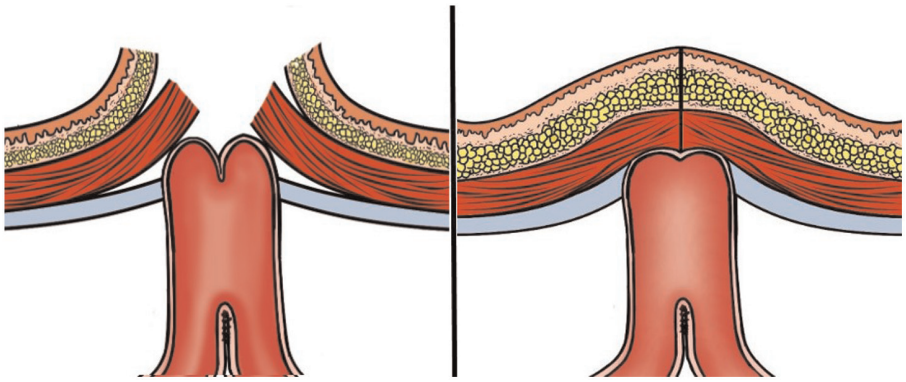


Stapled-division of the spur by GIA stapler.

Results

This study was carried out between November 2018 and January 2020 and included 20 patients. Their ages

Figure 4



Extraperitoneal closure of the enterostomy.

ranged from 64 to 86 years, with a mean age of 72±12.3 years. There were 12 males and eight females, with male : female=3 : 2 (Table 1).

They underwent laparotomies for different indications and ended with double-barreled enterostomy. The indications for laparotomy, as shown in Tables 2 and 3 were obstruction in seven cases, colonic perforation in five cases, and fecal peritonitis owing to leaking anastomosis in eight cases. The surgical procedures were sigmoid colectomy in seven cases, extended left hemicolectomy in three cases, extended sigmoid colectomy in two cases, and only disconnection of the leaking anastomosis in the remaining eight cases together with the peritoneal lavage and drainage (Table 2). At the end, in all cases, the two free ends of the bowel were brought to the skin as double-barreled enterostomy as described.

Postoperative results

One (5%) case was complicated with external leakage and wound dehiscence. She was managed by opening the wound to allow free drainage and tissue debridement and then conservative treatment till inflammation and edema subsided, and when her nutritional status improved, then another trial of extraperitoneal closure took place, and she passed the second trial successfully.

Table 1 The demographic data of the patients

Data	*n* (%)
Age (years)	
60–70	5 (25)
70–80	12 (60)
80–90	3 (15)
Total	20 (100)
Sex	
Male	12 (60)
Female	8 (40)
Total	20 (100)

Overall, three (15%) cases had simple wound infection without leakage. Diarrhea for more than 1 week appeared in three (15%) cases and improved gradually and disappeared within 3 weeks. Moreover, five (25%) cases developed intermittent colicky pain that disappeared within 2 weeks. Three (15%) cases developed high fever (>38.5°C) that subsided within 1 week. Moreover, two (10%) cases developed incisional hernias that appeared after 4 weeks postoperatively.

At the end, all patients were surgically stable with open bowel and normal defecation. There was no mortality throughout our study.

Discussion

Temporary stoma creation is an essential part of emergency and effective surgery and therefore used quite commonly, but considerable morbidity and mortality were recorded after stoma closure [13].

The benefits of this technique over simple surgical closure are, firstly, stapling at a separate step provides a safe wide anastomosis to test the integrity of the distal bowel while at the same time maintaining the decompressing stoma, and when ensuring the distal bowel integrity, extraperitoneal closure can be safely done, and secondly, the closure will be much easier owing to the very wide stapling anastomosis between the two loops that allow two-layer inverted closure of the edges without narrowing.

Table 3 The postoperative morbidity

The complications	*n* (%)
Leakage and wound gaping	1 (5)
Simple wound infection	3 (15)
Diarrhea for more than 1 week	3 (15)
High fever (>38.5°C)	3 (15)
Intermittent colicky pain	5 (25)
Incisional hernias	2 (10)

Table 2 Indications and the procedures done in explorations

Indications	The operative procedure	*n* (%)
Obstruction		
Volvulus sigmoid	Sigmoid colectomy	4 (20)
Obstructing splenic flexure carcinoma	Extended left hemicolectomy	3 (15)
Perforation		
Perforated colonic diverticulitis	Sigmoid colectomy	3 (15)
Perforated descending colon carcinoma	Extended sigmoid colectomy	2 (10)
Leakage of anastomosis		
Ileo-ileal anastomosis	Disconnection of the anastomosis	5 (25)
Ileo-transverse anastomosis	Disconnection of the anastomosis	3 (15)
Total		20 (100)

Table 4 Literature survey mortality rates after stoma closure

The complications	*n*	Mortality (%)
Knox *et al*. [18]	179	2.2
Rosen and Friedman [7]	153	1.4
Salley *et al.* [6]	166	0
Parks and Hastings [8]	83	0
Köhler *et al*. [19]	182	0.5
Riesener *et al*. [20]	548	2
Goligher *et al.* [16]	533	3
Current study	20	0

In our study, we preferred to close the stoma in the last stage with inverting sutures not with linear stapler because we believe that everting staples would have higher rate of leakage. This was recorded by some authors many years ago [14–16].

A critical point in our technique is that the suturing of the limbs of the double-barreled stoma should extends to a distance of at least 10 cm to be longer than the length of the arms of the GIA stapler (7 cm), thereby preventing other loops of the gut or omentum from being interposed between the two limbs of the stoma and being injured during subsequent stoma closure. Therefore, this step is safe and not liable to intraperitoneal leakage because stapling is done within the U-shaped sutures done previously in the first stage, which provides an outer seal for the anastomosis.

In this study, wound infection occurs in 15% of cases, which is rather greater than reported by other studies [1,4,13,17] who recorded wound infection between 4.6 and 13.8% among their cases, but we think that the small number of our patients (only 20 cases), where one patient represents 5% of cases, makes the comparison unfair. Moreover, one (5%) case was complicated with leakage at the site of closure compared with 5–17.6% reported by others [1,4,13], and thanks to the extraperitoneal closure in our technique, leakage was presented with fecal fistulae not peritonitis, and this was managed by good drainage then another trial of closure, which succeeded for perfect and permanent solution of stoma. None of our patients developed peritonitis or fatal sepsis, none of them were obstructed, and only one (5%) case needed reoperation.

There was no mortality among our cases, whereas other studies [6–8,13,18–20] recorded mortality rates between 0 and 3% (Table 4).

Conclusion

Staged stapling closure of the double-barreled enterostomy is a safe and easy technique to close temporary stomas with no need for another laparotomy and without the risk of peritonitis or obstruction.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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