Disc excision versus cruciate incision in stoma creation: a prospective controlled pilot study

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Received: 26 August 2021
Accepted: 24 September 2021
Published: xx Month 2021

The Egyptian Journal of Surgery 2021, 40:1432–1436

Background
The pattern of fascial incision during colostomy formation as a risk factor for parastomal hernia (PSH) development has been debated recently in cases of end colostomies. The aim of this pilot study was to assess the feasibility of adopting the fascial disc excision technique in case of temporary loop colostomies.
Patients and methods
A total of 20 patients with temporary loop colostomies (10 new patients with fascial disc excision technique compared with similar cases with cruciate incision technique in our database), whether primary (i.e. a single loop with opened anterior wall) or secondary (i.e. via a hand-sewn posterior wall anastomosis between the two colonic ends), were observed for PSH development till stoma reversal, and then, the feasibility of abdominal wall reconstruction was recorded.
Results
The rate of PSH development was high in both groups and was directly proportional to the time needed for stoma 'take down.' However, no significant difficulties were encountered during abdominal wall reconstruction after stoma reversal.
Conclusion
The fascial disc excision technique for loop colostomy creation is feasible with some 'theoretical' advantage from the physical point of view.

Keywords:
cruciate incision, fascial disc excision, loop colostomy

Egyptian J Surgery 40:1432–1436

1110-1121

Introduction

Parastomal hernia (PSH) is defined as a protrusion of abdominal contents through the trephine of the abdominal wall by which a stoma was formed [1]. It is a common complication of stoma formation in colorectal surgery, with an incidence up to 50% [2], causing discomfort, pain, bowel strangulation, and incarceration as well as difficulties with stoma care [3,4]. Identified risk factors for PSH include advanced age, obesity, immunosuppression, increased intraabdominal pressure, and postoperative wound infection [2]. Management of PSH can pose difficulties due to significant rates of recurrence and morbidities of the repair [2]. The initial construction of an ileostomy is a relatively simple procedure. However, this statement may be inappropriate given the high rate of complications, which have been reported as high as 70% [5]. Some of these complications may require surgical intervention, including ileostomy revision [6]. Therefore, adherence to sound surgical technique is essential when creating ostomies [7].

Most authors recommend a longitudinal or cruciate incision to be made in the anterior rectus sheath while creating the stoma [8].

Some authors suggested to excise a disc of the fascia instead 'reducing, theoretically, the risk of parastomal hernia as it is resistant to the radial forces of expansion, as compared with a cruciate incision and linear forces resulting in splitting or tearing of the fascia along the lines of the cruciate incision' [9].

A recent study of the effect of abdominal wall strain forces on the trephine diameter in case of permanent end colostomies concluded that there is no difference whether the aperture was done in a cruciate or circular incision pattern [1].

The aim of this pilot study is to test for the incidence of PSH using the technique of disc excision of the fascia in loop colostomies and feasibility of abdominal wall reconstruction during stoma reversal over a small group of patients in comparison with the classical cruciate incision of the sheath.

Patients and methods

A total of 10 patients, candidates for temporary fecal diversion at the colonic level presenting to our institute, were recruited for this study. Written informed consent was obtained from the patients. The study was approved by the Department of Surgery. The time interval for recruitment was from January 2020 till March 2021. Having received the approval of the ethical committee in our institute, Ain Shams University, Faculty of Medicine, General Surgery Department, patients enrolled in the study had no history of associated medical comorbidities, that is, they were medically free by history (however, patients with previous abdominal surgeries were not excluded). The BMI of the enrolled patients should not exceed 35 'for better assessment of the colostomy status.' Patients were enrolled in the study regardless of the diagnosis, provided they were candidates for colonic diversion and loop colostomy could be safely constructed. Emergency cases undergoing damage control surgery, that is, diversion and Hartmann procedure with or without colectomy, were excluded. Morbidly obese patients with BMI more than 35 were excluded. Patients with mesenteric vascular insults 'ischemia or occlusion' were also excluded. Patients with malignant colonic/rectal lesions receiving neoadjuvant chemotherapy or chemoradiotherapy were excluded. The results of the recruited patients were compared with the data of the last 10 nearly similar patients who underwent loop colostomy diversion in the database of the General Surgery Department (patients chosen from the database were of similar age, general medical conditions, and similar indications for diversion, but it was hard to unify the surgical team). They were referred to as group 'B,' having the recruited new patients as the study group, that is, group 'A.' Exploratory laparotomy was done for all patients, and the colonic insult was dealt with accordingly, either direct suturing or colonic resection. Having the patient ready for fecal diversion, the aperture of the stoma in group 'A' was fashioned by excising a disc of the skin, subcutaneous tissue, and the underlying muscle sheath [the anterior rectus sheath in five patients having the colostomy done in a transrectus site (group A1), or the sheath of the external oblique muscle in the other five patients having the colostomy designed in a pararectus position (group A2)]. The average diameter of the excised disc of tissues was 3–5 cm. In the control group, the muscle sheath was not excised but a cruciate incision about the same length, that is, 3–5 cm, was done instead [also, having the patients allocated in two groups: transrectus group (group B1) and pararectus group (group B2) of five patients each]. In all patients, the loop colostomy was matured after having the colon exteriorized, using full-thickness vicryl 2/0 sutures in the opened anterior wall to the skin (having the posterior colonic wall being intact primarily or after doing posterior wall half anastomosis before exteriorizing the cut ends of the colon following segmental resection using simple continuous 2/0 vicryl sutures). Patients were kept nothing per os till the stoma began to function, and then, enteral feeding was started gradually. Postoperative follow-up results were recorded for all patients with special stress on the viability and position of the stoma. Postdischarge follow-up visits were scheduled for the patients weekly for 1 month, and then monthly till stoma reversal was decided. Special attention in those visits was paid for the status and viability of the stoma as well as the development of PSHs. During the second operation for restoration of bowl continuity, stoma revision was done similarly in all patients, that is, directly tackling the loop stoma and performing the anastomosis using circular staplers after complete freeing up of the colonic loop without the need to re-explore the abdomen. Special attention was paid to the feasibility of the closure of the muscular sheath in the patients. It was done in a simple continuous pattern using 'PDS loop' zero. Subcutaneous drains were inserted in all patients. Patients started enteral feeding on complete recovery from anesthesia and were discharged within 2–3 days.

Results

As patients with different indications for diversion were enrolled in this pilot study and for better correlating our results with those recorded in the database of our department, the demographic data of the recruited as well as the patients recalled from the database were also correlated.

In our study, we had 12 males and eight females. The age range was 20–56 years. Of the enrolled males, eight patients were manual workers and the remaining four had clerical jobs. On the contrary, six females were housewives, and two females were practicing non-'physically stressful' jobs.

Previous exploratory laparotomy was recorded in eight males and two females. Cesarean section delivery was encountered in six female patients (Table 1).

The indications of fecal diversion are enlisted in Table 2. It is noticed that all patients enrolled in the study had left colonic or anorectal cause with no one having a right colonic pathology as it is common in our

Table 1 Demographic data

	Male	Female
Number	12	8
Average BMI	29	32
Smoking	10	2
Physically stressful jobs	8	0
Previous laparotomy	8	2

Table 2 Indications of diversion

Indication of diversion	Male	Female
Obstructing cancer with lumen discrepancy between ends	4	4
Palliative transverse loop colostomy in advanced cancer	2	2
Unexpected colonic injury	2	2
Protection of perineal wound	4	0

practice to do primary anastomosis in patients with proximal colonic lesions, and diversion in those patients is unusual (unless there is a marked discrepancy in the diameter of both ends).

Considering the initial operation of fecal diversion, we had 10 patients with transrectus stoma [group A1 (five patients) and group B1 (five patients)],and 10 patients with pararectus stomata (groups A2, B2). The average time needed for the stoma to function was 1–2 days, after which, patients started oral feeding. The length of postoperative stay varied greatly among patients according to the indication of diversion. It was about 3–4 days in cases with obstructing cancer and 5–14 days in cases of colonic injuries (according to the presence or absence of associated bony and other organs injury). It was 5 days in the two females (iatrogenic injury during gynecological operations) but 14 days in the two males (road traffic injuries with fracture pelvis; one of them had extraperitoneal bladder injury) (Table 3).

Our concern regarding the recruited patients, beside the original diagnosis, was about the diverting stoma, that is, viability and fixation. All patients (the recruited 10 patients as well as the 10 patients recalled from the database) had a viable stoma, with no signs of ischemia or gangrene.

During the postdischarge visits, the rate of 'clinically detected' PSH was high, having two cases in group A1, two cases in group A2, two cases in group B1, and three cases in group B2. The rate of peristomal infection was also high, affecting nearly all (seven out of nine) patients who developed PSH (all of the nine patients, except one case in group A1 and one case in group B2).

Table 3 Postoperative stay after diversion

Indication of diversion	Postoperative stay (in days)
Obstructing cancer	3–4
Colonic injury owing to iatrogenic gynecological injury	5
Colonic injury owing to road traffic accident	14

The time needed for stoma reversal varied greatly according to the indication of diversion, being about 2 months in patients being diverted for noncancer indications but reaching up to 6 months in those patients with malignant colonic lesions.

The second operation of stoma reversal and abdominal wall reconstruction was done smoothly in all of the 20 patients with no technical difficulties of not having to re-explore a 'nonvirgin' abdomen.

PSH was dealt with during the second operation via direct anatomical repair without mesh.

It is to be mentioned that the operative time needed for stoma maturation in the first operation and abdominal wall reconstruction in the second operation did not vary greatly between group A and group B (25 min/20 min and 7 min/7 min).

Discussion

Development of PSH after fecal diversion depends on many variables. One of these variables, if not the most important, is the surgical technique adopted during stoma creation. Classically speaking, cruciate incision in the anterior abdominal wall (more precisely speaking; in the anterior rectus sheath) was considered to be the sound surgical technique adopted by many surgeons. The site of stoma maturation, whether through or lateral to the rectus muscle, was found to have no significant effect on the development of PSH by many authors [1,8,10]. Even the idea of the cruciate incision was challenged [1] that some authors recommended to do a disc excision of the anterior abdominal wall, instead, claiming that technique would be more resistant to radial distracting forces from a physical point of view [8].

The feasibility of adopting the disc excision technique was demonstrated in cases of end colostomies but not in case of loop colostomies, and this was the aim of our pilot study.

A total of 10 patients were recruited and divided into two groups according to the site of stoma exit in relation to the rectus abdominis muscle, being the other still highly debatable issue: group A1 (through) and group A2 (lateral to) the rectus muscle. Similar group of patients were recalled from our database and also divided into two groups according to the site of the stoma in relation to the rectus muscle (B1 and B2). Factors that may affect the postoperative course of the constructed stoma, other than the adopted technique while dealing with the abdominal wall, were 'pacified' in our inclusion and exclusion criteria, that is, old age, BMI, vascular insults, and medical comorbidities, which may affect wound healing and bowl function. Patients were divided into two nearly identical groups regarding other demographic factors as well as the indication of diversion.

Peristomal infection is highly prevalent in patients with fecal diversion in general, reaching 5.6% [11] and up to 9.2% in some studies [12]. In our study, there were seven cases that developed peristomal infection, which is a relatively high percent taking into consideration the small sample size, being a pilot study. This can be attributed to the fact that it is a potentially septic region, being in continuous contact with the fecal matter. This requires a good care of the stoma and peristomal region.

Peristomal infection appears to be an important risk factor for the development of PSHs. In our study, all patients who developed peristomal infection had PSHs lately. This goes in accordance with the studies done previously in the literature since 1984 and till now [13,14].

During the operation of abdominal wall reconstruction after restoration of bowel continuity, no significant difficulty was met in all of the 20 patients (although more time was needed for cases with PSH for careful dissection, reduction, and repair of hernial sac). There was a concern that the diameter of the abdominal wall defect left after restoring bowel continuity may be too large to be closed primarily. Those fears were based on three facts: a fascial disc had been excised during the initial operation, the diameter of the defect through which a loop colostomy is exteriorized, is inevitably larger than the diameter needed in case of end colostomies, and that the time spent before restoring bowl continuity, is directly proportional to the diameter of the abdominal wall aperture (some authors concluded that there is an increase in the diameter of the abdominal wall trephine about 0.22 mm/month, whether it is a transrectus or a pararectus stoma [1]). However, all the study group patients (group A) were closed primarily without the need for mesh reconstruction of the 'potentially septic' stoma site. The diameter of the aperture left was not more than 10 cm in all cases (and this diameter was found in patients with malignant lesions having to wait for about 7–8 months after fecal diversion to receive adjuvant therapy).The idea of our study was based on a theoretical assumption that equalizing the radial forces exerted on all ends of the abdominal wall aperture needed for stoma exteriorization (having it made in a circular fashion) could help in decreasing the incidence of PSHs in comparison with the classical technique of cruciate incision of the fascial sheath (where radial and traction forces would inevitably, increase the diameter of the abdominal wall defect) [9] taking into consideration that the risk of developing a PSH is directly proportional to the diameter of the abdominal wall defect (estimated to be about 10% increase in risk for every millimeter increase in diameter [15]).

In our study, we found no difference in the incidence of PSH development between the two groups (four cases in group A and five cases in group B). Furthermore, the diameter of the abdominal wall defect detected during the second operation of stoma 'take down' was nearly the same between different groups (range, 7–10 cm) as long as the initial indication for diversion was the same and the time interval before restoration of bowel continuity did not vary greatly. This can be explained by that the ischemic edges of the cruciate incision site were regressed spontaneously until a good perfusion was found. This could be supported by the postdischarge fact that all abdominal wall defects assumed a circular pattern during restoration of bowel continuity, regardless of the initial technique of abdominal wall incision during stoma maturation. However, this point needs to be studied on a larger sample size before projecting it on the general population.

Conclusion

The technique of disc excision of the fascial sheath during loop colostomy maturation is noninferior to the classical technique of cruciate incision and can have some 'theoretical' advantages.

Limitation

The small sample size in our study, being a pilot study, makes it difficult to project our findings on the general

population. Comparing our 10 patients with similar patients in the database meant that the surgical team was not the same, although it is a fact that the personal and technical variations have strong effect on the surgical outcome. PSH has many risk factors. Each of those factors needs to be studied separately on a wider scale in relation to our proposed technique of disc excision.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Ho KK, Economou T, Smart NJ, Daniels IR. Radiological progression of end colostomy trephine diameter and area. BJS Open 2018; 3:112–118.

2 De Robles MS, Young CJ. Parastomal hernia repair with onlay mesh remains a safe and effective approach. BMC Surg 2020; 20:1.

3 Francesco S, Bonaduce I, Cabry F, Sorrentino L, Iaquinta T, Fenocchi S, Roberta G. A new anterior approach to parastomal hernia repair (PHR) with linear stapler suture: a case report. Ann Med Surg 2020; 60:475–479.

4 Krstic S, Resanovic V, Alempijevic T, Resanovic A, Sijacki A, Djukic V, *et al.* Hartmann's procedure vs loop colostomy in the treatment of obstructive rectosigmoid cancer. World J Emerg Surg 2014; 9:52.

5 Shazi B, Bruce JL, Laing GL, Sartorius B, Clarke DL. The management of colonic trauma in the damage control era. Ann R Coll Surg Engl 2017; 99:76–81.

6 Gilshtein H, Ghuman A, Dawoud M, Yellinek S, Kent I, Sharp SP, Wexner SD. Indications for, and outcomes of, end ileostomy revision procedures. Colorectal Dis 2020; 17:15449.

7 Daams F, Luyer M, Lange JF. Colorectal anastomotic leakage: aspects of prevention, detection and treatment. World J Gastroenterol 2013; 19:2293–2297.

8 Ansell J, Hughes D, Torkington J. Laparoscopic ileostomy and colostomy for faecal diversion, in, Michael Parker, Werner Hohenberger: lower gastrointestinal tract surgery: Vol.1, laparoscopic procedures. Surgery 2019; 1:112.

9 Schwartzberg DM, Holubar SD. Crohn disease: S surgical management, in, Steele, Scott R. (2021) Cleveland Clinic illustrated tips and tricks in colon and rectal surgery. Philadelphia: Lippincott Williams & Wilkins 2021; 1:846.

10 Hardt J, Meerpohl JJ, Metzendorf MI, Kienle P, Post S, Herrle F. Lateral pararectal versus transrectal stoma placement for prevention of parastomal herniation. Cochrane Database Syst Rev 2013; 11:CD009487.

11 Liu WH, Pai L, Wu CC, Jao SW, Yeh CC, Hsiao CW. Postoperatively parastomal infection following emergent stoma creation for colorectal obstruction: the possible risk factors. Int J Colorectal Dis 2008; 23:869–873.

12 Ayhan H, Akcay K, Olmez YN, Simsek C, Abbasoglu O. Redetermining the cutoff point of peristomal infection scoring: methodological research. J Parenter Enteral Nutr 2021; 26:1–7.

13 Carne PW, Robertson GM, Frizelle FA. Parastomal hernia. Br J Surg 2003; 90:784–793.

14 Thompson MJ. Parastomal hernia: incidence, prevention, and treatment strategies. Br J Nurs 2008; 17:S16.

15 Pilgrim CH, McIntyre R, Bailey M. Prospective audit of parastomal hernia: prevalence and associated comorbidities. Dis Colon Rectum 2010; 53:71–76.