

Modification of Turnbull–Cutait transanal colon pull-through as a salvage procedure in cases of failed low colorectal anastomosis

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Received: 19 December 2019

Accepted: 26 December 2019

Published: 27 April 2020

The Egyptian Journal of Surgery 2020, 39:409–414

Introduction

In 1961, Turnbull and Cutait described the colon pull-through with delayed anastomosis for patients with rectal cancers below peritoneal reflection, Hirschsprung disease, and Chagas disease. With the technological upgrading, the surgical staplers offered an easy and safe primary anastomosis in the bottom of the pelvis and replaced the pull-through. Despite this, the pull-through still has a role nowadays in patients with complex anorectal diseases in whom achieving primary anastomosis is difficult even with the use of surgical staplers.

Aim

The authors are reporting the experience in Turnbull–Cutait pull-through operation, its indications, the technical modification, and the results.

Patients and methods

A total of 28 patients had two-stage transanal pull through procedure after completing the original resection for different anorectal problems. In the first stage, the left colon was completely mobilized, pulled through, and fixed to the anal canal, and the perianal skin was done, and covering ileostomy was raised. In the second stage, the pull-through was excised few cm below the anal verge, and the ileostomy was closed. Patients were followed up for 6 months to document the continence status and the development of any complications.

Results

Autoamputation of the colon stump occurred in 10 patients. Retraction of the pulled colon occurred in five patients causing severe pelvic sepsis in three of them. The three patients were treated by dismantling the anastomosis terminal colostomy. Other minor complications included anal pain and discharge. The patients showed wide range of continence state with clear improvement after 6 months.

Conclusion

Salvage Turnbull–Cutait pull-through is an easy procedure that can be used in patients with complex anastomotic complications and difficult pelvic anatomy. Retraction and gangrene of the colon stump are serious complications that need to be studied to improve the outcome of this procedure. Continence is definitely reduced, but it is accepted by most patients.

Keywords:

colon pull-through, delayed anastomosis, pelvic sepsis

Egyptian J Surgery 39:409–414

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1110-1121

Introduction

In spite of the improvement in surgical techniques and instruments, rectal surgery is still technically demanding in not a small percentage of patients especially male sex, large sized tumors, and patients who received neoadjuvant chemoradiotherapy [1,2]. Surgical outcomes, for both open and laparoscopic procedures, are also influenced by certain patients' adverse anatomical criteria that can be showed by preoperative pelvic MRI [3–7].

Swenson [8] initially described the abdominoperineal pull-through resection with immediate anastomosis for benign and malignant diseases of the rectum and rectosigmoid area as inflammatory bowel diseases, Hirschsprung disease, Chagasic megacolon, and rectal

cancer. Turnbull and colleagues described the technique of delayed anastomosis to avoid the high incidence of anastomotic leakage and pelvic sepsis of Swenson operation. This technique was used for patients with tumors found in the rectum below peritoneal reflection and also in Hirschsprung disease [9,10]. Cutait *et al.* [11] used the same technique in adults with Chagasic disease and rectal cancer.

The originally described pull-through by Turnbull and Cutait included two stages. In the first stage, resection was

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done and the distal rectum was everted through the anal canal. The proximal colon was pulled through the rectal tube and sutured to it. The second stage was done after 1 or 2 weeks without anesthesia and included amputation of the excess colon and augmentation of the sutures line.

With the invention of surgical staplers and increasing experience with pelvic surgery, the stapled primary anastomosis replaced Turnbull–Cutait pull-through procedure as the first choice for uncomplicated routine surgery. However, we believe that the pull-through operation still has a role in some patients with difficult pelvic anatomy, redo pelvic surgery, old pelvic sepsis, patients with complex anorectal pathologies and advanced cancer, and in case of stapler failure.

Aim

The aim of this study was to report our experience in pull-through procedure as a salvage operation in certain difficult operative situations when the anastomosis could not be completed by the traditional techniques.

Patients and methods

This is a retrospective analysis of prospectively collected data of 28 patients (19 males), with age range of 27–64 years, and mean age of 57 years, who had transanal colon pull-through operation in Ain Shams University Hospitals and Dar ElShefa Hospital over a period of 3 years from September 2016 till September 2019. The study was approved by Research Ethics Committee of the Department of General Surgery, Ain Shams University. The decision to do the pull-through procedure was either intraoperative ($n=10$) or was taken owing to the development of different postoperative complications in the low colorectal or coloanal anastomosis ($n=18$). Thirteen patients were original patients of the authors' institute and 15 patients were referred from other institutes; the cause of referral was usually the development of postoperative complications (Table 1).

Table 1 The indications of the pull through surgery in the present study

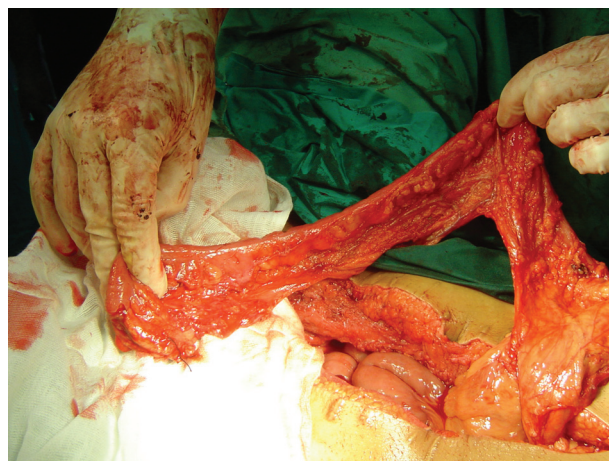
Indication of the pull-through	$n=28$ [n (%)]
Stapler misfiring	3 (10.7)
Grossly inconvenient distal safety margin	2 (7.1)
Pelvic anatomical difficulties	5 (17.9)
Anastomotic stricture ^a	4 (14.3)
Local recurrence at anastomotic site ^a	2 (7.1)
Anastomotic leakage with pelvic sepsis ^a	5 (17.9)
Iatrogenic rectovaginal or rectovesical fistula ^a	7 (25)

^aThe pull-through operation was done as a delayed procedure at least 3 months after dismantling the anastomosis, raising an end colostomy and cure of pelvic sepsis.

Surgical technique

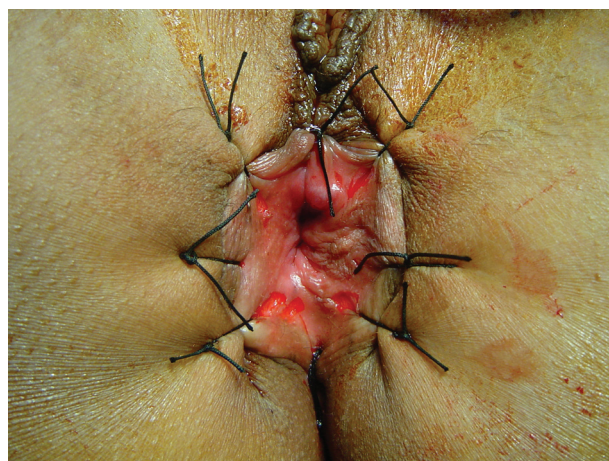
The operation was done in two stages. In the first stage, after completing ultra-low anterior resection, the left colon was completely mobilized and the inferior mesenteric vein was ligated and divided just below the lower border of the pancreas (Fig. 1). Anal retracting stitches were taken so that the anus was everted, and the dentate line was seen at the anal verge (Fig. 2). Gentle anal dilatation is done. Transanal mucosectomy above the dentate line was done using diathermy after injection of adrenaline saline solution 1/200 000 in the submucous plane (Fig. 3). A transanal clamp was introduced to grasp the proximal colon end, and the proximal colon was pulled through the anal canal so that at least 3–5 cm of the colon could be seen protruding from the anus without tension (Fig. 4). Fixation of the pull-through was done by seromuscular stitches to the anal canal, and the perianal skin was done, and a covering loop ileostomy was raised.

Figure 1



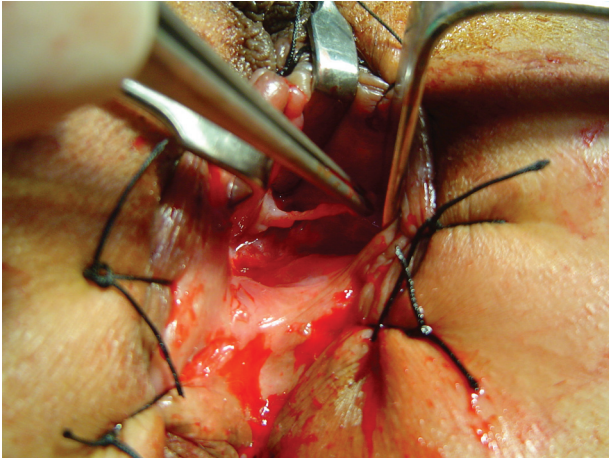
Mobilization of the left colon.

Figure 2



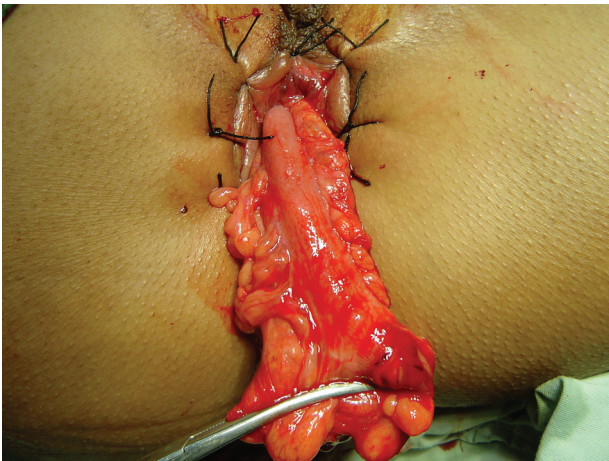
Retraction of the anal canal.

Figure 3



Transanal mucosectomy.

Figure 4



Transanal colon pull-through.

The second stage of the procedure consisted of closure of the loop ileostomy and amputation of pull-through 1–2 cm below the anal verge if autoamputation has not already occurred (Fig. 5). The second stage was usually performed 6 weeks to 6 months after the first stage, and it was preceded by distal loopogram to check for the integrity of the coloanal anastomosis.

Between the two stages, patients were regularly checked for the viability, retraction, or autoamputation of the pull-through. Patients were informed to immediately report to the hospital if any symptom or sign of pelvic sepsis appeared (severe anal pain, purulent anal discharge, abdominal pain, fever, or perianal swelling).

After the second stage, the patients were followed up at 1, 3, and 6 months to check their bowel function, continence status (using the Wexner score), or any unexplained symptoms.

Figure 5



Viable healed pull-through.

Results

The indications of the pull-through surgery in the present study are shown in Table 1.

Three (10.7%) patients developed retraction of the colon stump into the anal canal after the first stage; one of those patients (3.6%) showed signs and symptoms of pelvic sepsis and needed transanal drainage. The integrity of the anastomosis was not affected in any of those patients as was shown later in loopograms, and the ileostomy was safely closed in all three patients.

Three (10.7%) patients developed retraction of the colon stump after closure of the ileostomy. All three patients developed pelvic sepsis and needed re-exploration, dismantling the anastomosis, and raising end colostomy. All patients are waiting for other interventions to restore bowel continuity, and they were excluded from the follow-up of the continence score.

Stump gangrene and autoamputation occurred in 10 (35.7%) patients (Fig. 6). Colon gangrene occurred in one (3.57%) patient (Fig. 7). This patient underwent exploration, pelvic drainage, and permanent colostomy.

Minor self-limiting symptoms occurred in 11 patients. This included anal pain ($n=5$), anal discharge ($n=6$), and pruritus ($n=4$). Postoperative complications are shown in Table 2.

Different degrees of incontinence occurred in all patients immediately after closure of the ileostomy, but it improved gradually after 3 and 6 months. Incontinence persisted in nine patients, and three patients needed to wear pads constantly. The

Figure 6



Gangrenous pull-through.

Table 2 Complications after the first and the second stage of surgery

Timing	Complications	n=28 [n (%)]
After first stage	Retraction	3 (10.7)
	Pelvic sepsis	1 (3.6)
	Anal discharge	6 (21.4)
After second stage	Retraction	3 (10.7)
	Pelvic sepsis	3 (10.7)
	Anal pain	5 (17.9)
	Pruritus	4 (14.3)

postoperative Wexner score of all patients is shown in Table 3.

Discussion

Approximately 60 years ago, Turnbull and Cutait, in two different institutions, described the operation of transanal colon pull-through with delayed colorectal anastomosis in an attempt to avoid the technical difficulty and the disastrous complications of primary anastomosis in the bottom of the pelvis. They claimed that their technique was effective in the management of rectal cancer, Chagas disease, and other pathologies [9,12]. With the introduction of surgical staplers and the development of new surgical techniques, primary ultra-low colorectal anastomosis became much easier

Figure 7



Gangrenous colon.

Table 3 Degree of continence after the second stage

Wexner score in 25 patients	0-5	6-10	11-15	16-20
After 1 month	5	9	8	3
After 3 months	11	8	6	0
After 6 months	15	6	4	0

and safer, and the colon pull-through operation fell out of interest. However, in recent years, the Turnbull-Cutait pull-through operation is starting to reappear as a salvage procedure to avoid the construction of a permanent stoma in patients with complex anorectal pathology and in case of stapler failure after ultra-low rectal resection. Some researchers reported the use of pull-through operation even as a primary procedure to decrease the incidence of anastomotic complications [13].

In the present study, we did not use the colon pull-through as a primary procedure. Our indications included complex anorectal pathology, stapler failure, and reversal of Hartmann after complicated low colorectal anastomosis. Most patients of the latter group were referrals from other hospitals with the lost hope to close their stomas. Like other studies, most patients in the current were males, which reflects the real indication of the pull-through technique in the difficult narrow and deep male pelvic anatomy. The wide age range reflects the benign and malignant pathologies of these patients.

The adhesion formed between the serosa of the distal colonic segment and the anal canal in pull-through procedure theoretically optimizes anastomotic healing [14]. A meta-analysis that included 98 studies of outcomes after rectal resection followed by pull-through reported anastomotic leak and pelvic sepsis

rates of 11 and 12%, respectively [15]. This is similar to the leak rate in the present study. The leak rate after colorectal anastomosis is 11% [16]. Although colon pull-through does not seem to improve the leak rate, yet it should be taken into consideration that this operation is performed in technically difficult situation in which the leak rate would have been much higher if the anastomosis was done by the traditional techniques. The low leak rate after pull through is more important for patients with rectal cancer as it has been shown that the incidence of local recurrence after rectal cancer resection is higher with leaking anastomosis [17,18], and anastomotic leak was considered an independent prognostic factor for local recurrence after resection of cancer rectum.

Respecting the oncological principles is mandatory when studying any technique that can be used for the surgical treatment of cancer. The pull-through technique modifies only the reconstruction technique without affecting the radical tumor resection, that is, total mesorectal excision and achievement of free distal and circumferential resection margins. Indeed, in the present study, the pull-through operation was used in two patients who had grossly inadequate distal resection margin after resection of a bulky tumor in the lower rectum. It is not expected for pull-through procedure to have a negative effect on oncological outcome as the latter is linked to tumor excision rather than type of intestinal anastomosis [19].

The cornerstone of the success of the pull-through procedure is the proper mobilization of the left colon and splenic flexure. The idea of central ligation of the large vessels respects the oncological principles of tumor resection and also allows full mobilization of the left colon with preservation of the blood supply through the marginal vessels. This can be achieved by ligation of the inferior mesenteric artery at its origin and ligation of the inferior mesenteric vein just below the pancreas. These steps usually allow a long length of well-vascularized colon stump to pass through the anal canal.

Having said that, it should be mentioned that the marginal artery is a delicate artery that can be injured by rough manipulation of the mobilized left colon. Injury of the marginal artery is usually in the form of thrombosis that manifests few days after the operation in the form of gangrene of the left colon. This preventable complication happened in one of our patients who was treated by re-exploration with resection of the gangrenous left colon and raising a

left transverse end colostomy. This patient never showed again to restore continuity of his bowel. We emphasize that the mobilized left colon should be handled carefully to avoid the disastrous complication of left colon ischemia.

Complications after pull-through operation vary in literature. In a study by Bianco *et al.* [20], no patient had any early or late complications, and all of their patients attained a good level of fecal continence after 2 years. However, these results are not realistic as the study included only five patients. According to Remzi *et al.* [21], the procedure did not succeed in 17 (25%) patients. Three of these patients had a permanent stoma during the second stage. Two did not have the stoma closed, and 12 patients recreated stoma formation after previous closure. Causes of failure included fecal incontinence, ischemic necrosis, colovaginal fistula, and recurrent cancer rectum. In another study, two of seven patients showed procedure failure in the form of complete stump necrosis and pelvic sepsis [22]. In this study, five (17.86%) cases showed retraction of the pull through, and three of them experienced severe pelvic sepsis and ended up with terminal colostomy. We believe that this is the most disappointing complication of the operation of pull-through. All patients in the present study who had stump retraction started by having stump ischemia and autoamputation. This implies that the cause of stump retraction was not improper mobilization but rather ischemia of the stump caused by the constriction effect of the anal canal sphincter tone on the pulled through colon. To solve the problem of the discrepancy between the diameter of the anal canal and the thickness of the mesocolic fat, Bianco *et al.* [20] recommended that the surgical specimen should be resected at the level that allows the thinner left colon rather than the sigmoid to pass through the anal canal to avoid the guillotine effect of the tone of the sphincter muscle on the colonic stump, especially in morbidly obese patients. This problem was solved in the current study by using gentle anal dilatation to decrease anal tone and its compression effect on the blood supply of the pulled through colon. This issue should be better investigated in future studies.

It seems that coloanal anastomosis could solve this problem, yet coloanal anastomosis is sometimes impossible to perform as in cases of scared anal canal after radiotherapy or pelvic sepsis and is also very difficult in morbidly obese patients. For this situation appears the importance of the short and simple pull-through procedure.

Other minor complications included anal pain (five patients 17.86%) and anal discharge (six patients 21.43%), and all these complications were self-limiting. The continence states were variable, but the study shows marked improvement of the continence state after 6 months.

Conclusion

Salvage Turnbull–Cutait pull-through appears to be a fast and easy procedure and could be offered to patients with complex anastomotic complications. This procedure offers a very easy solution for a very difficult situation. However, the failure rate and the serious complications are questionable.

It could be added to the surgeon's armamentarium as an alternative to the creation of a permanent stoma.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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