Malone Antegrade Continence Enema in Patients with Perineal Colostomy After Rectal Resection

Jin-Hai Wang · Jia-He Xu · Feng Ye · Xiang-Ming Xu ·
Jian-Jiang Lin · Wen-Bin Chen

Received: 23 November 2012 / Accepted: 29 July 2013 / Published online: 29 August 2013
© Association of Surgeons of India 2013

Abstract The objective of this study was to evaluate the value of antegrade continence enema (Malone operation) in abdominoperineal resection (Miles' operation). Between January 2008 and May 2009, five cancer patients (two men and three women) underwent abdominoperineal resection and digestive reconstruction by perineal colostomy and Malone antegrade continence enema in our institution. Their functional results and quality of life were recorded. None of the patients died, but two had wound infections and one experienced urinary retention. Patients performed antegrade enema every 24 h with 2,000 mL of normal saline by themselves. The duration of the enema lasted for an average of approximately 35 min, and fecal contamination was not detected at 24 h. Patient satisfaction was determined to be 88 %. Malone antegrade continence enema associated with abdominoperineal resection and perineal colostomy provided acceptable continence. It preserved the body image of the patients and resulted in a satisfactory quality of life. It is a potential alternative for patients who are not willing to have a permanent colostomy.

Keywords Rectal cancer · Malone antegrade continence enema · Miles operation

Introduction

Abdominoperineal resection with colostomy after Miles' operation is the gold standard for treatment of ultra-low rectal cancer and anal cancer. Patients continue with their lives after tumor

resection; however, removal of the anus causes not only a physical disability but also bowel colostomy abdominal trauma, thus greatly affecting their quality of life. Psychological pressure inhibits patients from participating in the community and socializing and leads them to severe depression. Colostomy is required for patients with low rectal cancer. Perineal colostomy stoma in situ is more acceptable than abdominal stoma to patients, but incontinence becomes a problem for them. Antegrade continence enema was first used in 1990 for the treatment of pediatric refractory fecal incontinence, and it resulted in a good quality of life for those concerned.

We were interested in whether patients with perineal colostomy stoma in situ would benefit from antegrade continence enema. Since January 2008, five patients with ultra-low rectal cancer underwent the following procedures according to their own wishes at the First Affiliated Hospital, College of Medicine, Zhejiang University: Miles' surgical resection of the tumor and anus without creation of an abdominal wall stoma, perineal colostomy, and orthotopic anus operation. Meanwhile, a port serving as a hidden umbilicus for antegrade enema purposes was made approximately 8 cm from the ileocecal transection of the ileum and distal ileum after shaping and proximal end-to-side anastomosis of the ileum cecum was performed. The functional results in and quality of life of the patients were recorded.

Materials and Methods

Patients

Five patients (two men and three women) ranging in age from 27 to 63 years (mean=52.6 years) who underwent abdominoperineal resection and digestive reconstruction by perineal colostomy and Malone antegrade continence enema

J.-H. Wang · J.-H. Xu · F. Ye · X.-M. Xu · J.-J. Lin ·
W.-B. Chen (✉)

Department of Colorectal Surgery, The First Affiliated Hospital,
College of Medicine, Zhejiang University, Hangzhou 310003, China
e-mail: jinhaiwangcn@yeah.net

(MACE) for cancer were selected for this study. These patients did not have distant metastasis and did not undergo chemotherapy, traditional Chinese medicine treatment, and any other adjuvant therapy prior to their surgery. They were subjected to blood stool and rectal examinations. Their tumors were located less than 5 cm from the anal margin. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the ethics Committee of First Affiliated Hospital of Zhejiang University. Written informed consent was obtained from all participants.

Operation

The patients were operated in the same manner. Their tumor and anus were first removed using conventional Miles' operation. An abdominal stoma was not created, but their sigmoid colon and perineal skin were sutured with perineal colostomy to rebuild an orthotopic anus (Fig. 1). An appendectomy was simultaneously performed to prevent postoperative appendicitis from occurring. An ileostomy was then conducted following the method described by Christensen et al. [1]: 8–10 cm of the ileocecal segment was disarticulated (with adjustments in the abdominal wall according to different thickness levels) (Fig. 2); part of the bowel was removed longitudinally with a linear stapler after a 16-F catheter had been inserted into the distal ileum, to rebuild the appendix (Fig. 3); proximal ileum and ileocecal side anastomosis was performed; the umbilicus was cut to the right size; and the rebuilt appendix was pulled out of the stoma across the umbilicus (Fig. 4). The operating time lasted for an average of 4.9 h, of which 1.3 h was allotted for ileostomy (including disinfection of the cecum and terminal ileum). The average blood loss was approximately 400 mL. Lymph node enlargement was apparent during the intraoperative exploration of the mesenteric system in three patients.

Fig. 1 After resection of the tumor and anus using conventional Miles' operation, perineal sigmoidostomy was performed to reconstruct an orthotopic "anus"

Results

General Data

None of the patients died during surgery. Postoperative wound infection occurred in one male patient, but it healed after 3 weeks of dressing treatment. Postoperative urinary retention that gradually improved via indwelling catheterization occurred in two patients; they were discharged after 4 weeks. The average exhaust time was 5 days after the operation, and bowel movement was documented after 2 days of eating. Antegrade continence enema started 9 days after the operation using 2,000 mL of warm saline for 5 days and 1,000 mL thereafter. Two weeks later, the stoma catheter was removed after lavage. After 4 days of lavage therapy, each patient's flushing tube gradually slid into the distal colon with peristalsis, causing it to be inserted too deep. Then, after 2 days of washing, flushed water directly flowed out of the anus without feces, which flowed out after flushing. We thus pulled out the flushing tube and conducted recatheterization for flushing (general information and surgical data for the five patients are shown in Tables 1 and 2).

Follow-up

The maximum postoperative time was 17 months. A male patient went to the hospital after 45 days because of stoma vegetation. Examination revealed that the right side of the umbilicus had a proliferation of granulation tissue measuring approximately 0.4 cm with no significant stoma stenosis and no effect on intubation. This patient did not receive treatment. A patient presented with movement to the vaginal wall after 1 year, was readmitted, and underwent local excision surgery. Two female patients with pathological stage T₃N₁M₀ are currently undergoing intravenous chemotherapy. Each patient

Fig. 2 An appendectomy was performed to prevent postoperative appendicitis. The ileum was transected about 8 to 10 cm away from the ileocecus, according to the distance from the ileocecus to the umbilicus

was followed up by phone monthly, and their outcomes were quantified using a slightly modified Schdl scoring system (Table 3). The results are shown in Table 4.

Discussion

Although surgical techniques have made great progress in recent years, our team pioneered the colon bypass technology [2], which preserves the anus down to 5 cm from it. However, preserving the anus of patients with ultra-low rectal cancer remains challenging, and Miles' operation is still the gold standard for treating ultra-low rectal cancer and anal cancer. Colostomy after Miles' operation changes the normal anatomy and physiology of patients, making daily living difficult for them and thus inhibiting them from participating in social activities as well as subjecting them to severe depression. Although the relevant technology continues to improve ostomy care, which enhances the postoperative quality of life of patients, surgeons should still seek new techniques. Many scholars [3–6] remain persistent in their practice by adopting various methods to reconstruct the anal sphincter and anus in situ. Considering the poor efficacy of treatments and numerous complications, some patients need to be diverted to the

Malone operation to solve their bowel problems by antegrade enema. We have also investigated potential treatments for low rectal cancer by attempting gracilis anal sphincter and gluteus maximus flap anal sphincter reconstructions, but we obtained negative outcomes. Some foreign centers adopt gracilis muscle transplantation to reconstruct the anus with pacemakers, resulting in their spending much time and money with inexpensive antegrade enemas to address defecation. The creation of an artificial anus has been reported with success, with the first case having exhibited the absence of abscess and colonic necrosis. Madoff [7] and other scholars have reported their successful experience with nearly ten cases of artificial anus surgery, but most of these patients will require enemas for their defecation disorders after surgery.

Schmidt [8] first proposed perineal colostomy in 1982, with the surgery aiming to conform to the physiological anatomy of the digestive tract; however, given the lack of bowel and sphincter sensors, it could not control defecation. Nevertheless, Schmidt added that perineal colostomy with retrograde enema effectively controlled incontinence, with its efficiency and patient satisfaction in 1 year being 59 % and approximately 85 %, respectively. Thirty years ago, a patient admitted to our hospital refused to have an abdominal stoma and opted for

Fig. 3 Distal ileum was narrowed by removing part of the intestinal wall

perineal colostomy with retrograde enema. He survives to this day.

MACE was first introduced in 1990 by Malone et al. [9]. It was initially used to treat pediatric refractory fecal incontinence and constipation, including spina bifida, Hirschsprung's disease, and anorectal malformations with significant effects. This technique has since been applied to adults with spinal trauma or neurogenic incontinence. Christensen et al. [10] compared retrograde enema and Malone antegrade enema in adult neurogenic incontinence. They found that the latter type has an effectiveness of 87 %, is simple and non-time consuming, and yields high patient satisfaction, whereas retrograde enema only exhibits an effectiveness of 73 %, is time consuming, and yields low patient satisfaction. Malone antegrade enema can keep the colon empty, and the surgery is simple and effective, has a low incidence of complications, and represents the best way to control incontinence. A number of other scholars [11–15] also found that MACE achieves good results in the management of fecal incontinence. Patients with this special case lack the bowel receptors of the rectum and anal canal, as do those who undergo low rectal perineal colostomy after

Miles' operation. Portier et al. [16] combined Miles' operation, perineal colostomy, and the Malone procedure in 18 patients: they used Miles' operation to remove the tumor and anus as well as perineal colostomy and established the ileocecal stoma as an antegrade enema channel at the same time. However, studies in China have not been reported to date.

Three kinds of antegrade enema stomas are commonly used as the channel: appendix stoma, intestinal ileocecal valve stoma, and ileostomy [1]. Portier et al. [17] compared the appendix stoma with ileostomy and found that the postoperative complications of colostomy, such as stenosis and abscess, are significantly higher in appendix stomas than in ileostomies, the reflux and water leakage are severe when rinsing, and some patients even require ileostomy surgery after appendectomy because of the postoperative complications of appendix stomas. Lawal [18] held that umbilical appendicostomy is feasible using a laparoscopic-assisted approach and significantly reduces the leakage rate. In addition, stomal stenoses may be lessened by a V-to-V umbilical-to-appendix anastomosis. Herndon [19] stated that a colon flap MACE conduit can be a good option when the appendix is not available (such as in appendicovesicostomy,

Fig. 4 An end-to-side ileocecostomy was performed. The narrowed distal ileum and the umbilicus were anastomosed for postoperative gut irrigation

short appendix, shortened mesentery, retrocecal appendix, prior appendectomy, and right hemicolectomy). Lefevre et al. and other scholars [11, 20–22] also compared these three methods,

with their results indicating that ileostomy is the best method. Therefore, we chose ileostomy and followed the specific surgical procedure described by Christensen et al. [1] We also found

Table 1 General data

	Sex	Age	Chief complaint	Rectal examination	Preoperative chemoradiation	Distant metastasis
Case 1	M	55	Bloody stool for 2 months	Lesions located in the anterior rectal wall, about 3 cm away from the anal margin, fixed, involvement one half of the intestinal wall	No	No
Case 2	M	55	Defecation frequency increased and bloody stool for 5 months	Lesions is about 3 cm away from the anal margin, movable, involvement two thirds of the intestinal wall	No	No
Case 3	F	63	Bloody stool for 10 days	Cauliflower-like tumor about 3 cm in diameter can be palpated in anal canal	No	No
Case 4	F	63	Anal pain for 1 week	Mass about 2 cm in diameter can be palpated in anal canal	No	No
Case 5	F	27	Bloody stool for 2 weeks	Lesions is about 4 cm from the anal margin, movable, involvement one half of the intestinal wall	No	No

Table 2 Operation data

Case	Operation time (h)	Ileostomy time (h)	Intraoperative blood loss (mL)	Intraoperative anesthesia	Lymph node metastasis
Case 1	5.5	2	370	satisfied	No
Case 2	5	1.5	440	satisfied	No
Case 3	5	1.5	380	satisfied	Exist
Case 4	5	1.5	500	satisfied	Exist
Case 5	5	1.5	280	satisfied	Exist

that the stoma automatically shuts down when the flushing tube is removed after lavage based on the anti-reflux effect of the ileocecal valve and that basically there will be no fecal spill, which are much better than the results observed for the appendix stoma.

Lefevre et al. [11] kept the catheter placed on the location of the stoma in operation for 3 weeks and started antegrade continence enema after 2 weeks by rinsing with tap water in the range of 500–1,000 mL. Portier et al. [16] started retrograde enema 5 days after the operation with 500–1,000 mL of water for 4 days and then initiated antegrade continence enema. We started antegrade continence enema 9 days after

Table 4 Malone antegrade continence enema evaluation form of five patients

Patients	Score	Satisfaction (%)
Case 1	23	92
Case 2	21	84
Case 3	22	88
Case 4	21	84
Case 5	23	92
Average	22	88

the operation using 2,000 mL of warm saline for 5 days and then 1,000 mL thereafter. Two weeks after the operation, we removed the catheter in the stoma after lavage. During lavage (30 min on average), the five patients did not experience any discomfort; at 24 h, they discharged liquid stool.

Portier et al. [12] reported that ileostomy is a simple operation whose total operating time does not increase much but that it is associated with such complications as stoma stenosis and reflux leakage when flushing. By contrast, we found that the total operating time increased by one third more than that of traditional surgery, which can be attributed to the lack of skills of the surgeons, the temporary steps that had to be considered (e.g., disinfection of ileocecal and terminal ileum and catheter placement and fixation), and the need for an additional appendectomy. Complications in our patient group will be followed up over the long term.

Current anal sphincter preservation technology in rectal cancer continues to progress, and many patients with ultra-low rectal cancer have benefitted from coloanal anastomosis technology. However, we believe that more focus should be given to quality of life rather than to the rate of anal sphincter preservation to determine the success of tumor treatment. The postoperative quality of life of patients with coloanal anastomosis will not be all satisfactory, perhaps because a uniform standard to evaluate the quality-of-life outcomes of coloanal anastomosis, traditional Miles' operation, and the new version of Miles' operation does not exist. Therefore, whether the modified operation described herein is comparable with the conventional one remains unknown. Despite this, compared with the traditional operation, the new version of Miles' operation not only can eliminate both physical and psychological suffering but also may significantly reduce health care costs (with its annual postoperative cost being 100 RMB compared with that of approximately 3,000 RMB for colostomy bags alone under traditional Miles' operation). Advances in biotechnology, microelectronics, and intelligent technology will potentially ensure the success of the use of artificial anal sphincters and rebuilding the anus in situ. For now, MACE associated with abdominoperineal resection and perineal colostomy is still the best choice for patients with ultra-low rectal cancer who are not agreeable to a permanent abdominal stoma.

Table 3 Malone antegrade continence enema evaluation form (revised Schdl score)

Standard	Score
Postoperative fecal pollution	
None	10
Less than once per month	8
Less than once per week	6
Less than once per day	4
More than once per day	2
Intubation time	
Immediately	5
Less than 5 min	4
Less than 10 min	3
Less than 15 min	2
More than 15 min	1
Flushing time	
Less than 30 min	5
Less than 45 min	4
Less than 60 min	3
Less than 90 min	2
More than 90 min	1
Impact on daily life	
Very convenient	5
Convenient	4
Slight inconvenience	3
Inconvenience	2
Very inconvenience	1

Total score is 25 points.
The higher the score, the more satisfactory the results are

References

- Christensen P, Buntzen S, Krogh K, Laurberg S (2001) Ileal neoappendicostomy for antegrade colonic irrigation. *Br J Surg* 88:1637–1638. doi:[10.1046/j.0007-1323.2001.01959.x](https://doi.org/10.1046/j.0007-1323.2001.01959.x)
- Ye F, Wang D, Xu X, Liu F, Lin J (2008) Use of intracolonic bypass secured by a biodegradable anastomotic ring to protect the low rectal anastomosis. *Dis Colon Rectum* 51:109–115. doi:[10.1007/s10350-007-9144-9](https://doi.org/10.1007/s10350-007-9144-9)
- Sato T, Konishi F, Kanazawa K (1997) Anal sphincter reconstruction with a pudendal nerve anastomosis following abdominoperineal resection: report of a case. *Dis Colon Rectum* 40:1497–1502
- Madoff RD, Rosen HR, Baeten CG et al (1999) Safety and efficacy of dynamic muscle plasty for anal incontinence: lessons from a prospective, multicenter trial. *Gastroenterology* 116:549–556. doi:[10.1016/S0016-5085\(99\)70176-9](https://doi.org/10.1016/S0016-5085(99)70176-9)
- Rouanet P, Senesse P, Bouamrine D, Toureille E, Veyrac M, Astre C, Bacou F (1999) Anal sphincter reconstruction by dynamic graciloplasty after abdominoperineal resection for cancer. *Dis Colon Rectum* 42:451–456. doi:[10.1007/BF02234165](https://doi.org/10.1007/BF02234165)
- Rullier E, Laurent C, Zerbib F, Garrelon JL, Caudry M, Saric J (1998) Anorectal reconstruction by coloanal anastomosis and dynamic double graciloplasty after abdominoperineal resection [in French]. *Ann Chir* 52:905–912
- Madoff RD, Baeten CG, Christiansen J et al (2000) Standards for anal sphincter replacement. *Dis Colon Rectum* 43:135–141. doi:[10.1007/BF02236969](https://doi.org/10.1007/BF02236969)
- Schmidt E (1982) The continent colostomy. *World J Surg* 6:805–809. doi:[10.1007/BF01655382](https://doi.org/10.1007/BF01655382)
- Malone PS, Ransley PG, Kiely EM (1990) Preliminary report: the antegrade continence enema. *Lancet* 336:1217–1218
- Christensen P, Kvitzau B, Krogh K, Buntzen S, Laurberg S (2000) Neurogenic colorectal dysfunction—use of new antegrade and retrograde colonic wash-out methods. *Spinal Cord* 38:255–261. doi:[10.1038/sj.sc.3100991](https://doi.org/10.1038/sj.sc.3100991)
- Lefevre JH, Parc Y, Giraudo G, Bell S, Parc R, Tiret E (2006) Outcome of antegrade continence enema procedures for faecal incontinence in adults. *Br J Surg* 93:1265–1269. doi:[10.1002/bjs.5383](https://doi.org/10.1002/bjs.5383)
- Mattix KD, Novotny NM, Shelley AA, Rescorla FJ (2007) Malone antegrade continence enema (MACE) for fecal incontinence in imperforate anus improves quality of life. *Pediatr Surg Int* 23:1175–1177. doi:[10.1007/s00383-007-2026-3](https://doi.org/10.1007/s00383-007-2026-3)
- Hoekstra LT, Kuijper CF, Bakx R, Heij HA, Aronson DC, Benninga MA (2011) The Malone antegrade continence enema procedure: the Amsterdam experience. *J Pediatr Surg* 46:1603–1608. doi:[10.1016/j.jpedsurg.2011.04.050](https://doi.org/10.1016/j.jpedsurg.2011.04.050)
- Ok JH, Kurzrock EA (2011) Objective measurement of quality of life changes after ACE Malone using the FICQOL survey. *J Pediatr Urol* 7:389–393
- Bani-Hani AH, Cain MP, Kaefer M, Idrum KK, King S, Johnson CS, Rink RC (2008) The Malone antegrade continence enema: single institutional review. *J Urol* 180:1106–1110
- Portier G, Bonhomme N, Platonoff I, Lazorthes F (2005) Use of Malone antegrade continence enema in patients with perineal colostomy after rectal resection. *Dis Colon Rectum* 48:499–503. doi:[10.1007/s10350-004-0802-x](https://doi.org/10.1007/s10350-004-0802-x)
- Portier G, Ghouti L, Kirzin S, Chauffour M, Lazorthes F (2006) Malone antegrade colonic irrigation: ileal neoappendicostomy is the preferred procedure in adults. *Int J Color Dis* 21:458–460. doi:[10.1007/s00384-005-0031-3](https://doi.org/10.1007/s00384-005-0031-3)
- Lawal TA, Rangel SJ, Bischoff A, Peña A, Levitt MA (2011) Laparoscopic-assisted Malone appendicostomy in the management of fecal incontinence in children. *J Laparoendosc Adv Surg Tech A* 21:455–459. doi:[10.1089/lap.2010.0359](https://doi.org/10.1089/lap.2010.0359)
- Herndon CD, Cain MP, Casale AJ, Rink RC (2005) The colon flap/extension Malone antegrade continence enema: an alternative to the Monti–Malone antegrade continence enema. *J Urol* 174:299–302. doi:[10.1097/01.ju.0000161215.67278.99](https://doi.org/10.1097/01.ju.0000161215.67278.99)
- Chéreau N, Lefèvre JH, Shields C, Chafai N, Lefrançois M, Tiret E, Parc Y (2011) Antegrade colonic enema for faecal incontinence in adults: long-term results of 75 patients. *Color Dis* 13:e238–e242. doi:[10.1111/j.1463-1318.2011.02651.x](https://doi.org/10.1111/j.1463-1318.2011.02651.x)
- Worsøe J, Christensen P, Krogh K, Buntzen S, Laurberg S (2008) Long-term results of antegrade colonic enema in adult patients: assessment of functional results. *Dis Colon Rectum* 51:1523–1528. doi:[10.1007/s10350-008-9401-6](https://doi.org/10.1007/s10350-008-9401-6)
- Chatoorgoon K, Pena A, Lawal T, Hamrick M, Loudon E, Levitt MA (2011) Neoappendicostomy in the management of pediatric fecal incontinence. *J Pediatr Surg* 46:1243–1249. doi:[10.1016/j.jpedsurg.2011.03.059](https://doi.org/10.1016/j.jpedsurg.2011.03.059)