

Preliminary report: the antegrade continence enema

P. S. MALONE P. G. RANSLEY E. M. KIELY

The principles of antegrade colonic washout and the Mitrofanoff non-refluxing catheterisable channel were combined to produce a continent catheterisable colonic stoma. The intention was that antegrade washouts delivered by this route would produce complete colonic emptying and thereby prevent soiling. The procedure has been successfully carried out in five patients with intractable faecal incontinence.

Lancet 1990; **336**: 1217–18.

Introduction

Congenital abnormalities, such as spina bifida, imperforate anus, and Hirschsprung's disease, and abnormalities that follow spinal injury, repeated pelvic surgery, or any operation on the rectum or anus have the potential to produce faecal incontinence. Treatment consists of training to establish a regular bowel habit, control of stool consistency by diet and drugs, and the use of purgatives or enemas to produce regular colonic emptying. Operative measures, such as sphincter reinforcement with muscle slings, are also used but they are of little benefit for incontinence of neuropathic origin. Shandling and Gilmour¹ reported high success rates with an enema continence catheter which administers large-volume saline enemas retrogradely. A small number of patients remain incontinent despite all attempted treatments and opt for a permanent colostomy.

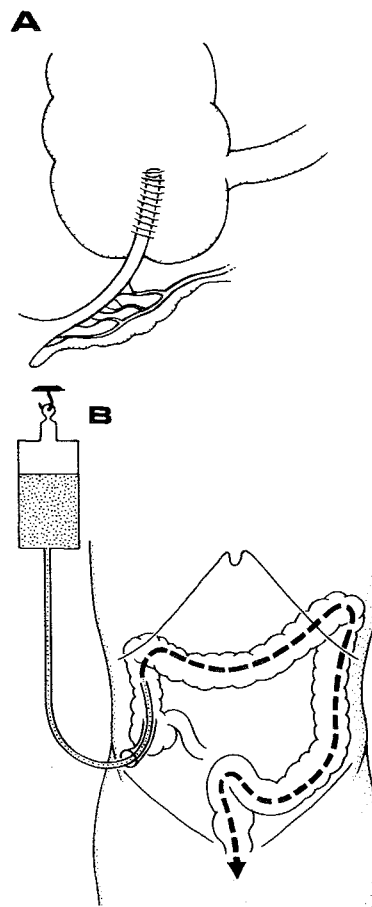
We describe here a new operative technique that facilitates the administration of antegrade washouts to empty the colon and thus prevent soiling—the antegrade continence enema (ACE). The principle of the procedure is that the appendix is reimplanted in a non-refluxing manner into the caecum and the other end is brought out on the abdominal wall as a continent stoma. This procedure provides a catheterisable channel through which antegrade washouts are given to produce colonic emptying (see figure).

Patients and methods

Since October, 1989, ACE has been used in five patients, who have been followed up for 2–8 months (table 1). In four patients (1, 2, 4, 5) the procedure was carried out in conjunction with bladder reconstructive surgery for urinary incontinence. Every effort had been made to control faecal incontinence, including repeat pull-through procedures and pelvic floor surgery for the two patients with anorectal malformation. The new technique was used as the last resort in patients who would otherwise have undergone colostomy formation.

Preoperative bowel preparation and prophylactic antibiotics are recommended. A right iliac fossa gridiron incision is used, but if additional procedures are to be done, a laparotomy is required. The caecum and appendix are delivered from the wound, and the blood supply to the appendix is carefully preserved. The appendix is then resected on its vascular pedicle, with a generous cuff of caecum left at its base. The caecal defect is closed and the distal end of the appendix is amputated. At this stage it is important to check the patency of the appendix lumen by passage of a catheter through it. A 5 cm long submucosal tunnel is fashioned by sharp dissection through one of the taenia on the caecum, and the mucosa of the

bowel is opened at its distal end. The appendix is reversed and its distal end is anastomosed to the mucosal opening in the caecum by means of absorbable sutures. The appendix is placed in the submucosal tunnel and the seromuscular layers of the caecum are closed over it, thus creating a non-refluxing channel (figure, A)—the Mitrofanoff principle.² The site of the stoma is marked on the abdominal wall before operation and the appendix is now delivered through this site. The caecum is anchored to the anterior abdominal wall, with no kinking of the appendix. The stoma is fashioned by means of a broad-based lateral skin flap that is made into a tube and anastomosed to the cuff of caecum on the base of the appendix. This flap serves to bury the appendix and minimise discharge on the abdominal wall. The resulting non-refluxing continent stoma provides access to the proximal colon by way of a narrow catheterisable channel. A catheter is left in situ for 2–3 weeks to prevent kinking of the channel, but washouts can be started after 10 days without removal of the catheter (figure, B).



Non-refluxing appendicocaecostomy (A) and ACE principle (B).

For washout a bag of irrigation saline is hung above the toilet and is delivered by way of an intravenous giving set. It is also possible to use tap water with one (5 ml) teaspoonful of salt per pint (0.5 l)

ADDRESSES: **Wessex Regional Centre for Paediatric Surgery, Southampton General Hospital** (P. S. Malone, FRCSI), and Departments of Urology (P. G. Ransley, FRCS) and **Paediatric Surgery** (E. M. Kiely, FRCS), **Hospitals for Sick Children, Great Ormond Street, London, UK.** Correspondence to Mr P. S. Malone, Wessex Regional Centre for Paediatric Surgery, General Hospital, Tremona Road, Southampton SO9 4XY, UK.

TABLE I—CLINICAL DETAILS OF PATIENTS

Patient	Sex	Age (yr)	Diagnosis
1	F	18	Myelomeningocele
2	F	12	Cloacal anomaly
3	F	8	Imperforate anus
4	F	9	Myelomeningocele
5	F	8	Myelomeningocele

TABLE II—WASHOUT REGIMENS AND RESULTS

Patient	Washout	Maximum time taken (min)	Frequency (h)	Leakage
1	Phosphate enema; 400 ml saline	30	48	None
2	Phosphate enema	25	48	None
3	Half phosphate enema; 300 ml saline	20	48	None
4	Phosphate enema; 80 ml saline	20	48	Slight after 24 h
5	Half phosphate enema; 200 ml saline	30	72	Slight after 36 h

administered by means of sets used to give barium enemas. The patient sits on the toilet and catheterises the caecum and the ACE is then given. The regimens used by our patients are described in table II.

Results

We encountered no serious operative difficulties or postoperative morbidity as a result of ACE. For the first two patients we did not make a skin tube (as described above) for the stoma. Both were troubled with mucous discharge. One required stomal dilatations and, though she may require a revision of the stoma in the future, she is continuing to catheterise. The remaining three patients have skin tubes and have had no difficulties with mucous discharge or stomal complications. All stomas are continent of faeces and flatus. It was difficult to establish appropriate regimens for washout, but by a process of trial and error each patient developed her own individual protocol (table II). Although some patients still have slight rectal leakage of faecal fluid there is unanimous agreement that the ACE has had a major effect in controlling their incontinence and in changing their lives for the better.

Discussion

This operative technique has its foundation in accepted surgical practice. Hewitt and colleagues³ described whole gut irrigation as the preparation of choice for large-bowel surgery and Muir⁴ described colonic preparation by intraoperative antegrade colonic washouts delivered by way of a tube caecostomy. Dudley and Radcliffe^{5,6} reassessed the technique of "on-table" antegrade colonic washouts and described successful bowel cleansing in 64 patients. Shandling and Gilmour¹ reported high success rates with an enema continence catheter for delivery of large-volume saline washouts in a retrograde manner to patients with spina bifida. This experience supports the concept that the administration of large-volume total colonic washouts can produce complete bowel emptying and thus prevent soiling. However, in our experience some patients with spina bifida are unable to cope with retrograde enemas because of immobility and lax perineal muscles. Many patients with faecal incontinence undergo repeated operations for imperforate anus and the scarred, sensitive perineum and

anal canal make the use of retrograde enemas difficult. It is in these groups that antegrade washouts would be particularly valuable but no technique for their administration has been available.

In 1980 Mitrofanoff² described the use of the appendix implanted in a non-refluxing fashion into the bladder to provide a continent catheterisable channel through which the bladder could be emptied. This technique has gained widespread acceptance for the management of urinary incontinence. We could see no reason why the same principles could not be applied to faecal incontinence.

Our initial experience of the technique in five patients is encouraging. Only one patient has had difficulties with stomal stenosis that required dilatation and will probably need a revision in the future. The other problem associated with the stoma was mucous discharge, but it has largely been controlled by the skin tube technique described here, as is found in urological practice with larger numbers of patients. We would not expect serious stoma troubles based on the long-term experience of patients with urinary tract Mitrofanoff reconstructions. We encountered many early difficulties with the large-volume antegrade washouts as the colon was cleared of residual faecal masses which had not been dislodged by conventional bowel preparation. In one patient who was severely constipated, saline refluxed through the ileocaecal valve and caused abdominal distension and pain. With the use of washouts alone most patients had leakage of faecal fluid from the rectum for long periods after administration. We have now adopted an individual approach for each patient through trial and error. Each individual regimen largely consists of the initial antegrade administration of a phosphate enema followed by smaller volumes of saline lavage.

The technique was used only when all other attempts to control incontinence had failed and the only remaining option was colostomy. Each patient is delighted with the result. They find the technique of catheterisation acceptable and easy to carry out. The enemas and washouts are given while the patient is sitting on the toilet so a wheelchair-bound patient can carry out the procedure alone and thus become completely independent. The maximum time taken in our experience is 30 min every other day—a small price to pay to be clean and to avoid a permanent colostomy. As our experience grows and long-term results become available the indications for this operation may become less restricted and the ACE may replace other methods as the treatment of choice for faecal incontinence. The ACE can be carried out by itself or in combination with surgery for urinary incontinence, as in four of our patients. It is important that this surgery is carefully planned in advance.

Though the numbers are still small and our follow-up is short, we believe the ACE offers hope to people with intractable faecal incontinence, whether children or adults.

REFERENCES

1. Shandling B, Gilmour RF. The enema continence catheter in spina bifida: successful bowel management. *J Pediatr Surg* 1987; **22**: 271-73.
2. Mitrofanoff P. Cystostomie continente trans-appendiculaire dans le traitement des vessies neurologiques. *Chr Pediatr* 1980; **21**: 297-305.
3. Hewitt J, Rigby J, Reeve J, Cox AG. Whole gut irrigation in preparation for large-bowel surgery. *Lancet* 1973; **ii**: 337-40.
4. Muir EG. Safety in colonic resection. *Proc R Soc Med* 1968; **61**: 401-08.
5. Dudley HAF, Radcliffe AG, McGeehan D. Intraoperative irrigation of the colon to permit primary anastomosis. *Br J Surg* 1980; **67**: 80-81.
6. Radcliffe AG, Dudley HAF. Intraoperative antegrade irrigation of the large intestine. *Surg Gynecol Obstet* 1983; **156**: 721-23.