

After the Honeymoon—Medium-Term Outcome of Antegrade Continence Enema Procedure

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Purpose: The aim of this study was to determine medium-term outcomes of the antegrade continence enema (ACE) procedure.

Methods: A retrospective casenote review plus telephone questionnaire was conducted. The study was performed at a regional paediatric surgical centre. The subjects were consecutive children undergoing the ACE procedure over a 5 year period. Main outcome measures were use of the ACE; reversal rates; complications, ease of use, effectiveness, and satisfaction scores. Data are expressed as median (range).

Results: Thirty-two (52%) of 62 children undergoing the ACE procedure were girls. The age at the time of operation was 11.5 (3.8 to 17.6) years. Underlying diagnoses included spina bifida (n = 31), anorectal malformations (n = 15), slow-transit constipation (n = 9), Hirschsprung's disease (n = 2), sacral agenesis (n = 2), and trauma/tumour (n = 2). Median follow-up was 5.4 (3.25 to 8.25) years. Eleven of 62 (18%) children were no longer using the ACE (n = 5) or had it surgically reversed (n = 6; 14.1 ± 9.3 months postprocedure). Reasons for disuse/reversal were lack of effectiveness (n = 4), complications (n = 2), noncompliance (n = 3), independent continence (n = 1), and pain (n = 1). Five (8%)

children currently have a colostomy. Gender ($P = .31$; Fisher's Exact), age (Pearson), and underlying diagnoses ($P = .07$, χ^2) were not predictors of failure. Overall, stomal stenosis was the most common complication, affecting 26 of 62 (41%) children. Of 32 questionnaire respondents to linear scores, ease of use was rated as 2 (0 to 8, 0, very easy; 10, very difficult), discomfort on use as 3 (0 to 9; 0, no pain; 10, very painful), overall satisfaction as 9 (0 to 10; 0, completely dissatisfied; 10, completely satisfied). Eighty-four percent were completely continent or had soiling less than once a month. There was a significant correlation between the level of continence and satisfaction with the procedure ($P = .04$; Pearson).

Conclusions: The ACE procedure offers significant benefits to some children with incontinence or intractable constipation. However, it is not universally successful, and other continence promoting strategies may need to be considered. *J Pediatr Surg* 38:65-68. Copyright 2003, Elsevier Science (USA). All rights reserved.

INDEX WORDS: Antegrade continence enema, faecal incontinence, outcomes.

THE ANTEGRADE CONTINENCE enema (ACE) was described in 1990 and since then has been adopted widely in the treatment of intractable faecal incontinence of variable aetiology in both children and adults.¹ Early reports have shown it to be a safe, effective procedure although not without significant problems such as stenosis, leakage, prolapse of the stoma, and abdominal pain. Previously, we have shown an high initial success rate (80%) in a large cohort of 40 patients treated at our hospital.² The objective of this study was to report the medium-term outcome on an extended group of these patients and to examine the causes for treatment failure.

MATERIALS AND METHODS

Consecutive children with faecal incontinence undergoing the ACE procedure from 1993 to 1998 at Alder Hey Children's Hospital were included in the study. All children had not responded to nonoperative bowel management strategies including laxatives, enemas, manual evacuations, and high rectal washouts. Children and parents were counselled by a stoma nurse specialist (PC) and a consultant paediatric surgeon before the procedure.

Operative Technique

All patients had routine bowel preparation as described previously.² Prophylactic antibiotics (cefotaxime and metronidazole) were administered perioperatively. Initially, the appendix was reimplanted orthotopically into the caecum with a submucosal tunnel to ensure that it was nonrefluxing.² Subsequently, the approach was modified to simple appendicostomy, imbricating the caecum around the base of the appendix with interrupted sutures. A skin flap was fashioned at the appendicocutaneous junction to create a wide cutaneous stoma that could be catheterised easily. A tubularized lateral caecal flap was fashioned in children whose appendix had been removed or used in a urologic procedure. Postoperatively, an indwelling SILASTIC® (Dow Corning, Midland, MI) Foley 10 to 12F catheter was left for at least 2

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weeks, after which intermittent catheterization was commenced. In some cases in which intermittent catheterization proved impracticable a Mickey button (Bard Inc, Murray Hill, NJ) was used as an indwelling device.

Outcome Measures

Main outcome measures were a case note review to determine the use of the ACE and a questionnaire to determine (1) ease of use, (2) effectiveness (soiling), and (3) patient satisfaction by the use of linear analogue scoring.³ In addition, questionnaire respondents (the child or the parents if the child was too young or unable) were grouped according to the degree of faecal continence: soiling several times per day, 1 to 2 times daily, few times per week, few times per month, occasionally or always clean. The mean time taken to perform antegrade washout and the type and volume of solution used also were measured.

Statistical Analysis

Data were analysed using SPSS for Windows (v10.0.7; SPSS, Chicago, IL) and Prism (Graphpad software, San Diego, CA). Fisher's Exact, χ^2 , and Pearson's correlation coefficient were used as appropriate. *P* value less than .05 was considered significant. Data are presented as median (range) unless otherwise indicated.

RESULTS

Demographics

Sixty-two children underwent the ACE procedure during the study period. The underlying diagnoses leading to intractable incontinence are listed in Table 1. Children with spina bifida accounted for half of all procedures and slow-transit constipation (as defined by radio-opaque bead transit studies⁴) was the second most common indication. The gender ratio was almost equal (male to female, 30:32). The median age at which the procedure was performed was 11.5 (3.8 to 21.4) years. The median follow-up period was 5.4 (3.25 to 8.25) years.

Quantitative Outcomes

Stoma use. Of the 62 children studied, 11 (18%) no longer were using the ACE stoma (*n* = 5) or had it surgically reversed (*n* = 6). Reasons for disuse or reversal were lack of effectiveness (*n* = 4), complications (*n* = 2; retraction and leakage respectively), noncompliance (*n* = 3), independent continence (*n* = 1) in a patient who had spina bifida, and pain (*n* = 1). Five (8%) children currently have a colostomy, of whom, 3 had spina bifida, one had an anorectal malformation, and one

Table 1. Summary of Diagnoses Leading to Extractable Faecal Incontinence/Constipation

Diagnosis	No. (%)
Spina bifida	31 (50.0)
Anorectal malformations	15 (24.1)
Slow transit constipation	9 (14.5)
Hirschsprung's disease	2 (3.2)
Sacral agenesis	2 (3.2)
Trauma/tumour	2 (3.2)

Table 2. Incidence and Type of Complications After the Antegrade Continence Procedure

Complication	No. (%)
Stomal stenosis	26 (41.9)
Stomal prolapse	4 (6.5)
Significant abdominal pain	7 (11.3)
Caecal perforation	1 (1.6)
Faecal fistula	1 (1.6)
Psychological (self-image)	1 (1.6)
Cosmetic (scar)	1 (1.6)

had colonic hypomotility. Gender (*P* = .31; Fisher's Exact), age at time of ACE (*P* = .15; Pearson), underlying diagnoses (*P* = .07; χ^2), and the possibility of a learning curve as reflected by the year in which the procedure was performed (*P* = .13; Pearson) were not predictors of failure.

Complications. There were 41 complications in 35 of 62 (57%) children (Table 2). The most common complication was stomal stenosis affecting 26/62 (41%) children. All but one of these children (25/26) underwent stomal dilatation, and 14 required V-Y plasty revisions. Four patients had stomal prolapse requiring revision. Four children needed a further laparotomy; one because of faecal fistula, one because of caecal perforation after a difficult catheterization, and 2 because of persistent leakage.

Qualitative Outcome—Questionnaire Study

Thirty-three of 51 (65%) patients still using the ACE stoma were contacted to evaluate qualitative outcome. One family refused to participate. Of 32 questionnaire respondents to linear scores of 0 to 10, ease of use was rated as 2. Scores given were from 0 to 8 (0, very easy; 10, very difficult). Discomfort on use was noted with scores ranging from 0 to 9 (0, no pain; 10, very painful). The median time taken to perform the enema was 53 minutes (15 minutes to 3 hours). The median volume used was 550 (50 to 1,000) mL. The majority of patients (20; 62.5%) used a phosphate enema combined with saline; 4 used 0.9% saline solution alone, one used a phosphate enema alone, and 7 used other solutions, notably Klean-prep (Norgine, England), Picolax (Ferring Pharmaceuticals, England), or Fletcher's solution (Pharmax, England). Six (19%) of children opted to have an indwelling Foley catheter and 3 a Mickey button device (9%).

Within the questionnaire group, 18 (56%) children experienced problems with their stoma. Six (19%) patients had stomal stenosis requiring reoperation, 8 (25%) experienced leakage, 3 (9%) suffered stomal bleeding/irritation, one child had pain during use, and another had a wound infection. There was no correlation between the incidence of complications and type of procedure per-

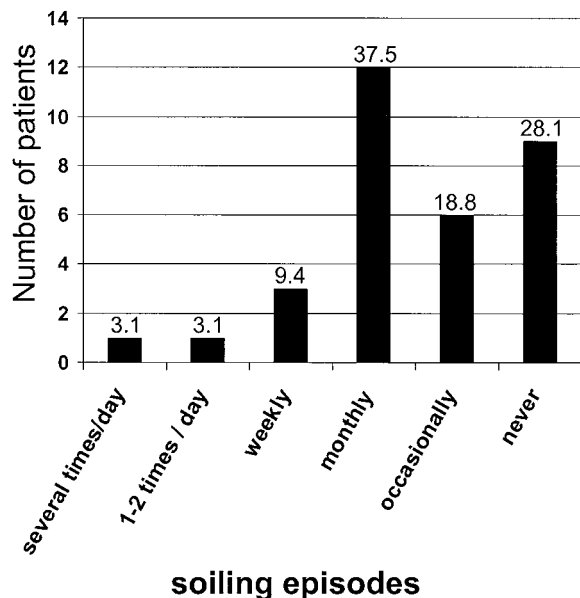


Fig 1. Frequency of faecal soiling after the antegrade continence enema procedure. Values above each bar are percentages.

formed or outcome as determined by frequency of soiling (Pearson; $P = .501$) or qualitative satisfaction (Pearson, $P = .293$). The presence of an indwelling catheter had no influence on the incidence of problems (Fisher's Exact; $P = .69$; 66% with catheter v 52% without catheter).

The outcome as expressed by frequency of soiling is expressed in Figure 1. Eighty-four percent of patients soiled infrequently as defined as less than one episode of soiling per month. The median satisfaction score was 9, range 0 to 10 (0, completely dissatisfied; 10, completely satisfied). There was a significant correlation between level of continence and satisfaction with the procedure ($P = .04$, Pearson).

DISCUSSION

Previously, we and others have shown a high early success rate after formation of an ACE stoma for faecal incontinence and constipation secondary to a wide range

of conditions.^{2,5-7} In this study we have found that in the majority of patients (84%) the ACE procedure is an effective medium-term measure both in terms of patient satisfaction and in objective measures of faecal continence. As such, it represents a significant advance in the treatment of these patients.⁸

Medium-term follow-up has shown that there is a significant minority in whom the ACE procedure is not effective or is only required for short-term use. We were unable to identify any predictors of failure in this study, perhaps because of the diverse reasons why the ACE failed. However, we have found previously that wheelchair-bound children with myelomeningocele have a poorer outcome (50% continence) than non-wheelchair bound children.² It is noteworthy that ineffectiveness and noncompliance were the most common reasons for failure. Psychological factors may play a role but were not addressed in this study. Although age was not a predictive factor overall, the ACE failed in the youngest child (3.8 years) on whom the procedure was performed because of noncompliance by the child subsequently aided and abetted by his parents. Care should be exercised when contemplating the operation in young children. Abdominal pain during the antegrade enema also is a common problem of uncertain aetiology in that in one patient it led to nonuse of the ACE. One advantage of the ACE is the ease with which it can be reversed if required.

Among patients still using the ACE, the procedure is associated with a high degree of satisfaction related to excellent levels of continence. For these good results to be achieved, it is essential for a stoma therapist/continence advisor to provide advice and support in the months after surgery, because considerable experimentation with different irrigation solutions may be required before the optimal management protocol for an individual is found. During the preoperative counselling period, children and parents should be warned of the high incidence of complications such as stomal stenosis that may require further surgical intervention.

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Discussion

Mr Stewart (Nottingham, England): The simplest way to prevent the problem of stenosis is by the insertion of a button gastrostomy. I would recommend that ACE procedures are performed laparoscopically with the simultaneous insertion of a button, and that has worked very well for me. Have you any experience of this?

R. Dey (response): The laparoscopic method is being thought of but has not yet started at our Institute. It is certainly in the pipeline. Yes, I do agree with you, although daily catheterization of the stoma, if not daily washout, also is suggested as a way around it.

Mr Jaffray (Newcastle, England): It is always nice to see a report that confirms your own prejudices, so I congratulate you on this report. I think one thing that should be emphasised is that the single biggest thing that predicts success is a dedicated stoma nurse with a particular interest in this problem. I have found this to be invaluable, and I do not think the service would work without this. I would like to know what your experience in Alder Hey is with a dedicated stoma nurse.

R. Dey (response): I agree with you absolutely, and, at Alder Hey, we have the services of an excellent stoma nurse. She is the major lynchpin in the pre- and postoperative period. This is because a lot of the children have trouble, not only with getting used to the idea but also to particular technical aspects like washout regimes, particularly frequency of washouts, and these are things that require extensive trial and error and patience, and the stoma nurse is invaluable here. She is the major communicator with the children.

A. Holschneider (Cologne, Germany): You did give us a relationship between your primary diagnosis and the outcome. If you do not have any motility in your colon and slow transit, then your procedure cannot work, so it would be very interesting to know if there was any relationship.

R. Dey (response): This result has not been shown in this particular study, but we did find that there was no significant correlation between the initial diagnosis and the success or satisfaction of the stoma later on.