Journal of Pediatric Surgery (2011) 46, 1236–1242

ELSEVIER

Journal of Pediatric Surgery

www.elsevier.com/locate/jpedsurg

The appendix as a conduit for antegrade continence enemas in patients with anorectal malformations: lessons learned from 163 cases treated over 18 years☆

Shawn J. Rangel[a,*], Taiwo A. Lawal[b], Andrea Bischoff[b], Kaveer Chatoorgoon[b], Emily Louden[b], Alberto Peña[b], Marc A. Levitt[b]

[a]*Department of Pediatric Surgery, Children's Hospital Boston, Harvard School of Medicine, Boston, MA 02115, USA*
[b]*Colorectal Center for Children, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA*

Received 19 March 2011; accepted 26 March 2011

Key words:
Fecal incontinence;
Anorectal malformation;
Imperforate anus;
Bowel management;
Antegrade continence enema;
Appendicostomy

Abstract

Introduction: The antegrade continence enema (ACE) has been shown to be a safe and effective method for managing fecal incontinence in the pediatric population. The purpose of this study was to examine our experience with the ACE procedure using the appendix as a catheterizable conduit in children with anorectal malformations (ARMs).

Methods: We reviewed the charts of all patients who underwent an ACE procedure using the appendix as a catheterizable conduit between January 1992 and January 2010. Preoperative diagnosis (ARM type), operative details, functional outcomes, and postoperative complications were assessed. Technical modifications over time included selective cecoplication, implementation of the umbilical V-V appendicoplasty technique, and laparoscopy for cecal mobilization.

Results: Mean age was 9.9 ± 0.6 years, and 67% were male. The most common preoperative diagnosis was rectourethral fistula in boys (39%) and persistent cloaca in girls (61%). Forty-five complications occurred in 41 patients with an overall incidence of 25.6% (stricture, 18%; leakage, 6%; prolapse, 4%; intestinal obstruction, 0.6%). The incidence of stomal leakage was lower in patients when a cecoplication was performed (2.9% [4/138] vs 29.4% [5/17]; $P < .01$), and the incidence of stricture was lower in patients when the umbilical anastomosis was created using the V-V appendicoplasty technique (11% [11/100] vs 30% [18/60]; $P < .01$). Successful management of incontinence was reported by 96% of all patients.

Conclusions: The ACE procedure using the umbilical V-V appendicoplasty provides an effective and cosmetically superior means for bowel management in children with ARMs. The rate of late complications is not insignificant however, and preventative strategies should focus on careful operative technique and ensuring compliance with catheterization protocols well past the initial postoperative period.

The antegrade continent enema (ACE) procedure was first described by Malone nearly 30 years ago and has revolutionized the management of fecal incontinence in children with a variety of underlying conditions [1-3]. A

☆ Presented at the Annual Meeting of the AAP Surgical Section, October 2-5, 2010, San Francisco, CA.

* Corresponding author.
E-mail address: shawn.rangel@childrens.harvard.edu (S.J. Rangel).

0022-3468/$ – see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.jpedsurg.2011.03.060

multitude of clinical reports have since demonstrated the procedure to be safe and highly efficacious, with most contemporary series reporting successful bowel management in more than 90% of patients [1,4-12]. To date, however, relatively little has been published regarding functional outcomes and complication profiles specific to children with anorectal malformations (ARMs). The goal of this study was to examine our experience with the ACE procedure using an appendiceal conduit in the management of fecal incontinence in this patient population.

1. Methods

Following institutional review board approval (CCMC IRB# 2009-1512), we reviewed the charts of all patients with ARMs from 2 children's hospitals who underwent an ACE procedure using an appendiceal conduit between January 1992 and January 2010. All procedures were performed by 1 of 2 surgeons (AP or MAL). Preoperative diagnosis (type of ARM), operative details, functional outcomes, and the timing and nature of postoperative complications were assessed. All patients were enrolled in our comprehensive bowel management program before their procedure. This program was designed to teach patients (and their families) how to successfully manage their incontinence through a regimented trial-and-error retrograde enema program [13-15]. The ACE procedure was then offered only to motivated families who successfully completed the program and subsequently desired a more convenient means of enema administration.

1.1. Surgical technique

All patients were admitted the day before surgery for a mechanical bowel preparation (Golytely: Braintree Laboratories, Inc. Braintree, MA, USA, 25 mL/[kg h] until effluent clear) and received a single dose of cefoxitin and Flagyl: Pfizer, Inc., New York, New York, USA immediately before incision. The operative techniques used to construct the antegrade conduits and postoperative care protocol have been previously described by the authors and have since been modified [16]. For patients with an appendix, creation of an appendicostomy with an umbilical anastomosis remains our conduit of choice (Fig. 1). During the initial experience, all patients underwent a cecal plication around the appendiceal base that was believed to reduce the incidence of stomal leakage. Midway through the experience (1997), a more selective approach to plication was adopted based on an intraopertive assessment of native appendiceal continence. This was tested by filling the cecum with saline through the intubated appendix while occuding the distal ileum and proximal ascending colon. The tube was then removed; and the appendix was inspected for leakage, with plication performed in cases where native continence was absent. After subsequent observation revealed that intrinsic continence did not prevent or predict postoperative leakage, this step was abandoned; and all appendicostomies were then plicated as standard practice.

An additional modification was introduced in 2002, when both surgeons adopted the V-V advancement technique in the construction of the umbilical anastomosis. With this technique, the appendix is spatulated and circumferentially anastomosed to the superior portion of

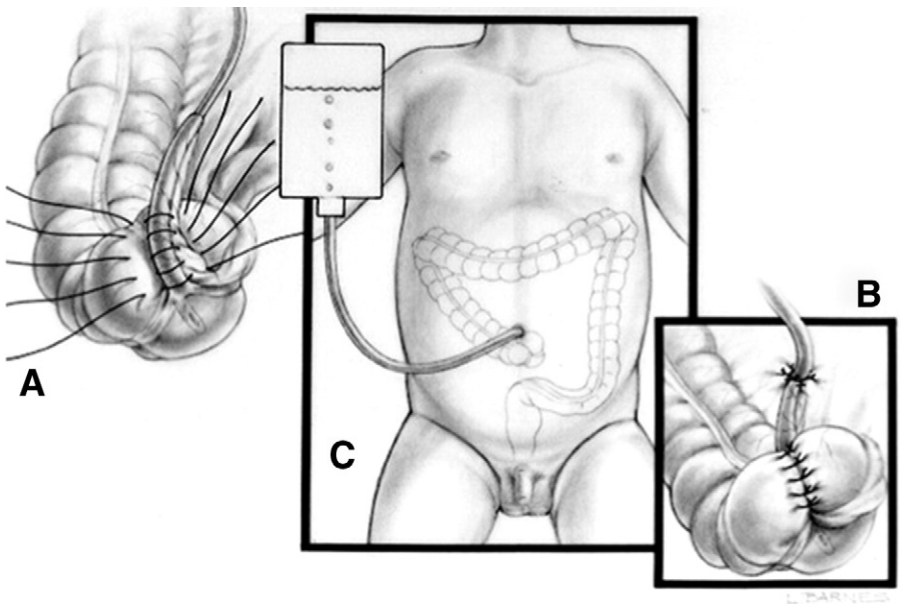

Fig. 1 Construction of the appendicostomy and administration of the antegrade enema. A, Intubation of the appendix with an 8F feeding tube and placement of cecal plication sutures to create an antireflux valve. B, Completed cecal plication with anastomosis of the appendicostomy to the umbilical orifice. C, Administration of the antegrade enema through the umbilical stoma on postoperative day 2.

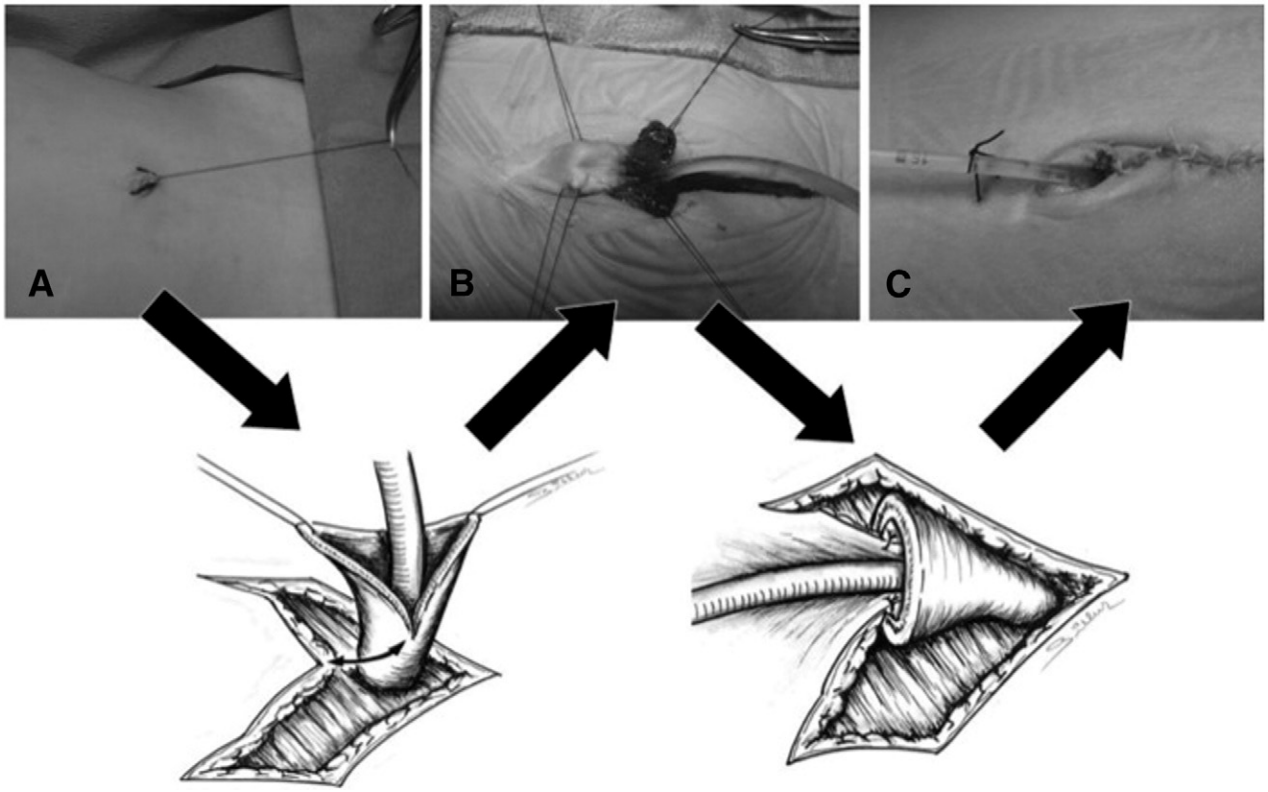

Fig. 2 Illustration of the V-V advancement technique for the umbilical anastomosis. A, A broad, V-shaped skin incision is made in the medial aspect of the inferior umbilical fold. The incision is extended inferiorly through the skin and fascia to externalize the appendicocecal junction for cecal plication. B, The tip of the appendix is spatulated, and the anastomosis is begun by approximating the superior-medial part of the skin incision to the most proximal portion of the spatulated appendix. C, Closure of the inferolateral aspect of the skin incision to the anterior portion of the spatulated appendix. This final step creates a tunneled anastomosis completely hiding the stoma within the inferior umbilical fold.

the V-incision at the umbilicus (Fig. 2). The resulting effect is a tunneling of the distal conduit within the inferior umbilical fold, resulting in a completely hidden, mucosa-free orifice that is mechanically stented open by the V-V anastomosis. The technique was introduced to reduce the incidence of strictures while at the same time improving the cosmetic appearance of the stoma.

1.2. Statistical analysis

Proportions were compared between groups using the Fisher's Exact test, and the Wilcoxon's sum rank-order test was used for the analysis of nonparametric data. All statistical analysis was performed using SAS version 9.1 (SAS Institute, Cary, NC).

2. Results

A total of 163 ACE procedures were identified. The mean age at operation was 9.9 years (range, 20 months to 36 years), and 67% of patients were male. The most common preoperative diagnosis was rectourethral fistula in boys (39%) and persistent cloaca in girls (61%) (Table 1). The median number of previous abdominal operations was 3 (range, 0-10), and 93% of patients had undergone at least one prior abdominal procedure.

Nine patients underwent a split-appendix procedure based on the appendiceal blood supply, where one portion of the organ was used for a urologic reconstruction and the other for the ACE conduit. Nineteen percent (31/163) of the procedures were performed with laparoscopic assistance. The last 100 (62.5%) patients in the series had their umbilical anastomosis performed using the V-V anastomotic technique. Six patients underwent a new (or revised) ACE procedure because of a dysfunctional antegrade procedure performed at an outside institution (more than half owing to a chronically leaking cecostomy button).

2.1. Functional outcomes

Ninety-six percent of all patients reported being completely clean at a median follow-up of 16 months (range, 2 months to 15 years). For the purpose of this study, *clean* was defined as being completely free from accidents and soiling of undergarments between daily enemas. Most

Table 1 Distribution of ARMs by sex in patients undergoing an ACE procedure

Diagnosis	No. of patients
Male	
Rectovesical fistula (bladder neck)	18 (11.1%)
Rectourethral fistula	
Prostatic	27 (16.6%)
Bulbar	7 (4.3%)
Unknown level of urethral fistula	8 (4.9%)
Rectoperineal fistula	1 (0.6%)
Malformation without fistula	3 (1.8%)
Unknown type [a]	40 (24.5%)
Complex malformations	5 (3.1%)
Total	109 (66.9%)
Female	
Cloacal exstrophy	2 (1.2%)
Persistent cloaca	33 (20.2%)
Rectovestibular fistula	12 (7.4%)
Rectoperineal fistula	1 (0.6%)
Malformation without fistula	1 (0.6%)
Unknown type [a]	4 (2.5%)
Total	54 (33.1%)
All patients	163 (100.0%)

[a] Anorectal malformations were categorized as "unknown type" if originally repaired at an outside institution and if the operative report was unavailable or did not specify the anatomical level of the fistula.

patients required 2 to 3 postoperative visits to optimize their enema regimen. All 6 patients who reported ongoing soiling were found to be noncompliant with their enema program.

2.2. Complications

Forty-five complications occurred in 41 patients, reflecting an overall patient-complication rate of 25.2% (Table 2). Thirty-eight (23.3%) patients required an operative revision with a median time to reoperation of 7 months (range, 1-105). Stomal stenosis was the most common complication (17.8%) and the most common indication for reoperation (76% of all revisions). Median time to reoperation for stenosis was 8 months (range, 2-123). There was no difference in the median age of those who developed stenosis and those who did not (8.2 vs 8.4 years, $P = .82$), and cecoplication did not increase the rate of stenosis (plication: 17.4% [24/138] vs nonplication: 29.4% [5/17]; $P = .35$). The use of the umbilical V-V appendicoplasty technique was associated with a lower incidence of strictures when compared with the traditional circular anastomosis (11% [11/100] vs 30% [18/60]; $P < .01$]. This difference remained significant after adjusting for differences in the length of follow-up between groups.

Table 2 Distribution of complications observed in patients with ARMs who underwent an ACE procedure for fecal incontinence

Complication	n (incidence)
Stomal stenosis	29 (17.8%)
Stomal leakage	9 (5.6%)
Mucosal prolapse	6 (3.7%)
Bowel obstruction	1 (0.1%)
Wound infection	0 (0%)
Total	45/163 (25.2%)

Leakage at the stomal site was observed in 9 (5.6%) patients, and this complication was responsible for 24% (9/38) of all operative revisions. Median time to reoperation for leakage was 12.4 months (range, 3-54). The rate of stomal leakage was significantly reduced when a cecoplication was performed (2.9% [4/138] vs 29.4% [5/17]; $P < .01$), although this did not affect the median time from operation to leakage if the complication occurred (11.4 vs 15.0 months; $P = .57$). Median appendiceal length was not different between conduits that leaked and those that did not (8 vs 7 cm; $P = .11$). Stomal prolapse occurred in 6 patients, and all required operative revision. One patient developed a bowel obstruction and required an exploratory laparotomy and adhesiolysis. There were no wound infections or other infectious complications.

3. Discussion

The first description of an antegrade colonic irrigation was made of more than a century ago, but Malone et al [2] popularized the broader concept of using the technique for the treatment of fecal incontinence in the early 1990s. Nearly 3 decades later, a multitude of technical modifications have been reported with the goal of improving functional outcomes while at the same time reducing the incidence and morbidity of complications [17-23]. In this regard, functional outcomes and complication rates remain substantial and highly variable across reported experiences. This variation is likely because of not only differences in operative technique but perhaps even more so the heterogeneity of children undergoing these procedures. Most published outcomes to date have focused largely on children with myelomeningocele, spinal bifida, and other neurogenic causes of fecal incontinence [12]. It was these considerations that motivated us to report our own extensive experience with the ACE procedure in children with ARMs.

Our 96% overall success rate with the ACE procedure in managing fecal incontinence compares favorably with other large series in the literature [2,4,5,8,24,25]. However, one must be cautious when comparing functional outcomes between experiences to ensure that the definitions and metrics used to report continence-related outcomes are clearly described. In our series, we defined *successful management* as being completely free of soiling accidents between daily enemas. Although achieving this goal can take

several weeks of intensive trial-and-error modification to optimize the enema regimen, we believe that this end point is the only "true" metric of success given the quality-of-life impact associated with even a mild degree of residual encopresis. We attribute our success to our rigorous preselection process and extensive support infrastructure, all centered around a comprehensive bowel management program [13]. We believe that successful preoperative management of fecal incontinence and compliance with the retrograde enema program are absolutely essential for success following all ACE procedures.

The aggregate complication rate of 25% in our series is also consistent with that reported in larger series, which ranges from 18% to 57% [2,4,5,8,24,25]. However, a more meaningful discussion of complication rates should be put in context with other experiences reporting on similar patient populations. Unfortunately, studies focusing on children with ARMs are relatively few; and data are limited. The largest reported experience to date (before our present series) in patients with ARMs was published by Curry et al in 2002 [5]. Of the 300 ACE procedures reported in their series, 83 patients with an underlying ARM underwent an ACE procedure using an in situ nonreversed appendix or cecal flap neoappendix for the conduit. Although the overall complication rate in their entire series was 41% (with stenosis observed in 30%), the complication rates for patients with ARMs was not reported. In 2007, Mattix et al [26] reported a complication rate of 53% in 32 patients with ARMs with a mean follow-up of 3.8 years. All complications were because of stenosis, and 34% required an operative revision.

Similar to most published series, stomal stenosis was the most common complication and indication for reoperation in our experience. Our rate of 17.8% is also consistent with the 13% to 41% range reported in other large series [2,4,5,8,24,25]. In our experience, all cases of stomal stenosis occurred at the skin level rather than within the conduit channel, suggesting an etiology of skin-level cicatrization rather than appendiceal ischemia or catheter-related mucosal injury. The relatively high rates of skin-level stomal stenosis following ACE procedures have led to the development of novel tissue-flap techniques in an effort to reduce the incidence of this complication. These have included the Y-appendicoplasty [23], the Y-V umbilicoplasty [27], the V-quadrilateral-Z flap [20], and the umbilical tubular skin flap [27], among others. The rates of stenosis using these techniques have been reportedly less than 10%, but meaningful comparison between these techniques is made difficult because of the marked variation in follow-up periods and nonstandardized criteria used to define stomal stenosis. Furthermore, there is evidence that the type of conduit and catheterization schedule may influence the timing and rate of stenosis, making objective comparison of these techniques even more challenging [28,29].

When choosing which technique is best suited for a particular patient, one should consider cosmetic implications and potential impact on body image in addition to the expected complication profile. In this regard, the umbilical V-V appendicoplasty results in a completely hidden orifice within the inferior fold of the umbilicus and is only noticeable during catheterization. We have since further modified our technique to create a broader-based V-shaped appendix, with the goal of further reducing stricture rates while at the same time maintaining the cosmetic benefit of the technique. Our observed stricture rates have since fallen to less than 10% over the last year with this modification. Given the relatively low stricture rates associated with a well-constructed umbilical V-V appendicoplasty and that most cases of stenosis are amenable to treatment in the ambulatory setting [28], one must carefully weigh the psychological benefit of a superior cosmetic result against any marginal benefit that more disfiguring techniques may offer in reducing the incidence of an otherwise easily manageable complication. This latter emphasis is an important consideration for our patients with ARMs (and their parents), who often place great value on outcomes that make them as socially "normal" as possible—both in appearance as well as in management of continence issues.

Although it is likely that differences in technical factors and stoma location are responsible for some of the variance in reported stenosis rates, an important observation in our series and others is that most stenotic complications occur 9 to 12 months following the ACE procedure [4,28]. This may suggest that patient-related factors such as growth, physical activity level, and catheterization compliance issues may be at play in the genesis of late stenotic events. The potential role of noncompliance is further supported by evidence that catheterization schedule may influence the timing and rate of this complication [6,30]. In an attempt to reduce the occurrence of late stricturing, we have changed our practice to have patients catheterize their stoma twice a day: once for enema administration and once as a preventative measure.

The need for creating an antireflux valve to prevent stomal leakage remains controversial and has not been examined in a prospective manner. The finding that cecoplication reduces the rate of stomal leakage in our experience has been confirmed in some studies and refuted by others. In the 2 largest reported experiences of ACE procedures where cecoplication was routinely performed, leak rates were observed in 3% and 7% of patients with a median follow-up of at least 2.5 years [5,29]. Several centers have since reported their experience without routine cecoplication, and this has largely been driven by the introduction of minimally invasive techniques [17,18,21,25,31]. In the largest reported series to date, Nanigian and Kurzrock [21] recently described their experience with 22 patients using an entirely laparoscopic technique. They used a 2- or 3-port technique depending on whether the cecum had to be mobilized to bring the appendix up to the umbilicus. The appendix was then delivered through the umbilical port site, where it was

attached as a stoma to the umbilicus using a spatulated technique. A cecoplication was not performed, and they observed no leaks after a mean follow-up of 2 years.

Differences in reported outcomes following cecoplication may in part be influenced by patient selection factors. In the study by Nanigian and Kurzrock, 20 of the 22 patients were wheelchair bound; and only one had undergone a previous abdominal operation. Conversely, nearly every patient in our series was an active, fully functional child; and most had undergone at least one previous laparotomy. It is plausible that scar tissue involving the abdomen and abdominal wall and the relatively greater physical activity levels in our patient population may impact the native appendiceal continence mechanism over the short and long term, respectively. This is supported by other studies reporting relatively higher complication rates in patients with ARMs following ACE procedures [32]. When taken in context with our own experience, we believe that the etiology of stomal leaks is multifactorial and that further long-term follow-up (and standardized definitions) will be needed to establish which patient populations are likely to benefit from cecoplication.

In conclusion, we believe that the ACE procedure using the umbilical V-V appendicoplasty technique provides an effective and cosmetically superior means for bowel management in children with ARMs. In this regard, our current technical and perioperative approach has evolved from nearly 2 decades of experience with this unique population and attempts to maintain the goal of optimizing functional outcome while at the same time preserving maximum body image for these high-functioning children. Although the incidence of postoperative complications is not insignificant, many are easily treated in the ambulatory setting with minimal expense and morbidity. In this regard, preventative strategies should focus on careful operative technique and ensuring compliance with catheterization protocols well past the initial postoperative period.

References

[1] Ellsworth PI, Webb HW, Crump JM, et al. The Malone antegrade colonic enema enhances the quality of life in children undergoing urological incontinence procedures. J Urol 1996;155(4):1416-8.

[2] Malone PS, Ransley PG, Kiely EM. Preliminary report: the antegrade continence enema. Lancet 1990;336(8725):1217-8.

[3] Yerkes EB, Cain MP, King S, et al. The Malone antegrade continence enema procedure: quality of life and family perspective. J Urol 2003;169(1):320-3.

[4] Bani-Hani AH, Cain MP, Kaefer M, et al. The Malone antegrade continence enema: single institutional review. J Urol 2008;180(3): 1106-10.

[5] Curry JI, Osborne A, Malone PS. The MACE procedure: experience in the United Kingdom. J Pediatr Surg 1999;34(2):338-40.

[6] Dey R, Ferguson C, Kenny SE, et al. After the honeymoon—medium-term outcome of antegrade continence enema procedure. J Pediatr Surg 2003;38(1):65-8 discussion 65-68.

[7] Gerharz EW, Vik V, Webb G, et al. The in situ appendix in the Malone antegrade continence enema procedure for faecal incontinence. Br J Urol 1997;79(6):985-6.

[8] Griffith D, Malone P. The Malone antegrade continence enema (MACE). J Pediatr Surg 1995;30:68-70.

[9] Koyle MA, Kaji DM, Duque M, et al. The Malone antegrade continence enema for neurogenic and structural fecal incontinence and constipation. J Urol 1995;154(2 Pt 2):759-61.

[10] Levitt MA, Soffer SZ, Pena A. Continent appendicostomy in the bowel management of fecally incontinent children. J Pediatr Surg 1997;32 (11):1630-3.

[11] Sheldon CA, Minevich E, Wacksman J, et al. Role of the antegrade continence enema in the management of the most debilitating childhood recto-urogenital anomalies. J Urol 1997;158(3 Pt 2): 1277-9 discussion 1279-1280.

[12] Sinha CK, Grewal A, Ward HC. Antegrade continence enema (ACE): current practice. Pediatr Surg Int 2008;24(6):685-8.

[13] Bischoff A, Levitt MA, Bauer C, et al. Treatment of fecal incontinence with a comprehensive bowel management program. J Pediatr Surg 2009;44(6):1278-83 discussion 1283-1274.

[14] Levitt M, Pena A. Update on pediatric faecal incontinence. Eur J Pediatr Surg 2009;19(1):1-9.

[15] Peña A, Guardino K, Tovilla J, et al. Bowel management for fecal incontinence in patients with anorectal malformations. J Pediatr Surg 1998;33:133-7.

[16] Levitt M, Soffer S, Peña A. Continent Appendicostomy in the bowel management of fecal incontinent children. J Pediatr Surg 1997;32: 1630-3.

[17] Kajbafzadeh AM, Sina AR, Moradi A, et al. Laparoscopic antegrade continent enema through VQ stoma skin flaps using two ports: long-term follow-up. J Endourol 2007;21(1):78-82.

[18] Karpman E, Das S, Kurzrock EA. Laparoscopic antegrade continence enema (Malone) procedure: description and illustration of technique. J Endourol 2002;16(6):325-8 discussion 328.

[19] Koivusalo A, Pakarinen MP, Rintala RJ. Treatment of a leaking ACE conduit with Deflux injections. Pediatr Surg Int 2006;22(12):1003-6.

[20] Landau EH, Gofrit ON, Cipele H, et al. Superiority of the VQZ over the tubularized skin flap and the umbilicus for continent abdominal stoma in children. J Urol 2008;180(4 Suppl):1761-5 discussion 1765-1766.

[21] Nanigian DK, Kurzrock EA. Intermediate-term outcome of the simplified laparoscopic antegrade continence enema procedure: less is better. J Urol 2008;179(1):299-303.

[22] Stock JA, Hanna MK. Appendiceal cecoplication: a modification of the Malone antegrade colonic enema procedure. Tech Urol 1996;2(1): 40-2.

[23] Tam PK. Y-appendicoplasty: a technique to minimize stomal complications in antegrade continence enema. J Pediatr Surg 1999;34(11):1733-5.

[24] Kiely E, Ade-Ajayi N, Wheeler R. Antegrade continence enemas in the management of intractable fecal incontinence. J R Soc Med 1995;88: 103-4.

[25] Koivusalo A, Pakarinen M, Rintala RJ. Are cecal wrap and fixation necessary for antegrade colonic enema appendicostomy? J Pediatr Surg 2006;41(2):323-6.

[26] Mattix KD, Novotny NM, Shelley AA, et al. Malone antegrade continence enema (MACE) for fecal incontinence in imperforate anus improves quality of life. Pediatr Surg Int 2007;23(12):1175-7.

[27] Woodhouse HC. An introduction to the rock-art of Southern Africa. Durban: Art Publishers; 2002.

[28] De Ganck J, Everaert K, Van Laecke E, et al. A high easy-to-treat complication rate is the price for a continent stoma. BJU Int 2002;90 (3):240-3.

[29] Griffin SJ, Parkinson EJ, Malone PS. Bowel management for paediatric patients with faecal incontinence. J Pediatr Urol 2008;4 (5):387-92.

[30] Clark T, Pope JCT, Adams C, et al. Factors that influence outcomes of the Mitrofanoff and Malone antegrade continence enema reconstructive procedures in children. J Urol 2002;168(4 Pt 1):1537-40 discussion 1540.

[31] Van Savage JG, Yohannes P. Laparoscopic antegrade continence enema in situ appendix procedure for refractory constipation and overflow fecal incontinence in children with spina bifida. J Urol 2000;164(3 Pt 2):1084-7.
[32] Kim J, Beasley SW, Maoate K. Appendicostomy stomas and antegrade colonic irrigation after laparoscopic antegrade continence enema. J Laparoendosc Adv Surg Tech A 2006;16(4): 400-3.

Discussion

Stephen Kimmel (Pensacola, FL): What size stent do you use when you're going to form a new stapled appendix?

T Lawal: We use an 8F feeding tube. It's the same catheter that they will use in the clinic to intubate their appendicostomy, so we use that same one to form the plication around the tube. We actually place the tube when we're doing the plication itself or if we're extending it, we'll use that size tube.

S Kimmel: Do you modify the technique of the plication when you're doing it laparoscopically?

T. Lawal: No, we don't. We mobilize the cecum and appendix. We do have to make the midline incision a little bit longer, but it's still shorter than if we did an open appendicostomy. We do pull it up into the wound, and so sometimes the cecum is a little beat up afterward. We may wait a day before starting clear fluids; but if they're clinically improved by the next day, which they often are, then we'll start right away.