

Percutaneous cecostomy in the management of organic fecal incontinence in children

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Abstract

AIM: To assess the effectiveness and safety of imaging-guided percutaneous cecostomy in the management of pediatric patients with organic fecal incontinence.

METHODS: Twenty three cecostomies were performed on 21 children with organic fecal incontinence (13 males, 8 females), aged from 5 to 16 years (mean 9.5 years). Thirteen patients had neurogenic fecal incontinence and 8 patients had anorectal anomalies. Procedures were performed under general anesthesia and fluoroscopic guidance. Effectiveness and complication data were obtained for at least 1 year after the procedure.

RESULTS: Cecostomy was successful in 20 patients (primary technical success rate 95%). Cecostomy failed in one patient due to tube breakage (secondary technical success rate 100%). The tubes were *in situ* for an average of 18 mo (range 12-23 mo). Eighteen patients

(87%) expressed satisfaction with the procedures. Resolution of soiling was achieved in all patients with neurogenic fecal incontinence (100%) and in 5 of 8 patients with anorectal anomalies (62.5%). Eleven patients (52%) experienced minor problems. No major complications were noted.

CONCLUSION: Percutaneous cecostomy improves the quality of life in children with organic fecal incontinence. A satisfactory outcome is more prevalent in patients with neurogenic fecal incontinence than anorectal anomalies.

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Key words: Cecostomy; Fecal incontinence; Interventional radiology; Pediatric radiology

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INTRODUCTION

Fecal incontinence refers to the inability to hold feces in the rectum. This is due to failure of voluntary control over the anal sphincters, permitting untimely passage of feces and gas. Though most children become toilet trained between 2 and 4 years of age, there are some situations in which children do not develop complete control of their stool elimination. This leads to stool leaking from the rectum at unexpected times. Fecal incontinence is a devastating disability that is not uncommon in the pediatric population. Fecal incontinence can be one of the most

psychologically and socially debilitating conditions in an otherwise healthy individual. It can lead to social isolation, loss of self-esteem and self-confidence, and depression^[1].

Fecal incontinence can be associated with peristalsis, sensation, sphincter control, anatomy, or psychosocial disorders. Most cases of fecal soiling in children are functional and are usually associated with severe constipation. Organic fecal incontinence may be permanent, as in patients with myelodysplasia, self-limiting, as in patients who have fecal soiling after a pull-through operation for Hirschsprung's disease, or partial, as with many patients who have undergone repair of an anorectal malformation^[2]. Recently, Di Lorenzo *et al*^[3] classified pediatric fecal incontinence into four main categories according to pathophysiology. The first category is functional fecal retention due to withholding of feces because of fear of painful defecation, which results in constipation and overflow soiling. The second category is functional non-retentive fecal soiling due to antidiarrheal agents, which can increase the consistency of stools and facilitate continence. The third category is organic fecal incontinence due to congenital anorectal anomalies. The last category is organic neurogenic fecal incontinence, which occurs in children with spina bifida or spinal injuries.

Traditional treatments of fecal incontinence include dietary modification, laxatives, suppositories, enemas, manual disimpaction, biofeedback and electrostimulation. Despite these efforts, many patients do not achieve fecal continence. Fecal incontinence can be treated by emptying the bowels with a rectal enema. This treatment is effective, but it can also be messy, time-consuming, inconvenient, and difficult (or impossible) for some patients to do by themselves.

Surgically created cecostomies have been attempted for many years. In 1986, Casola *et al*^[4] described a percutaneous approach for the placement of a cecostomy catheter for colonic decompression in adults. In 1988, Ganc *et al*^[5] described a technique for transcolonoscopic extraperitoneal cecostomies as an effective new therapeutic technique for the management of fecal incontinence. In 1990, Malone *et al*^[6] described antegrade colonic enema (MACE) as a surgical procedure where the appendix is used to form a cutaneous cecostomy for fluid irrigation of the colon. However, these surgically created cecostomies carry risks of stomal stenosis, stomal leakage, appendiceal necrosis, general anesthesia and bowel perforation.

In 1996, Shandling *et al*^[7] described a pilot study for a percutaneous image-guided approach to gain access to the cecum for the introduction of an antegrade enema. This study was later followed by other studies that showed this percutaneous procedure represents a less invasive alternative to a surgical procedure^[8-12]. Percutaneous endoscopic cecostomy is a viable alternative to surgically or fluoroscopically placed cecostomy in a select group of patients with recurrent colonic pseudo-obstruction or chronic intractable constipation^[13]. In general, and according to the pathophysiology of pediatric fecal incontinence, functional fecal retention is treated by dietary changes, use of

drugs, anorectal biofeedback and cognitive and behavioral interventions, such as toilet training. On the other hand, patients with organic fecal incontinence benefit from techniques that teach them how to defecate, such as with cecostomy, which completely cleanses the colon, increases the child's autonomy, and decreases the chance of soiling. However, there is great variation in the postsurgical functional outcomes of these procedures^[3,8-12].

The purpose of our study was to assess the effectiveness and safety of imaging-guided percutaneous cecostomy in the management of pediatric patients with organic fecal incontinence.

MATERIALS AND METHODS

From January 2005 to December 2009, 23 imaging-guided percutaneous cecostomy tube placements were performed on 21 children with organic fecal incontinence. The patients included 13 males and 8 females aged from 5 to 16 years (mean 9.5 years). Thirteen patients suffered from neurogenic fecal incontinence secondary to spinal etiology (6 patients had myelomeningocele, 2 had sacral agenesis and 5 had dorso-lumbar spinal injuries with paraplegia). The other 8 patients had fecal incontinence secondary to anorectal anomalies after failure of medical and surgical management. This study was approved by the credential and privileges committee in our hospital. Informed consents were obtained from the parents or guardians. All patients had lax anal sphincter by digital rectal examination and had marked cecal dilatation 13 ± 3.5 cm as seen in plain abdominal radiographs. Ten patients underwent a barium enema study before admission to detect the position of the cecum.

Technique of percutaneous cecostomy

Pre-procedure preparation: The patients consumed a fluid diet for 2 d before the percutaneous cecostomy procedure. Usually the patients were admitted 1-d before the procedure. Forty five milliliters sodium phosphate solution (Phospho-Soda oral laxative; Fleet, Lynchburg, Va) was administered orally the night of admission. Radiography of the abdomen was performed just prior to the procedure to assess bowel cleansing, and a repeat dose of the phosphate solution was given, if necessary. Complete blood analysis, clotting and coagulation times were checked before the procedure. Abdominal and pelvic ultrasonography (Voluson 730 Expert, GE, Austria) was performed before the procedure to identify fluid collections and the positions of major organs, including the gallbladder, liver, and urinary bladder. Glucagon hydrochloride (Eli Lilly, Scarborough, Ontario, Canada) was administered intravenously at a dose of 0.5-1.0 mg before the procedure to inhibit colonic peristalsis. A prophylactic antibiotic regimen was given to all patients before and after the procedure. The antibiotic regimen included three intravenously administered antibiotics: 2.5 mg/kg gentamicin (Gentamicin Injection USP; Sabex, Boucherville, Quebec, Canada) every 8 h, 10 mg/kg metronidazole

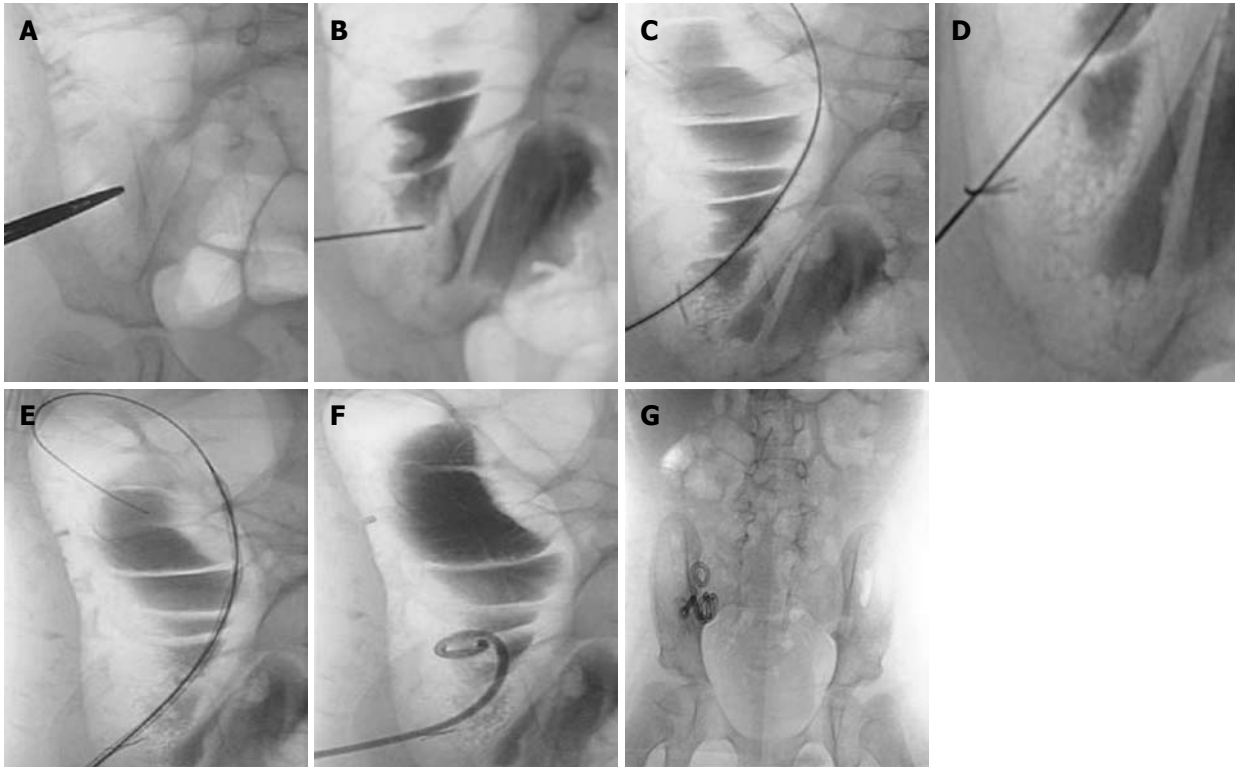


Figure 1 Procedure of percutaneous cecostomy. A: Skin entrance site is localized over the air-filled distended cecum; B: After needle insertion into the cecum, contrast is injected to confirm its location within the cecal lumen; C: Guide wire insertion into the distended right side of the colon; D: T-fastener deployed to fix the anterior wall of the cecum to the abdominal wall; E: The insertion tract is dilated before placement of the cecostomy tube; F: Locking pigtail catheter is inserted into the cecum; G: After 6 wk, the Dawson Mueller catheter is exchanged for the permanent Chait Trapdoor cecostomy catheter.

(Metronidazole Injection; Abbott, St Laurent, Quebec, Canada) every 8 h, and 20 mg/kg ampicillin (Ampicillin Sodium for Injection USP; Novofarm, Toronto, Ontario, Canada) every 6 h.

Procedure: The procedures were performed under general anesthesia in all patients. Imaging was performed on a C-arm fluoroscopic table with tilting capabilities (Siemens Neurostar, Siemens Medical Systems, Munich, Germany). We used the technique that was described in detail by Chait *et al.*^[14] in 2003.

Briefly, the cecum was distended with air by using a 22-F silicone (latex-free) Foley catheter (Rusch-Pilling, Kamunting, Malaysia) that was inserted through the rectum. The skin entrance site of the air-filled cecum was localized under fluoroscopic guidance (Figure 1A). A puncture was made using a Majestic 18-gauge, 7-cm, one-wall needle with a Seldinger shield (Merit Medical, South Jordan, Utah). To confirm the intraluminal position of the needle, 5 mL of water soluble contrast material (Omnipaque; Nycomed Imaging, Oslo, Norway) was injected under fluoroscopic guidance (Figure 1B). A 0.035-inch guide wire (Cook, Bloomington, MA) was inserted and the needle was advanced into the cecum (Figure 1C). A T-fastener (Meditech/Boston Scientific, Watertown, MA) was then deployed to fix the anterior wall of the cecum to the anterior abdominal wall (Figure 1D). The retention suture threads were clamped with mosquito forceps. The tract was dilated by the use of an 8-F Coons dilator (Cook, Bloomington,

MA; Figure 1E). After dilatation, a 8.5-F, 15-cm latex-free Dawson Mueller Mac-Loc locking pigtail catheter (Cook, Bloomington, MA) was inserted (Figure 1F). The catheter was connected to a drainage bag into which liquid drained to empty the colon and decrease the risk of leakage around the cecostomy tube site.

Post procedure care

The antibiotic regimen was continued for 48 h and followed by orally administered metronidazole (10 mg/kg every 8 h) for 5 d. Analgesia after the procedure comprised intravenously administered morphine (0.05 mg/kg) every 4 h, as needed, for 12 h, followed by orally administered acetaminophen (15 mg/kg) every 4 h as needed. The patients could eat after 12 h, if there was no paralytic ileus and early ambulation was advised as tolerated. Patients who were free of complications were discharged within 2 d or 3 d. Patients that suffered from postprocedure paralytic ileus were usually discharged on the 5th or 6th day after the procedure. When patients were discharged from the hospital, the drainage bags were removed at the time of discharge, and the patients were asked to flush the catheter by 5 mL of saline twice daily. A week after the insertion of the cecostomy tube, antegrade enema irrigations began according to individual needs. Patients and their relatives were trained on how to use the two irrigation bags for routine antegrade colonic evacuation and cleansing. The first bag was a sodium phosphate enema (Merck-Frost, Mississauga, Ontario, Canada), which was intro-

duced at a dose of 2 mL/kg up to a total dose of 130 mL. After 15 min, the second bag (200-400 mL saline solution) was introduced, which could be easily prepared (10 mL salt for one liter of water). The retention sutures were cut 10 d after the procedure.

Long-term care

After 6 wk, the Dawson Mueller Mac-Loc catheter was exchanged by the permanent Chait Trapdoor cecostomy catheter (Cook, Bloomington, MA). The exchange was performed over a guidewire under fluoroscopic guidance. No sedation or antibiotic coverage was necessary, and the procedure was performed on an outpatient basis (Figure 1G). The Chait Trapdoor catheter is to be replaced every year or when a problem arises. Catheter replacement was performed by cutting the old one below the “trapdoor” and advancing the new catheter over a guidewire. This displaced the distal part of the old catheter into the ascending colon, and then it passed easily through the rectum. Long-term care of the cecostomy patients was performed by a team comprising an interventional radiologist, a general surgeon and a pediatrician. Data regarding effectiveness, complications and satisfaction of treatment were obtained by interviewing the children and their parents during follow-up consultation.

RESULTS

Twenty three cecostomy tube placements were performed on 21 children with organic fecal incontinence. In all cases, an 8.5-F Dawson-Mueller catheter were placed in the cecum and exchanged after 6 wk with a cecostomy button (Trapdoor catheter). Tube placement was successful in 20 patients (primary success rate is 95%). Cecostomy tube insertion failed in one patient due to tube breakage during its insertion and replacement by another tube was successfully done in the same setting. Another patient required repeated tube placement after accidental dislodgement of the previously inserted tube after 5 d (secondary success rate is 100%). Functional results (effectiveness, complications and satisfaction) were obtained at a follow-up period of at least 1 year after the procedure. The cecostomy catheters were *in situ* for an average of 18 mo (range 12-23 mo). Eighteen of the 21 patients (87%) expressed satisfaction in the effectiveness of the procedure. Resolution of continuous soiling was achieved in all patients with neurogenic fecal incontinence (100%) and in 5 out of 8 patients with anorectal anomalies (62.5%). Antegrade enemas were administered according to the needs of the patient (range, every 12-48 h; mean, every 18 h).

Eleven patients (52%) experienced minor cecostomy tube related problems at some point during the follow-up period; a cecostomy tube infection occurred in 2 patients, which required oral antibiotic treatment, clogging of the cecostomy tube in 2 patients, partial dislodgment of the tube in 2 patients, the development of granulation tissue accompanied with redness at the cecostomy site appeared in 4 patients and vomiting related to the phosphate en-

ema occurred in one patient. These problems were easily corrected at home and did not require surgical intervention. Among the patients that underwent cecostomies, no procedure related death or major complication requiring surgical intervention or hospital admission was noted.

DISCUSSION

Fecal incontinence is a major health problem in that it affects the quality of life and causes significant embarrassment. In childhood and adolescence, fecal soiling represents a psychologically devastating problem and there is both physical and emotional distress associated with daily rectal enemas. Pediatric fecal incontinence is classified into organic or true fecal incontinence, which is either neurogenic or secondary to anorectal anomalies, and functional fecal incontinence, which is either retention-type due to fecal withholding with overflow or nonretentive-type of fecal soiling with antidiarrheal agents^[3]. The majority of cases of fecal incontinence in children are functional, which is fortunately a self-limiting problem and usually disappears at puberty. Organic fecal incontinence may be permanent, as with myelodysplasia; self-limiting, as after a pull-through operation for Hirschsprung's disease; or partial, as with an anorectal malformation^[2]. Traditional treatment options for fecal incontinence include dietary modification, drugs, retrograde enemas, manual disimpaction, biofeedback, electrostimulation and cognitive and behavioral interventions that facilitate continence. These options work well in controlling functional fecal incontinence^[3,15,16]. However, these options are ineffective in controlling organic fecal incontinence, which may benefit from techniques that completely cleanse the colon and decrease the chance of soiling such as with percutaneous cecostomy. Administration of antegrade enemas through a cecostomy is a therapeutic option for children with severe fecal incontinence. However, there is great variation in postsurgical functional outcomes of these procedures.

In this study, the primary and secondary technical success rates of insertion of cecostomy tubes were 95% and 100%, respectively, which are similar to other studies^[8-11,14,15,17]. Long term follow up of patients showed resolution of continuous soiling in all patients with neurogenic fecal incontinence. These results confirm the effectiveness of cecostomy in the management of patients with neurogenic fecal incontinence secondary to spina bifida or traumatic spinal injury, which was reported in other studies^[3,18,19]. On the other hand, resolution of continuous soiling was achieved in 5 of 8 patients with anorectal anomalies (62.5%). This result is lower than that of Sierre *et al*^[20] in which 90% of their 20 patients (18 of them had anorectal anomalies) reported satisfaction with the procedure. However, our results are similar to other studies that noted there is great variation in postsurgical functional outcomes of cecostomy in the management of patients with anorectal malformations^[3,21,22]. The reason for this relatively low success rate can be explained by the complexity of anorectal anomalies, such as the presence of

distal rectovesical or rectovaginal fistulae that may cause soiling.

Regarding post procedure complications in this study, there were no major complications and 11 patients (52%) experienced minor cecostomy tube related problems at some point during the follow-up period. These problems were easily corrected at home and did not require medical or surgical intervention. These complications are within the range of complications noticed in other studies^[17,22].

In conclusion, imaging-guided percutaneous cecostomy and antegrade enemas improved symptoms and the quality of life in children with organic fecal incontinence with minor early and late complications. The success rate was more evident in patients with neurogenic fecal incontinence rather than those with anorectal anomalies. However, further evaluation by double-blinded, randomized controlled trials is recommended to define the role of cecostomy in the management of different kinds of organic fecal incontinence.

COMMENTS

Background

In childhood, fecal incontinence represents a psychologically devastating problem. Pediatric fecal incontinence is classified into organic or true fecal incontinence, which is either neurogenic or secondary to anorectal anomalies, and functional fecal incontinence, which is either retention-type due to fecal withholding with overflow or a nonretentive-type of fecal soiling with antidiarrheal agents. The majority cases of fecal incontinence in children are functional, which a self-limiting problem, while organic fecal incontinence is permanent and needs surgical intervention.

Research frontiers

Traditional treatment options of fecal incontinence work well in controlling functional fecal incontinence. These options are ineffective in controlling organic fecal incontinence, which may benefit from techniques that completely cleanse the colon, such as surgical or imaging-guided percutaneous cecostomy.

Innovations and breakthroughs

Imaging-guided percutaneous cecostomy and antegrade enemas improved symptoms and the quality of life in children with organic fecal incontinence with minor early and late complications.

Applications

Administration of antegrade enemas through a percutaneous cecostomy is a therapeutic option for children with organic fecal incontinence.

Terminology

Percutaneous cecostomy is imaging-guided construction of an opening into the cecum with a tube through the abdominal wall. It is an alternative to the traditional surgical technique for cecal decompression.

Peer review

The manuscript is accepted without modification.

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