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Surgical management of functional constipation: An intermediate report of a new approach using a laparoscopic sigmoid resection combined with malone appendicostomy

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ABSTRACT

Introduction: We previously reported our surgical technique for functional constipation for patients who have failed medical management using a novel collaborative approach with gastroenterology input, pre-operative contrast enema, colonic manometry, and laxative protocol combined with a laparoscopic colonic resection with Malone appendicostomy. Now we report our intermediate outcomes.
Methods: Patients who failed bowel management program for functional constipation were reviewed from 3/2014–2/2017. Patients with Hirschsprung disease, anorectal malformation, tethered cord, spina bifida, Trisomy 21, cerebral palsy, mitochondrial disease, or prior colon resection were excluded.
Results: Of 31 patients (14 females; median age 12 years, follow-up 10.3 months) with functional constipation and failed medical management, 26 (84%) had preoperative colonic manometry which, in addition to the contrast enema, guided laparoscopic colon resection. Ten patients (32.3%) are clean with no flushes (1 takes no laxatives, 8 are on low dose laxatives only, and 1 patient was clean on laxatives but chose to switch back to flushes). Of the 21 patients that remain on antegrade flushes, 20 (95.2%) are clean, and one patient (4.8%) continues to soil. We define clean as no soiling and no abnormal stool burden on x-ray. Laxative trials are planned for all patients on an antegrade flush regimen.
Conclusion: Our intermediate results show that laparoscopic colon resection with Malone appendicostomy allows the majority of patients to be clean on antegrade flushes, and some to be on no or minimal laxatives.
Type of study: Retrospective review.
Level of Evidence: 3

1. Introduction

Pediatric functional constipation that does not respond to medical management and requires surgical intervention is an on-going problem, with a prevalence as high as 30%. [1] Rome IV remains the most widely accepted diagnostic criteria for pediatric functional constipation [2,3]. However, there is a paucity of high-level evidence that evaluates surgical indications or treatments for patients who have failed medical management [4–6]. Additionally, identical clinical scenarios are managed so differently by surgeons world-wide without consensus guidelines to aid in surgical decision making [7]. We previously reported our results in a retrospective review using a multi-disciplinary approach combined with a laparoscopic low anterior colon resection with antegrade flush via a Malone appendicostomy [8] (Fig. 1) Our goal is to be able to predict which patients will benefit from a colon resection with antegrade flush based upon bowel management, manometry, contrast enema and our multidisciplinary team. Here, we present an intermediate update now with longer follow-up and more patients included.

2. Methods

After IRB approval, (#IRB16–00701) we performed a single institution retrospective review from 2014 to 2017 of all patients with functional constipation that failed medical management and underwent a laparoscopic colon resection with antegrade flush by three pediatric colorectal surgeons. Patients that were excluded were those with: anorectal malformation, Hirschsprung disease, spina bifida, cerebral palsy, tethered cord, Trisomy 21, mitochondrial disease or those who had undergone a prior colon resection. We examined age, gender, associated medical conditions, pre-operative testing, post-operative complications, post-operative bowel regimens, and follow-up duration. Descriptive statistics were used. At our institution, patients undergo a

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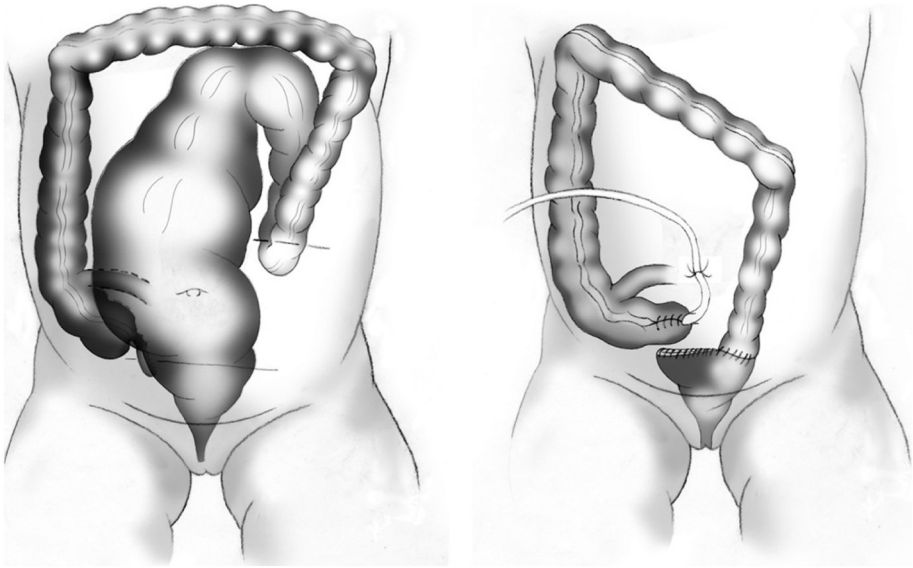

Fig. 1. Artistic diagram of the anatomic plan for the laparoscopic low anterior colon resection with antegrade flush via a Malone appendicostomy.

bowel management boot camp prior to determining "medical failure" using stimulant laxatives and bulking water-soluble fiber. Combined with an intensive educational program, the week long program with daily x-rays increases the compliance and overall success. Failure of this week long program is continued soiling, inability to tolerate laxatives or continued stool burden on x-ray. If this is unsuccessful, a multi-disciplinary team combining motility gastroenterology, psychology and pediatric colorectal surgery discuss the case. Then, colonic manometry and a contrast enema (Fig. 2) are used to guide subsequent recommendations and possible surgery. Colonic manometry was performed by motility gastroenterology either with the patient awake or under light monitored sedation, depending on age and tolerance to procedure. Our multidisciplinary team would then discuss each case again after study results were completed. Resection is performed where the colon is no longer dilated and appears to be normal caliber as well as normal function per manometry findings. Our institution preference is for a Malone appendicostomy however historically some patients did receive cecostomy tubes placed by interventional radiology in the beginning of this retrospective review.

Fig. 2. Typical contrast study demonstrating redundancy and dilation of the rectosigmoid colon.

3. Results

There were 31 patients (14 females) with the median age of 12 years. The median follow-up was 10.3 months (range 1.7–25.3 months) (Table 1). No patients were lost to follow-up. Patients were followed with a 2 week clinic visit, phone follow-up at 3 months and 6 months with a goal of a laxative trial bowel management at 6–12 months. Almost half (48%) had an associated behavioral disorder including autism, oppositional defiant disorder, attention deficit hyperactive disorder, depression, sensory integration disorder, and/or anxiety. Patients suffered from long-standing constipation in the form of soiling, impaction and bloating. Twenty-six patients (84%) underwent colonic manometry, and 80.8% of those had abnormal segmental motility. All 31 patients had a contrast enema prior to operative intervention and 87% of those were abnormal having either a dilated rectosigmoid or a redundant sigmoid loop. Twelve patients (39%) had a procedure done for antegrade enemas preoperatively in the form of a cecostomy that were not successful in reliably emptying the colon. Of these patients, 3 (25%) had the cecostomy changed to a Malone appendicostomy at the time of the colon resection. 24 (77%) patients

Table 1
Study demographics.

	Female	Male
Number of patients	14	17
Median age (years)	12 (range 4–18)	
Median follow-up (months)	10.3 (range 1.7–25.3)	
Post-operative complications	5 (16%)	
Laxatives only	10 (32.3%)	
Antegrade flush	21 (67.7%)	

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participated in our medical bowel management "boot camp" and failed a laxative trial.

10 (32.3%) patients have achieved the ultimate goal of being clean on both x-ray and in underwear on laxatives only. 1 patient takes no laxatives at all, 8 are on low dose laxatives only, and 1 patient was clean on laxatives but chose to switch back to flushes as a personal preference for the flush and is reluctant to take oral medications. Of the 21 patients that remain on antegrade flushes, 20 (95.2%) are clean and 1 (4.8%) patient continues to soil however non-compliance has been an issue with this patient. A laxative trial is planned for all patients on a flush regimen.

We had 5 (16%) postoperative complications. 2 patients had colitis treated as an outpatient with oral flagyl. One patient had a Malone stricture treated with a skin level revision. Two patients had anastomotic strictures treated successfully with serial dilations and mitomycin C application. Neither of these patients required subsequent resections. The dilations were performed at 6 weeks and 7 months after the initial surgery. 2 patients had a second resection. Of the patients requiring a second resection, one patient had a colonic resection and initially did well, however subsequently failed medical laxative management and had another colonic manometry that showed the right and transverse colon to have abnormal motility, therefore had a second resection of this segment. Currently, this patient is successful on laxatives only. The second patient initially did well after the colon resection then began having soiling due to the inability to tolerate the flush with cramping. Repeat colonic manometry showed normal motility, but the patient was unable to tolerate any stimulants. She underwent a subtotal colectomy with right colon to rectal anastomosis. This patient is currently clean on small volume Malone flushes using saline only and is awaiting a laxative trial.

4. Discussion

Functional constipation remains one of the most common and difficult problems in the pediatric population. The burden on the healthcare system and the associated costs are a useful benchmark of the impact from a public health perspective. Costs including inpatient burden in the United States have increased from 1997 to 2009 by 122% with total mean cost per discharged patient greater than $15,000. This is an increased cost of 221% during the same time period [9]. Additional studies estimate that the federal government spends nearly 4 billion dollars per year to care for children with constipation [10]. More importantly, the quality of life in the functional constipation patient and their families is greatly impacted [11,12]. Complications include poor health quality of life and diminished academic performance leading to deficits in education. Psychological problems are associated with functional constipation including but not limited to anxiety, depression, oppositional defiant disorder and social fears [13]. In our intermediate update report of 31 patients, almost half (48%) had an associated psychiatric disorder. Whether functional constipation is the etiology or the result of these psychological co-morbidities is a matter of debate [14].

30 of 31 (97%) of our patients are clean in normal underwear on a reliable medical regimen. Approximately one-third of our patients achieved the ultimate goal of being clean in underwear and clean on x-ray with the use of laxatives alone. One of these patients no longer requires laxatives. 21 patients remain on antegrade flushes with 20 (95.2%) patients successfully clean on their regimen and only one patient (4.7%) who continues to soil. All patients on Malone flushes have a laxative trial planned. Limitations to this study include a retrospective review, short-term follow-up, small study size.

We have shown here that a successful multidisciplinary program involving motility gastroenterology, psychology and pediatric colorectal surgery can effectively manage functional constipation in those patients who have failed medical management. Through the use of contrast enemas and colonic manometry, we can guide our surgical resection using a laparoscopic approach to remove the redundant and dysmotile portion of colon. With improving sophistication of motility assessment, the correlation between manometry results and surgical planning should continue to improve. The addition of an antegrade flush gets the patients clean and allows for a slow transition to laxatives over the subsequent 6 to 12 months after surgery. The implications of this to the practice of functional constipation will allow children to be clean in underwear and on x-ray and ultimately improve their quality of life.

We plan to present a finalized report with a longer follow-up with the addition of quality of life scores. We cannot overemphasize that the difficulty with this population remains that functional constipation is a disease process that may require adjustments throughout the patient's life and long-term follow-up is key to continued success.

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