



Radiologically supervised bowel management program outcome in patients with chronic idiopathic constipation

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Abstract

Purpose This study aimed to analyze our radiologically supervised bowel management program (RS-BMP) outcomes in patients with chronic idiopathic constipation (CIC).

Methods A retrospective study was conducted. We included all patients with CIC who participated in our RS-BMP at Children's Hospital Colorado from July 2016 to October 2022.

Results Eighty patients were included. The average time with constipation was 5.6 years. Before our RS-BMP, 95% had received non-radiologically supervised treatments, and 71% had attempted two or more treatments. Overall, 90% had tried Polyethylene Glycol and 43% Senna. Nine patients had a history of Botox injections. Five underwent antegrade continence procedure, and one a sigmoidectomy. Behavioral disorders (BD) were found in 23%. At the end of the RS-BMP, 96% of patients had successful outcomes, 73% were on Senna, and 27% were on enemas. Megarectum was detected in 93% of patients with successful outcomes and 100% with unsuccessful outcomes ($p=0.210$). Of the patients with BD, 89% had successful outcomes, and 11% had unsuccessful.

Conclusion Our RS-BMP has been proven to be effective in treating CIC. The radiologically supervised use of Senna and enemas was the appropriate treatment in 96% of the patients. BD and megarectum were associated with unsuccessful outcomes.

Keywords Chronic idiopathic constipation · Bowel management · Senna · Enema · Megarectum

Abbreviations

ACE	Antegrade continence enema
ADHD	Attention-deficit/hyperactivity disorder
ASD	Autism spectrum disorder
BD	Behavioral disorders
RS-BMP	Radiologically supervised bowel management program
CIC	Chronic idiopathic constipation

Introduction

Chronic idiopathic constipation (CIC) is children's most common colonic motility disorder [1]. It represents a functional condition of the lower gastrointestinal tract with an estimated prevalence worldwide of 14% [1, 2]. Peak incidence occurs during toilet training age, with no consistent effect of gender on prevalence [3, 4]. Constipation requires proper treatment and long follow-up because it significantly negatively impacts patients' daily and social lives and reduces health-related quality of life [5].

Symptoms include, among others, hard stools, infrequent bowel movements, abdominal pain, painful bowel movements, and pseudo-fecal incontinence. Most patients with CIC suffer from persistent fecal impaction, which should be considered a partial intestinal obstruction. Consequently, after being toilet trained, these patients have involuntary bowel movements in their underwear due to the overflow of soft stools passing around solid retained feces in the rectum. Additionally, urinary symptoms can be present, such as urinary incontinence and urinary tract infections [6–8]. CIC is

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commonly associated with megarectum, facilitating chronic and involuntary bowel movements. Megarectum becomes a low motility zone that enables the persistence or recurrence of fecal impaction and incontinence [7, 9].

CIC is a clinical spectrum with no clinical severity scale, making its management challenging. Children can be treated successfully on one side of the spectrum with minimal life changes, dietary modifications, and pharmacological interventions. However, on the other side, some patients require surgical interventions [6, 10–16].

Several studies reported the association of behavioral disorders (BD) with CIC and have demonstrated that these children suffer more attention-deficit / hyperactivity disorder (ADHD), autism spectrum disorder (ASD), anxiety, depression, emotional problems, and problems with peers [17–21].

We have a long experience managing patients suffering from idiopathic constipation for many years. They received inadequate amounts of laxatives or non-effective enemas and never had an abdominal x-ray. As a result, these patients continue with symptoms and are classified as refractory constipation to medical treatment. This study aimed to evaluate the outcome of a radiologically supervised bowel management program (RS-BMP) for patients with CIC.

Materials and methods

Study design

We conducted a retrospective, cross-sectional, single-institution, and descriptive study. We included all patients with CIC who participated in the RS-BMP in the Colorectal Center at Children's Hospital Colorado from July 2016 to January 2023. The RS-BMP lasts for eight successive days. Primary care physicians, pediatricians, or gastroenterologists referred these patients to us. Electronic medical records were reviewed to determine demographics, previous treatment, contrast enema results, rectum size, and behavioral disorder diagnosis. Also, we analyzed outcomes and treatment types after completing SR-BMP. Patients with anorectal malformations, Hirschsprung's Disease, and spina bifida were excluded. The Colorado Multiple Institutional Review Board approved this study (COMIRB 20-2275).

Definitions

- CIC: included all patients with constipation lasting more than six months who had been examined and studied to rule out organic etiologies.
- Successful outcome: On the last day of the RS-BMP, the amount of laxative or the enema recipe effectively produces a big voluntary bowel movement. The patient does not have involuntary bowel movements (feces accidents)

between bowel movements. The abdominal radiograph obtained after a bowel movement shows no residual feces in the rectum, sigmoid, and left colon.

- Unsuccessful outcome: At the end of the RS-BMP, the laxative or enema produces voluntary bowel movements, but the patient continues having involuntary bowel movements (accidents), and/or the abdominal radiograph confirms residual feces in the rectum, sigmoid, or left colon after the bowel movement.
- Megarectum: a recto-pelvic ratio greater than 0.61 [22].

Statistical analysis

We compared the success rate of the RS-BMP with previous treatment types, duration of constipation, megarectum, and BD. The Student's t-test and Chi-square or Fischer's exact test to compare proportions were used. The statistical analysis was conducted using the 26.0 version of the Statistical Package for the Social Sciences (SPSS®). Statistical significance was considered when a p value was < 0.05.

Results

A total of 80 patients met the inclusion criteria. The average age was 8.5 years (range 1–38 years). The largest age group was 6–9 years, accounting for 36% of the patients. Forty-eight patients (60%) were male. The average duration of constipation was 5.6 years, and the range was 1–17 years. BD was reported in 19 patients (Table 1).

Before RS-BMP

Four patients auto-enrolled in the RS-BMP; they did not receive any treatment prescribed by a physician. Seventy-six (95%) patients had received non-radiologically supervised treatments. Fifty-seven (71%) had attempted two or more treatments. Polyethylene Glycol (PEG) was the most prescribed medication; 90% of patients took PEG. Enemas were used in 46%, Senna in 43%, Botox injection in 11%, antegrade continence enema (ACE) procedure in 6%, and sigmoidectomy in 1% (Fig. 1). Sixty-nine patients had a contrast enema. Forty-six (66%) had megarectum; in 23 (43%), the recto-pelvic ratio was normal.

At the end of RS-BMP

Seventy-seven (96%) patients had a successful outcome. Fifty-seven patients (74%) were successful with Senna, and 20 (26%) with enemas. Sixty-nine patients were on PEG before RS-BMP, and 74% were successful with Senna and 26% with enemas. Similarly, 34 patients took Senna before RS-BMP, and 28 (82%) became successful after adjusting

Table 1 Demographic data and clinical characteristics of 80 patients with chronic idiopathic constipation before RS-BMP

Sex	Male	48 (60%)
	Female	32 (40%)
Age (years)	< 1	0 (0%)
	1–5	23 (28%)
	6–9	29 (36%)
	10–20	26 (32%)
	> 21	2 (2%)
Duration of constipation (years)	< 1	0 (0%)
	1–3	31 (38%)
	4–5	16 (20%)
	6–9	17 (21%)
	> 10	16 (20%)
Behavioral disorder	ASD	4 (21%)
	Developmental delay	4 (21%)
	ADHD	4 (21%)
	Anxiety	4 (21%)
	Depression	2 (10%)
	Anorexia nervosa	1 (5%)

RS-BMP Radiologically Supervised Bowel Management Program, *ADHD* Attention-deficit/hyperactivity disorder, *ASD* autism spectrum disorder

the amount of Senna (Table 2). Forty-three out of 46 (93%) patients with megarectum had a successful outcome, and all 23 (100%) patients with a normal recto-pelvic ratio also were successful ($p=0.210$).

Three patients had unsuccessful outcomes. One patient refused to continue taking medication and the use of rectal

enemas. We did not find the amount of Senna in one and the adequate enema recipe in the other. Both patients continued with fecal accidents. Two patients had BD.

There was no statistical significance when comparing the average age and duration of constipation between the successful group with the unsuccessful group ($p=0.98$ and $p=0.18$, respectively).

Sixty-one patients did not have BD; 60 (98%) had successful outcomes, and one (2%) had unsuccessful. Nineteen patients had BD; 17 (89%) had successful outcomes, and 2 (11%) had unsuccessful. There was no statistical significance in the outcome between patients with BD vs. those without BD ($p=0.075$).

Discussion

CIC is highly prevalent in children. It harms patients' quality of life and significantly interferes with their social interactions [23–25]. As shown in this study, all patients with CIC received medical treatment without following a specific protocol. Over 70% of those patients had attempted two or more treatments. Six patients classified as refractory to medical management underwent an unnecessary surgical procedure, ACE or sigmoidectomy, with no improvement in their constipation.

We have previously demonstrated RS-BMP's effectiveness in treating CIC [10]. Russell K, et al. also published similar data and showed a decrease in hospital and admission and surgical interventions [15]

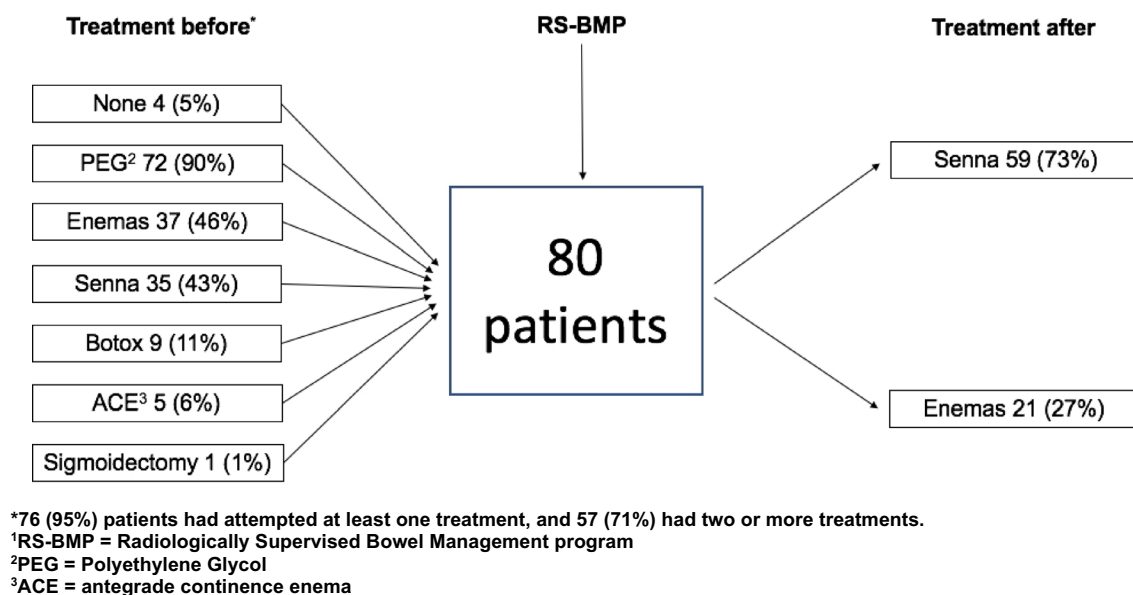


Fig. 1 Treatments before and after RS-BMP¹ in 80 patients with chronic idiopathic constipation

Table 2 Treatments before and after RS-BMP in 77 patients with chronic idiopathic constipation and successful outcome

	Treatment before RS-BMP						
	PEG n = 69	Enemas n = 34	Senna n = 34	Botox n = 9	ACE n = 5	None n = 4	Sigmoidectomy n = 1
Treatment after RS-BMP							
Senna	51 (74%)	24 (70%)	28 (82%)	5 (56%)	3 (60%)	4 (100%)	1 (100%)
Enemas	18 (26%)	10 (30%)	6 (18%)	4 (44%)	2 (40%)	0 (0%)	0 (0%)

RS-BMP radiologically supervised bowel management program, PEG polyethylene glycol, ACE antegrade continence enema

Our RS-BMP consists of a week-long process of trial and error to determine the adequate amount of laxative or rectal enema recipe for each patient. First, we perform a contrast enema to evaluate the characteristics of the rectum and sigmoid. Then, we check for fecal impaction, and if present, the patient undergoes a clean-out protocol based on enemas with daily radiological monitoring to confirm successful colon emptying objectively.

Our RS-BMP for CIC entails, in most cases, an initial cleaning of the colon. Then, based on the surgeon's experience during RS-BMP, the presence of megarectum, chronicity, history of overflow pseudo-fecal incontinence, regression using diapers, and significant social problems such as bullying and social isolation, it is worth considering using enemas for a period before attempting a laxative trial. The remaining patients are considered good candidates to start laxative trials.

The use of laxatives is based on trial and error. Our preference is to use a stimulant laxative, Senna. The initial dose is determined according to the characteristics described in the previous paragraph. The amount of Senna is adjusted daily based on the response to the initial dose. We evaluate the presence and characteristics of the feces and the occurrence of fecal soiling. But residual feces in the rectum, sigmoid, and left colon observed in the abdominal radiograph, obtained immediately after the bowel movement, is the most objective approach to maintain, increase, or reduce the amount of laxative.

According to the previously described, we proceed as follows:

1. If there is no bowel movement after 24 h of the Senna dose, a rectal enema is given, and the amount of Senna is increased.
2. The dose is also increased if there is a bowel movement, but the abdominal radiograph shows residual feces in the rectum.
3. The laxative dose is decreased if the family reports multiple liquid or soft bowel movements and the abdominal x-ray is clean (no residual feces in the rectum).

4. Finally, we keep the same amount of Senna if the patient has voluntary bowel movements, and the abdominal radiograph shows no residual feces in the rectum.
5. Some patients need high doses of Senna to have a successful outcome. However, some patients suffer from nausea, abdominal pain, vomiting, and poor quality of life. In those scenarios, we consider changing them to rectal enemas.

For the use of enemas, the amount of normal saline, glycerin, and castile soap is also determined based on the contrast enema and surgeon experience. It is adjusted daily according to the number of bowel movements in 24 h and the amount of stool in the rectum, sigmoid, and left colon seen on the daily abdominal radiograph obtained after the bowel movement.

After completing the eight days of the RS-BMP described earlier, our success rate of 96% was like previous publications [10, 15]. Over 80% of the patients on Senna before our RS-BMP were successful after adjusting the dosage. Similarly, most patients on enemas, even those who underwent ACE, Botox injection, and sigmoidectomy, were successful with Senna. This emphasizes the positive impact of the adequate use of Senna based on daily clinical and radiological findings.

We had three patients with unsuccessful outcomes. One refused to continue the treatment at the end of the RS-BMP week. The second patient, besides CIC, had ADHD, Ehlers-Danlos syndrome, and megarectum. The laxative protocol was attempted, but the patient continued to experience involuntary bowel movements. The last unsuccessful patient had ASD and megarectum. The enema-based protocol was tried; however, despite many adjustments to the enema recipe, we could not find the proper amount to keep the colon clean. EDS [26] and ADHD [20] have been associated with CIC, and it has been reported that these conditions could affect the chances of a successful BMP outcome.

Megarectum is a disorder that appears secondary to CIC [22]. It represents a life condition that makes CIC treatment challenging [13]. In the present study, the average

duration of constipation was 5.6 years; by that time, 66% of the patients had megarectum. Although a megarectum did not show statistical significance in terms of success rate, it was interesting that the three patients with unsuccessful outcomes had a megarectum. It has been reported that most patients with CIC and megarectum can achieve success under protocolized BMP [10]. However, these patients were predisposed to fecal impaction and the need for higher doses of laxatives, which could cause nausea, abdominal pain, and vomiting. Finally, some patients require rectosigmoid resection [13]. These circumstances emphasize the importance of timely referral and the practice of RS-BMP. Some patients underwent ACE without previous proper RS-BMP. However, we have found [27] that the success rate of antegrade enemas is considerably higher after a RS-BMP with rectal enemas. Therefore, creating an ACE without a previous rectal enema program does not guarantee a successful outcome.

Following a RS-BMP is essential in the management of CIC. Unfortunately, late referrals are common in these challenging patients, leading to unnecessary interventions.

Conclusions

The Radiologically Supervised Bowel Management Program has been proven to be effective in treating Chronic Idiopathic Constipation.

Author contributions Study conception and design: LT, AB, AD-M. Data acquisition: AD-M, LAW, JK, VR, LS, AM and MW. Analysis and data interpretation: LT, AD-M, LJ-G. Drafting of the manuscript: LT, AD-M. Critical revision: LT, AB, AP, AD-MM. Figures and Tables: LT, AB, AP, AD-M. All authors reviewed the manuscript.

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Declarations

Conflict of interest The authors declare no competing interests.

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