Study of anorectal myotomy and other surgical options in management of chronic idiopathic constipation

Moustafa Ramadan mohamed Abo elsoud* yousri Gaweesh† Ahmed Saad Ahmed‡ Said Awad** Moustafa Abd elbaky††

*Medical research institute, alexandria university, Darsh7620012001@yahoo.com
†Faculty of Medecine, Alexandria university
‡Medical research institute, alexandria university
**Medical research institute, alexandria university
††Medical research institute, alexandria university

Copyright ©2013 The Berkeley Electronic Press. All rights reserved.
Study of anorectal myotomy and other surgical options in management of chronic idiopathic constipation

Moustafa Ramadan Mohamed Abo elsoud, Yousri Gaweesh, Ahmed Saad Ahmed, Said Awad, and Moustafa Abd elbaky

Abstract

The purpose of this study was to assess the efficacy of adding colectomy and other surgical options to the anorectal myotomy in the management of chronic idiopathic slow transit constipation. We evaluated 20 patients suffering from chronic idiopathic constipation admitted to the department of surgery, Medical Research Institute, and to the unit of colorectal surgery in the Main University Hospital, Alexandria University. Preoperatively all patients exhibited pre-operative scoring of their constipation status reported by D. Altomare et al., 1996: Barium enema to locate any problem, to visualize the anatomical configuration of the, colon, and to visualize rectum with or without straining, assessment of colon transit time (CTT) done after ingestion of radio-opaque markers, Barium enema revealed 9 patients (45%) with normal large bowel and 11 patients (55%) with mega large bowel. CTT revealed 11 patients (55%) with retained and delayed radio-opaque markers in mega large bowel, 5 patients (25%) with scattered radio-opaque markers throughout the colon, 3 patients (15%) with delay of markers at the left side of the colon, and 1 patient (5%) with delay of markers at the sigmoid colon, types of colectomy done for the patients ranged from subtotal colectomy and ileorectal anastomosis, left hemi colectomy or sigmoid colectomy, other type of surgery was minimally assisted endorectal pull through which is done in cases of mega large bowel not responding to anorectal myotomy after 1 month.

KEYWORDS: Chronic idiopathic constipation, Colectomy, colon transit time, endorectal abdominally assisted colonic pull through
INTRODUCTION

Constipation is among the most common gastrointestinal disorders. It is so prevalent that in fact it is considered endemic in the elderly population. In the United States alone, more than 3 million prescriptions are written for cathartics yearly and over 800 million dollars are spent annually for over-the-counter (OTC) laxatives [1]. It is clear that constipation represents a major health problem [2]. Despite its significant impact, the etiology of constipation remains largely unknown. The variety of symptoms and risk factors associated with constipation suggest that its etiology is likely to be multifactorial [3].

The definition of constipation differs from patients and medical perspectives. Patients usually report qualitative symptoms such as need for straining, passing hard stools, having too few bowel movements or having unsuccessful defecation [4]. From a medical and research perspective constipation has been defined based only on bowel movement frequency. [5] More recently a consensual definition of constipation has been developed, based on alternative criteria assessing defecation difficulties and stool frequency (Rome III criteria). [6]

1) Two or more of the following:
   A. Straining (> 25%), B. Lumpy or hard stools (> 25%)
   C. Sensation of incomplete evacuation (> 25%), D. Sensation of anorectal obstruction/blockage (> 25%), E. Manual maneuvers (> 25%), F. < 3 BM.

2) Loose stools are rarely present without the use of laxatives.

3) There are insufficient criteria for IBS.

Constipation may be associated with a number of different diseases or conditions. The known etiologies of constipation include mechanical obstruction, metabolic disturbances, neurologic disorders, and medication side effects [7]. If a cause of chronic constipation, extraintestinal or colonic (organic or anatomic) cannot be identified, the constipation is considered to be an idiopathic disorder [8].

Chronic idiopathic constipation

Patients whose constipation cannot be attributed to known causes or may disclose a colonic or anorectal disorder of unknown etiology, and who do not respond to conservative dietary management are considered to have chronic idiopathic constipation [8]. Chronic idiopathic constipation can be divided into two broad categories; those who have variable degrees of colonic inertia "slow colon transit" and those who have pelvic outlet disorders "outlet obstruction" [9], however colonic inertia and outlet obstruction are sometimes present in the same patient with constipation [10].

1) Delayed colonic transit/motility (30%)

- Altered neuroenteric function and reflexes
• Failure of muscular apparatus

2) Functional outlet obstruction (40%) important causes not diagnosed easily on clinical basis

• Ultra short segment Hirschsprung disease

• Spastic pelvic floor syndrome

3) Combined (30%)

Slow-transit constipation without megacolon

Slow-transit constipation without megacolon is a condition that is almost entirely confined to women [11, 12]. Other terms used to describe this syndrome are colonic inertia or Arbuthnot Lane’s disease [13, 14].

Although these patients have a normal-sized colon, their colonic transit time is markedly prolonged.

Constipation with Megacolon and/or Megarectum

Some patients with severe, intractable constipation have a markedly dilated rectum and/or colon. This condition, also called idiopathic megarectum and/or megacolon, affects males and females in equal proportion. Most patients have the onset of symptoms in childhood or early adult life. Various segments of the large bowel may become dilated, but the process usually begins in the rectum. The etiology of this condition is still unknown.

PATIENTS

The study was conducted on 20 patients suffering from chronic idiopathic constipation admitted to the department of surgery, Medical Research Institute, and to the unit of colorectal surgery in the Main university Hospital, Alexandria University.

Inclusion criteria: Infrequent defecation with two or fewer bowel motions weekly, with difficulty and straining at defecation due to colonic and/or anorectal functional disorder of unknown etiology after a cordial attempt of medical treatment.

Exclusion criteria: Frequent defecation with more than two bowel motions weekly, large bowel organic disease: tumours, solitary rectal ulcer syndrome, diverticulosis and malignant colorectal stricture, Anorectal organic diseases: mechanical causes include fissures, anal stenosis due to surgery, crohn’s disease, and radiation, Anorectal outlet obstruction: rectocele, enterocele, rectal prolapse either occult or evident, and paradoxical contraction of the puborectalis muscle.,Psychological disorders: depression,Medications: aluminium or calcium containing antacids, opiates, anti-cholinergics, anti-histaminics, anti-depressants,Endocrinol disorders: hypothyroidism, hyperparathyroidism, glucagonomas, and panhypopitutarism and Neurological disorders: Parkinsonism, and demyelinating diseases.
METHODS

All patients were submitted to complete history taking, thorough physical examination including abdominal examination for detection of any possible organic disorders and digital rectal examination to determine content of the rectum, whether feces are hard or soft, and any other condition that may contribute to constipation such as anal fissures.

Investigations: include barium enema and colonoscopy in only selected cases to exclude the presence of neoplasia.

When the patients proved to have chronic idiopathic constipation, they were subjected to the following:

a) Pre-operative scoring of their constipation status using D. Altomare et al., 1996[15].

b) Colon transit time (CTT): Assessment of CTT done after ingestion of radio-opaque markers. Patients should maintain normal fiber intake during the study period but should not use laxatives, enemas or suppositories. Typically patients swallow a single capsule containing 20 radio-opaque markers before receiving a direct radiograph of the abdomen; 1 radiograph per day for at least 3 days is performed. The normal CTT is that less than 20% of the markers remain after 3 days. If more than 20% of the markers remain in the colon further radiographs are carried out for another 2 days, which allow differentiation between total and segmental slow transit constipation[16].

c) Surgical biopsy: Anorectal myotomy[17]:

i) Under general anaesthesia in lithotomy position, 2 stay sutures are taken at 4, 8 o’clock 1.5 cm above the dentate line to the skin including only the mucosa and submucosa.

ii) A shelf of mucosa is created posteriorly under which 10 ml 1:300,000 adrenaline in saline is injected submucosally.

iii) Incision with raising a mucosal flap is done as far as the finger can reach (across to the 3rd sacral piece) to demonstrate the internal sphincter and circular muscle layer of the rectum.

iv) A myotomy is done in this circular muscle layer using scissors or low voltage diathermy with a length of about 6-10 cms, thus demonstrating the external sphincter complex, the puborectalis muscle, and the extrarectal fat of the mesorectum above, and biopsies are taken from the extreme upper edges of the myotomy.

v) Then closure of the mucosal wound transversely is done after assuring hemostasis and a small pack is inserted for 12 hours to prevent seroma or hematoma formation.

e) Other Surgical options:

After rescoring of the constipation status and in patients showing no significant improvement, other surgical options would be considered only for definitely proven cases of slow-transit constipation after functional studies (CTT) and anatomic studies (barium enema) of the patient.
Statistical analysis

Descriptive statistics were calculated as frequencies and percents for qualitative variables and mean ± standard deviation for quantitative variables. Comparison of pre and post-operative values of different categories and total constipation score was done using Wilcoxon signed ranks test. The Comparison between normal and mega large bowel cases as regards need for further operation was done using Fisher exact test.

RESULTS

The studied patients were 11 males(55%) and 9 females(45%), the age of these patients ranged from 1 year to 59 years with a mean age of 24.45 ± 16.25. Table 1

Radiological diagnosis all patients were submitted to barium enema which revealed 9 patients (45%) with normal large bowel and 11 patients (55%) with mega large bowel. figures 2 and 3

Constipation scoring

The constipation scoring of all patients were recorded according to the constipation scoring system reported by D.Altomare et al. [15] preoperatively and one month postoperatively. Table 2

Colon transit time (CTT) Colon transit time was done in all patients who revealed 11 patients (55%) with retained and delayed radio-opaque markers in mega large bowel, 5 patients (25%) with scattered radio-opaque markers throughout the colon, 3 patients (15%) with delay of markers at the left side of the colon, and 1 patient (5%) with delay of markers at the sigmoid colon. Patients with obstructed defecation were excluded from the study. Figures 4 and 5

Surgery

According to the barium enema patients were classified into 9 patients (45%) with normal large bowel and 11 patients (55%) with mega large bowel.

Patients with normal bowel were operated upon according to their colon transit time (CTT):

1) 4 patients (20%) with markers scattered throughout the colon underwent subtotal colectomy (STC) with ileorectal anastomosis, 1 patient (5%) underwent anorectal myotomy and showed no improvement and required further surgery in the form of Subtotal colectomy with ileorectal anastomosis.

2) 3 patients (15%) with markers delayed in the left colon underwent left hemicolecctiony.

3) 1 patient (5%) with markers delayed in the sigmoid colon underwent sigmoid colectomy.
Patients with mega large bowel were operated upon with Anorectal myotomy and the constipation score was reported one month after the operation which revealed that 2 patients (10%) were improved after the operation and required no further surgery while 9 patients (45%) showed no improvement and required further surgery in the form of endorectal pull through. Figure 1 representing types of operations

Endorectal abdominally assisted colonic pull through

1) Under general anesthesia the patient was put in lithotomy position with head slightly down.

2) Four stay sutures were inserted at sites two, five, seven, and ten o’clock to evert the anal cushions in an outward fashion. Figure 6

3) Using diathermy a circumferential incision in the rectal mucosa was done after injection of diluted adrenaline solution submucosally all around the rectum. Care is being taken to avoid missing any islet of mucosa from cutting, and also not to go deeper than the submucosa.

4) A sleeve of mucosa is dissected free from the muscle wall of the rectum to reach at least 35 cm from the verge. At the beginning the dissection process is a bit difficult and my incline either to the mucosal side, or the muscular side, however, once the proper plane is established the process becomes easy and bloodless. Figure 7

5) The distance is insisted to pass the dilated rectum, the dilated sigmoid up to the area where the sigmoid is taking blood supply from the higher sigmoid arteries. Figure 8

6) Then through a transverse horizontal muscle cutting incision in the left iliac fossa the sigmoid is devascularised, and a circumferential cut of the muscle wall at the superior end of the mucosal dissection was done identified by the presence of a circumferential bruise at that site to enable the pull through process. Figure 9 and 11

7) The excess colon is transected and the colon is sutured to the everted inferior rectal mucosa in a circumferential fashion. Figure 10

8) A diverting stoma (ileostomy or transverse colostomy) is done to protect the suture line and is closed after two months.

Discussion

Constipation has got several interpretations among the medical as well as the non-medical societies. Obstructed defecation (OD) as a category can be easily separated from the other category of infrequent, hard, and sometimes painful motions usually associated with abdominal distension bloating and/or cramping.

In our study of the second category of patients which can be called the inertia constipation two types of patients can be easily distinguished. Type one includes
patients who proved to have normal large bowel diameter may be with some extra looping of the sigmoid or other regions of the colon (dolichocolon), and type two that includes patients with mega large bowel, whether it is only megarectum, rectosigmoid, or megacolon. Type one patients is going to be called slow transit constipation patients, while type two is going to be called constipation with mega large bowel patients.

In the results of this study type one slow transit constipation cases constituted 9 patients, with a male to female 2:1 and average age of 32.3 years while the other type involving constipation with mega large bowel constituted eleven patients with almost equal male to female ratio and average age of 15.27 years. The difference is statistically significant between the ages of the two groups; all patients with obstructed defecation were excluded from that study.

In the literature most of the patients with colonic inertia were females with a ratio reaching 80% of patients, and an average age of almost 45 years [18]. In this study the males were almost double in the ratio, and the average age was almost one decade younger. No evident explanation can be presented to explain this difference except may be the socioeconomic class of our patients were females are still embarrassed to complain of what the lay people think a trivial complaint is.

As for the colon transit time, it showed delay in the dilated segments of the large bowel in the eleven cases showing mega large bowel, thus adding nothing to the evaluation armamentarium in these patients. On the other hand, in patients with normal caliber large bowel, with or without extra-looping it was the main decision making tool for the colectomy used. Needless to say here that myectomy added nothing to these patients, and we did it only once. We felt that it unethical to expose patients with normal caliber large bowel to a myectomy operation, and we were satisfied to get a deep mucosal biopsy from the rectum during the colectomy operation in the other 8 patients. Transit-time studies are very helpful in the estimation of the length of the involved segment in patients with chronic intestinal obstruction.

Discussion of the types of operations used in this study should be classified into two main categories:

Operations used for cases with slow transit constipation without mega colon and or rectum (9 cases) i.e. different types of colectomies

Operations used for cases of constipation with associated megarectum and or mega colon (11 cases) i.e. myotomy and the novel endo rectal pull through that was used in 9 cases.

Colectomies used in this study were subtotal colectomies in five patients, left hemicolecetomy in three patients and sigmoidectomy in only one patient. In cases of total colectomies no postoperative morbidity was detected except for one case with
minor wound sepsis. All patients showed some sort of reasonable improvement in their constipation score.

Dietary measures and medical treatment including laxatives and enemas usually fail to relieve the distressing symptoms of this syndrome. Battaglia et al. [19] assessed the medium and long-term effects of biofeedback and muscle straining in patients with slow-transit constipation in 10 patients who were unresponsive to conventional treatments. At 1 year follow-up, beneficial effect was seen in only 20% of these patients and there was no improvement in colonic transit time. For these reasons, operative intervention is frequently considered. The most common technique is subtotal colectomy with ileorectal anastomosis. According to enthusiastic reports, this procedure seems to be highly effective with success rates of greater than 90%.

In their review of the literature, Pfeifer, Agachan, and Wexner [20] found 444 patients without megabowel, and the success rate for subtotal colectomy and ileorectal anastomosis was 83%. Because the selection of patients with constipation for colectomy may prove difficult, Sunderland et al. [21] evaluated the role of video proctography. Santhat and Gordon [22] suggested that when true idiopathic slow-transit constipation is identified on the basis of delayed markers and the ability to expel liquid on proctography, an excellent result could be anticipated from colectomy and ileorectal anastomosis.

Mollen et al [23] assessed the results of preoperative functional evaluation of patients with severe slow-transit constipation in relation to functional outcome in 21 patients who underwent colectomy and ileorectal anastomosis. Mean colorectal transit time was 156 hours (normal < 45 hours). Small bowel transit time was normal in 10 patients and delayed in five patients. Morbidity was 33% Small bowel obstruction occurred in six patients; relaparotomy was done in four patients. Follow-up varied from 14 to 153 (mean 62) months. After 3 months, defecation frequency was increased from one bowel movement per 5.9 days to 2.8 times per day. Seventeen patients continued to experience abdominal pain, and 13 still used laxatives and enemas. Satisfaction rate was 76%. After 1 year defecation, frequency was back at the preoperative level in five patients. An ileostomy was created in two more patients because of incontinence and persistent diarrhea but 52% still felt improved.

In this study exclusion of patients with obstructed defecation from the start could explain the satisfactory results that are reported, however the small number of the patients studied, and the lack of proper follow up and may be the use of the stapled anastomosis can contribute to the lack of the usually reported complications.

Despite a hesitation to perform a segmental resection, most surgeons point to the significance of segmental colonic transit time studies. In our opinion, it does not make sense to quantify regional transit if subtotal colectomy is the only preferable option for patients with slow-transit constipation.

A recent Swedish study that prospectively followed 28 patients who underwent segmental colonic resection (26 left and two right hemicolectomies showed good
symptomatic relief with reduced risk of side effects [24]. Patients were selected on the basis of a marked delay in either the right or left colon and a less impaired delay in the rest of the colon on oral indium 111 labeled scintigraphic transit studies. The median stool frequency increased from one to seven per week with a reduction in laxative and enema usage, but five operations failed and needed further surgery for constipation.

It would seem germane to consider regional transit in the decision-making process. If markers pass through the right colon but are only held up in the descending and sigmoid colon, a left hemicolectomy would be deemed appropriate because it would accomplish the task of removing the poorly functioning portion of the colon while obviating the potential complications of subtotal colectomy. Unfortunately this study included only three cases of left hemicolectomy and one case of sigmoidectomy all underwent uneventful recovery with very satisfactory results. May be the lack of a prolonged follow up caused an impression of the ideality of this operation choice.

Gladman et al [25] in 2005 have undergone a systematic review of surgical options for idiopathic megarectum and megacolon (IMB) to evaluate the published outcome data of surgical procedures for IMB in adults. A total of 27 suitable studies were identified, all evidence was low quality obtained from case series, and there were no comparative studies. The studies involved small numbers of patients (median 12, range 3-50), without long-term follow-up (median 3 years, range 5-7). Inclusion of subjects, methods of data acquisition, and reporting of outcomes were extremely variable. Subtotal colectomy was successful in 71.1% but was associated with significant morbidity related to bowel obstruction (14.5%). Segmental resection was successful in 48.4%, and recurrent symptoms were common (23.8%). Rectal procedures achieved a successful outcome in 71% to 87% of patients. Proctectomy, the Duhamel, and pull-through procedures were associated with significant mortality (3%-25%) and morbidity (6%-29%). Vertical reduction rectoplasty (VRR) offered promising short-term success (83%). Pelvic-floor procedures were associated with poor outcomes. A stoma provided a safe alternative but was only effective in 65% of cases. They concluded that data of surgery for IMB must be interpreted with extreme caution due to limitations of included studies. Recommendations based on firm evidence cannot be given, although colectomy appears to be the optimum procedure in patients with a non-dilated rectum, restorative proctocolectomy the most suitable in those with dilatation of the colon and rectum, and VRR in those patients with dilatation confined to the rectum. Appropriately designed studies are required to make valid comparisons of the different procedures available.

As one can conclude from the previously described techniques, results of failure, controversies in success, and alleged explanations, nothing can be so much an ideal procedure for patients with dilated large bowel if a minor, complications free procedure like the anorectal myectomy failed to give a satisfactory result. Soave operation whether done as classically described starting with a laparotomy or as recently described as a trans- anal pull through operation looks the most suitable procedure for those patients. This is because first, it avoids deep pelvic dissection with its accompanied hazards specially for young patients suffering a benign disorder, secondly, it enables excision of the or most of the dilated bowel which are considered abnormal even if the cause of dilatation was distally non relaxing segment, thirdly, it
ensures anastomosing what looks like normal bowel to the anal canal which should be at that time able to relax for the coming motion, and lastly it avoids or minimize abdominal exploration and bowel disturbance specially if the trans anal pull through procedure is adopted.

The debate of the length of the muscle cuff is eminent for discussion. In the original descriptions of the trans anal endorectal pull-through, the sub mucosal dissection was extended above the peritoneal reflection or about 5–6 cms [26, 27]. However, Somme and Langer [28] in 2008 reported having some patients in whom the long muscular cuff “rolled down” and created a tight constricting band around the pulled-through bowel, despite longitudinal division of the cuff prior to the pull-through. As they have gained experience and confidence with the operation, they have increasingly shortened the muscular cuff to approximately 1–2 cm. excellent results using a short cuff have been reported also by Rintala [29]. Some authors have taken this further and omit the sub mucosal dissection entirely, performing what is essentially a trans anal Swenson procedure. Despite the theoretical risk of injury to the prostate or bladder, preliminary reports of this approach appear promising [30].

Another argument applies to the use of protecting stomas. Despite the trend among pediatric surgeons to avoid routine colostomies, there are still some situations in which a colostomy or ileostomy is indicated [28]. These include the very sick child with enterocolitis, the older child with massive mega colon, uncomplicated Hirschsprung’s disease without access to an experienced pathologist, long-segment disease, and the child with trisomy 21 and developmental delay. The trans anal approach can be used for reconstruction in a child with a pre-existing colostomy without the need for a full laparotomy.

It is for these reasons we described the trans-rectal abdominally assisted pull through operation applied to 9 of our patients with satisfactory results. The operation as described in the results not in the methods was really the result of application of the above mentioned advantages of the Soave principle with the trans anal application with a trial to make things easier by:

1. Prolonging the submucosal dissection is done to reach almost the midsigmoid area. This is done to avoid tedious short vessels feeding the terminal distal part of the sigmoid and the upper rectum (short vasa recta).

2. Avoid the possible rolling down of the muscle cuff around the pulled through colon due to the very long muscular cuff which cannot roll down or up due to the presence of intact pelvic structures around.

3. Assure hemostasis during the submucosal dissection which is an easy task if done transanally. This dissection needs some meticulous use of stay sutures and sharp dissection until a sleeve can be hold by the left hand of the dissecting surgeon denoting reaching almost the mid rectal level, after which dissection becomes a very easy task with a lot of blunt dissection and diathermy coagulation of some traversing small blood vessels. The presence of thicker dilated rectum and colon definitely makes dissection easier than one can expect.

4. The abdominal assisting incision is a transverse one in the left iliac fossa almost 10 cm in length and is muscle cutting. No retraction is needed. The surgeon can easily identify the proximal end of the submucosal dissection by the presence of a hematoma.
and bruise in the sigmoid wall below which a transverse incision is done to isolate the mucosal tube circumferentially.

5. The only vessels needed to be ligated and cut are the sigmoid vessels which are easily identified in the usually long fat free mesentery found in these patients. Ligations of these vessels enable the surgeon to pull the specimen from below and assure the delivery of all dilated pathological bowel down to and through the anal canal.

6. The pulled through colon is sutured to the everted edge of the anal canal before releasing the main four stay sutures. Although not used, yet the possible use of a circular stapler is tempting to ensure neat anastomosis, after the easy application of a purse string sutures in both the delivered colon and the everted anal canal though the whole thickness in both. The specimen should include part of the tube as mucosa only, and part as full thickness colon.

The anastomosis as described is protected usually by transverse colostomy (5 patients) or ileostomy (4 patients). We did the protection but did not try omitting this step. The fear of the described muscular cuff abscess was the main motive to apply the protecting stoma. We did not come across any muscular cuff sepsis in our 9 patients. The main drawback of the transverse colostomy is prolapse that usually occurs in the distal segment that occurred in 3 out of five patients. However, this was not reported in the results since closure of the colostomy after one and half to two months cures the condition and this caused no problem during closure of the colostomy as well.

References


4- Borum ML. Constipation: evaluation and management. Prim Care 2001; 28(3):577-90


List of tables and figures

Table1. Representing Age and sex of patients

<table>
<thead>
<tr>
<th></th>
<th>Normal bowel</th>
<th>Mega large bowel</th>
<th>Test ¶ P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Min- max</td>
<td>9-49</td>
<td>1-34</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>32.33 ± 15.66</td>
<td>15.27 ± 10.18</td>
</tr>
<tr>
<td>Sex</td>
<td>Male: n (%)</td>
<td>6 (66.7)</td>
<td>5 (45.5)</td>
</tr>
<tr>
<td></td>
<td>Female: n (%)</td>
<td>3 (33.3)</td>
<td>6 (54.5)</td>
</tr>
</tbody>
</table>

¶: t test for comparison of age and Fisher exact test for comparison of sexes

*: Statistically significant at P ≤0.05

NS: Not statistically significant
Table 2 representing Pre and post-operative constipation score

<table>
<thead>
<tr>
<th>Score variables</th>
<th>Pre-operative Mean ± SD</th>
<th>Post-operative Mean ± SD</th>
<th>Z of WSR test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous bowel evacuation</td>
<td>2.35 ± 0.75</td>
<td>0.55 ± 0.69</td>
<td>3.88</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Use of laxatives</td>
<td>2.70 ± 0.47</td>
<td>0.45 ± 0.69</td>
<td>3.99</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Use of enema</td>
<td>2.80 ± 0.41</td>
<td>0.30 ± 0.66</td>
<td>4.06</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>2.55 ± 0.60</td>
<td>0.65 ± 0.59</td>
<td>3.89</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Abdominal distension</td>
<td>1.90 ± 0.91</td>
<td>0.80 ± 0.62</td>
<td>3.38</td>
<td>0.001*</td>
</tr>
<tr>
<td>Absence from work or school</td>
<td>1.55 ± 1.23</td>
<td>0.50 ± 0.89</td>
<td>3.11</td>
<td>0.002*</td>
</tr>
<tr>
<td>Total score</td>
<td>13.75 ± 2.90</td>
<td>3.25 ± 3.09</td>
<td>3.92</td>
<td>&lt;0.0001*</td>
</tr>
</tbody>
</table>

WSR test: Wilcoxon signed ranks test *: Statistically significant at P ≤ 0.05

Figure 1 Types of operations in patients

Figure 2 Barium enema showing mega rectum
Figure 3 barium enema showing normal large bowel

Figure 4. Plain x-ray showing markers scattered all over the colon after 5 days.
Figure 5 Plain x-ray showing markers in the rectum in obstructed defecation (excluded from the study)

Figure 6 stay sutures in the abdominally assisted endorectal pull through

Figure 7 mucosal sleeve dissection from the muscle wall
Figure 8 The mucosal sleeve almost reaching the desired level (more than 30 cms)

Figure 9 The pulled through colon. Notice the transverse incision in the left iliac fossa through which abdominal assistance of dissection was done.

Figure 10 Colon is sutured to the everted inferior rectal mucosa in a circumferential fashion.
Figure 11 Excised segment