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A child with chronic functional constipation – a challenge for a pediatrician alone or a surgeon as well? Case series and literature review

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ABSTRACT

Introduction: The role of surgical treatment for chronic functional constipation in children remains unclear. The objective of this study was to analyze clinical cases of patients qualified for surgical treatment.
Material and methods: We analized data of 160 pediatric patients hospitalized in 2013–2021. Thirteen patients subjected to surgical treatment.
Results: The study group consisted of 13 children. Organic causes of constipation were excluded. The duration of problems before qualification for surgical treatment averaged at 5.7 ±2.7 years. The most common symptoms were psychological disorders (13/13), abdominal pain (12/13) and fecal overflow incontinence (12/13). All patients were qualified for stepwise treatment: colostomy formation, segmental resection, and stoma closure. All children experienced subjective functional improvement. No severe surgical complications were observed.
Conclusions: In cases of functional constipation refractory to conservative treatment,, surgical treatment facilitates immediate improvement in symptoms and social functioning. Any surgical treatment should be preceded by the exclusion of organic causes of constipation.

KEY WORDS:
stoma, child, constipation, resection.

INTRODUCTION

Constipation is the most frequently reported condition in children. It is the cause of 3–5% of all pediatric presentations and as much as 25% of presentations at pediatric gastroenterologists [1–4]. In children, constipation is usually functional in origin, with organic background (Hirschsprung's disease – HD, congenital anorectal defects, neuromuscular diseases) accounting for only 5–10% of cases [1, 2, 5–7]. Rome IV criteria are a common diagnostic tool used for identification of functional constipation in children [8].

Primary conservative treatment modalities include modification of diet and lifestyle, laxatives, rectal enemas, biofeedback training, and psychotherapy [9, 10]. More

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than 50% of patients with chronic constipation present with good responses to conservative treatment [10]. Constipation that does not respond to conventional treatment modalities as administered over a period of at least 3 months is referred to as refractory constipation [1, 11, 12]. About 50% of patients still present with symptoms of constipation after 5 years of specialist care [5, 11].

In refractory constipation, surgical treatment is the preferred modality following the failure of conventional conservative treatment modalities [1, 7, 10, 13, 14]. Before the final decision is made regarding surgical treatment, patients should be thoroughly evaluated so that any potential organic causes of constipation are excluded beyond all doubt [2, 7].

In the past, the role of surgery was limited to the treatment of complications and correction of congenital anorectal abnormalities. Since then, the importance of pediatric surgical care in the treatment of constipation has increased significantly, and surgical interventions are undertaken at a much earlier stage of the disease treatment [9]. It is estimated that surgery is required in up to 10% of children presenting at pediatric surgeon's due to constipation [15]. It is suggested that the choice of the surgical procedure depends on the results of pre-operative examinations (anatomical conditions and function of the distal part of the colon), concomitant diseases, and the preference as well as experience of the surgical team [2, 13]. The spectrum of possible surgical procedures is broad and includes less invasive operations (myectomy or botulinum toxin injection), Malone procedure for antegrade colonic enema (MACE), as well as other procedures (colostomy, resection of megarectum) [13, 14].

MATERIAL AND METHODS

A retrospective analysis of 160 pediatric patients hospitalized at the Department of Pediatric Surgery in years 2013–2021. At the same time, patients remained under care from the Department of Paediatrics, Allergology and Gastroenterology. The exclusion criterion consisted in the diagnosis of constipation due to organic causes, i.e. HD, hypothyroidism, spina bifida, or congenital anorectal defects. Qualified into the study group were 13 patients aged 11.6 ±4.3 who had been subjected to surgical treatment due to functional constipation. The analysis included demographic data, natural history of the disease, additional investigations (anorectal manometry – ARM, colography), history of conservative treatment, type of surgical procedure and complications of surgical procedures. The characteristics of the study group are presented in Table 1.

The endpoint consisted in the assessment of functional improvement of patients following the formation of colostomy (Group A) and restoration of the continuity of the gastrointestinal tract (Group B). Patients were assigned into two groups: Group A (*n* = 13) consisted

TABLE 1. Characteristic of the study group

Patient`s number	Age [years]	Sex	Perinatal history				Age at first symptoms [years])	Co-morbidities	Physical development *		Family history of constipation
			Apgar score	Birth weight [g]	Delivery mode	Hbd			Weight [centyl]	Hight [centyl]	
1	3	F	9	810	SD	27	0.5	–	< 3	< 3	–
2	7	M	10	2390	SD	38	1.5	Fructose intolerance	3–10	3–10	–
3	7	F	10	3110	SD	41	0.5	–	25–50	50–75	–
4	10	M	10	4080	SD	39	2	–	90–97	50–75	–
5	16	M	9	3200	SD	36	0.5	Neurofibromatosis type 1, mental retardation	5–15	< 3	–
6	10	M	10	2850	SD	39	6	Fructose intolerance, asthma	10–25	50–75	+
7	9	F	9	3900	SD	39	5	–	3–10	10–25	–
8	13	M	10	2700	SD	32	1	–	3–10	50–75	–
9	11	F	8	1920	SD	40	4	–	10	25–50	+
10	17	M	10	3150	SD	40	4	Lactose intolerance	10–25	< 3	–
11	15	M	10	3600	SD	39	2	Asthma, ADHD	25–50	3–10	+
12	17	M	10	3100	SD	40	10	–	50–75	> 97	–
13	16	M	8	2650	SD	37	6	–	3–10	< 3	–

ADHD – attention deficit hyperactivity disorder, F – female, Hbd – week of pregnancy, M – male, SD – standard deviation

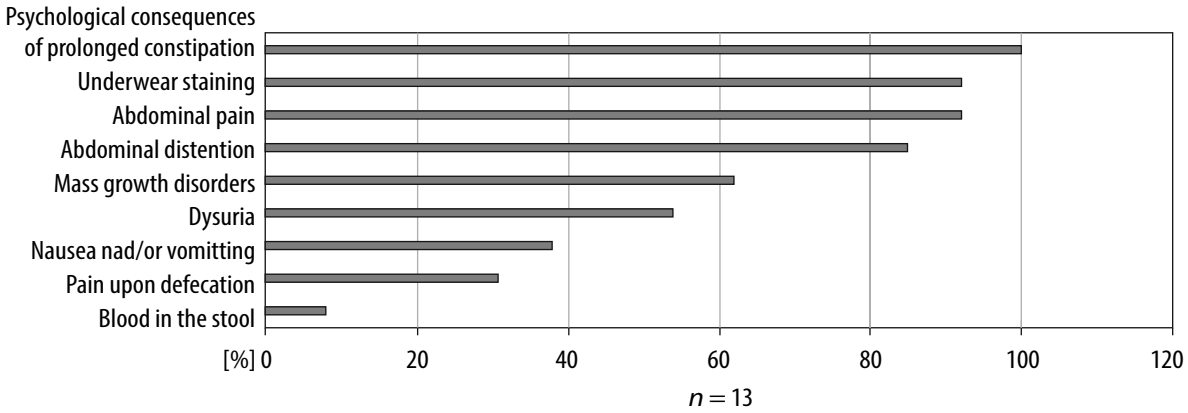

FIGURE 1. Clinical characteristics of the study group: frequency of clinical symptoms before surgical treatment

of all children after colostomy formation while Group B (n = 7) consisted of children already having undergone segmental resection and restoration of the continuity of the gastrointestinal tract. The treatment was administered in two steps, with colostomy being formed in step 1 and segmental resection to be followed by scheduled stoma being performed in step 2. Outcomes were defined according to score points achieved by the patients on the basis of predefined criteria including presence of clinical symptoms like: underwear staining, voiding problems, abdominal pain, nausea, vomiting, abdominal distension, poor apetite/poor weight gain psychological consequences of constipation, and laxative use. The presence of each criterion added 1 point to the patients final result. Poor effect of the treatment was defined when the patient received between 5 and 10 points, moderate 2–4 points and good effect when obtained 0 or 1 point.

RESULTS

The average age at the onset of first bowel habit disturbance symptoms was 3.3 ±2.8 years (minimum age of 0.5 years, maximum age of 10 years). In 4 children, the first symptoms had been observed as early as in infancy. In the remaining patients, first symptoms had developed at the age of 1–3, at the preschool age, and at the school age in 3, 5, and 1 patient, respectively. No impact of perinatal history on the development and the natural history of functional constipation was observed in any of the patients. Symptoms most commonly presented by the patients included psychological consequences of prolonged constipation (13/13), fecal overflow incontinence (12/13), abdominal pain (12/13), and abdominal distension (11/13); less frequent observations included weight growth deficiency (8/13), dysuria (7/13), nausea and/or vomiting (5/13), and pain upon defecation (4/13). Blood in the stool was the least common finding (1/13). Figure 1 presents the percentage distribution of the above symptoms. In 11 children, pathological dilatation of the rectum (megarectum) was confirmed radiologically whereas extended sigmoid loop was revealed by imaging studies in other 2 patients (Figure 2).

FIGURE 2. Pathological dilatation of the rectum

Colography was performed in each patient. The average width of the ectatic rectum was 69.7 ±25 mm (the smallest width was 35 mm and the largest width was 120 mm; the median width was 70 mm). Preoperative ARM was performed in 10 patients (examination was not possible in 2 patients due to the lack of cooperation while another patient had been previously treated at another site – no documentation available). Rectoanal inhibitory reflex (RAIR) was present in all of the 10 patients in whom preoperative ARM was performed (in 2 patients, RAIR was reduced yet present). The mean resting anal canal pressure was reduced compared to the age-adjusted standard in 10 patients. In all 13 patients other causes of constipation in the course of organic disorders, including electrolyte imbalance and hypothyroidism were excluded. In every case an intestinal biopsy was also performed with HD being excluded. In 3 children, magnetic resonance imaging (MRI) of the spine was performed in relation to the presence of diurnal and nocturnal enuresis, with no abnormalities being detected within the lumbosacral spine segment.

Conservative treatment had been implemented in 7 patients in the pre-operative period. The average duration of treatment had been 4.2 ±2.9 years (minimum of 1 year, maximum of 10 years). In these patients, macrogol

TABLE 2. Data on conservative and surgical treatment

Pacjent`s number	Body weight [kg]	Conservative treatment					Surgical treatment			
		Macrogole dosis [g/kg/d]	Enemas frequency	Fecal manual extraction	Biofeedback	Treatment duration to stoma creation	Stoma creation	Segmental rectosigmoid resection	Stoma closure	Time interval to the stoma closure [months]
1	6.2	0.8	Occasional	–	–	1	+	+	+	22
2	14.5	–	Occasional	–	–	–*	+	+	+	29
3	20	0.5	Occasional	–	+	3.5	+	+	s	NA
4	39	0.3	Chronic	+	–	6	+	+	s	NA
5	21.5	–	Occasional	–	–	–*	+	+	+	22
6	25.5	1.2	Occasional	–	+	2	+	+	s	NA
7	26	–	–	–	–	–*	+	–	–	NA
8	31.2	1	Occasional	–	+	5	+	+	+	12
9	34	–	–	–	–	–*	+	+	–	NA
10	35	0.6	Occasional	–	–	–*	+	+	+	17
11	41	1	Chronic	+	+	10	+	+	+	23
12	61	0.3	Chronic	+	+	2	+	+	+	23
13	55.5	–	–	–	–	–*	+	+	–	NA

** – patients operated on in the acute setting due to the signs of ileus, NA – not applicable, s – stoma closure already scheduled*

had been used in chronic maintenance treatment (mean dose of 0.7 ±0.3 g/kg, lowest dose of 0.3 g/kg, highest dose of 1.2 g/kg), accompanied by retention enema infusions performed regularly in 3 patients and on as-needed basis in the remaining patients. In addition, 6 pediatric patients had undergone biofeedback training. Manual extraction of the stool had been performed at least once in 3 patients. No conservative treatment had been provided to 6 out of 13 children in the study group – these patients had undergone emergency surgeries due to stool-related subileus. In 2 of these patients, parents had not followed the physician's recommendations; one of these two patients presented with additional symptoms of enterocolitis in the course of intestinal obstruction occlusion. In the remaining 4 children, no constipation-related symptoms had been observed by the parents prior to the acute symptoms of obstruction. Data on conservative and surgical treatment are provided in Table 2.

Each patient within the study group had been qualified for temporary colostomy formation after no improvement in the condition had been observed despite conservative treatment and the development of megarectum had been confirmed. The average duration of treatment prior to the decision regarding colostomy formation was 5.7 ±2.7 years (minimum of 1 year, maximum of 10 years). In 10 children, double-barreled stoma was formed in the Mikulicz procedure with the proximal and distal bowel segments (proximal and distal stoma) sutured to abdominal integuments. In 5 of these patients, colostomy was formed at the splenic flexure level while in another 5 patients, colostomy was formed at the hepatic flexure level. In the remaining 3 patients, 2 colostomies were formed at the descending colon level followed by rectal stump closure (Hartmann's method) while one patient was subjected to a Bishop-Koop procedure with the colostomy formed at the splenic flexure level. Good clinical effect following colostomy formation was achieved in 10/13 (76.9%) Group A children – patients presented with no signs of constipation and their emotional condition improved significantly. Prophylactic laxatives were recommended as adjuvant treatment in 7 of these patients while a decision to completely discontinue these drugs was made in the remaining 3 cases. Moderate effect was achieved in 3 children, each of whom required periodic administration of laxatives agents and presented with one symptom of constipation (one underwear staining in one child, dysuria-related problems in another child, and abdominal pain in the third child). No poor surgical outcomes were achieved in any of the patients.

No severe surgical complications were observed in the study group following stoma formation. Stoma prolapse occurred in 2 patients while another patient experienced recurrent epidermal excoriations. In addition, stoma revision was required in one patient due to stenosis.

The second stage of the surgical treatment consisted in the removal of the excessively vulnerable, dilated seg-

ment of the colon. In order to estimate the scope of potential colon resection, a contrast agent was infused into the distal stoma in the preoperative period, on average 10 ±3.3 months after colostomy formation. Segmental resection of the dilated colon was performed in 12 children. In 10 patients, the surgery was performed after an average of 14.7 ±5.0 months from the colostomy formation while the other 2 resections were performed simultaneously to the formation to colostomy in order to prevent primary fecal reflux which might occur prior to resection. Partial sigmoid and rectum resection was performed in 11 patients while rectum alone was excised in 1 patient. One patient is still waiting for the resection of the dilated colon.

In 7/13 children, colostomy was closed at 21.14 ±4.9 months after its formation and at 7.29 ±4.8 months after the second stage of the surgical treatment. In 3 other patients, the procedures have already been scheduled. In group B of patients after restoration of the continuity of the gastrointestinal tract, good effect was achieved in all cases (7/7). Five of these patients presented with no signs of constipation while another 2 continued to present occasionally signs of fecal soiling. Psychological consequences of prolonged constipation have resolved in all 7 patients within the group. In addition, complete discontinuation of laxatives was possible in all Group B patients. No moderate or poor outcomes were observed in any of the Group B patients following the restoration of the continuity of the gastrointestinal tract. Figure 3 presents the clinical evaluation of surgical outcomes.

In the post-operative period, patients were closely followed up at the Pediatric Surgery and Gastroenterology Departments in the outpatient setting. Twelve patients have remained under care from the Surgery Department until the date of this report. The average duration of follow-up to date is 11 months (the shortest being 1 month and the longest being 39 months). One patient was lost to follow up after 5 years of observation.

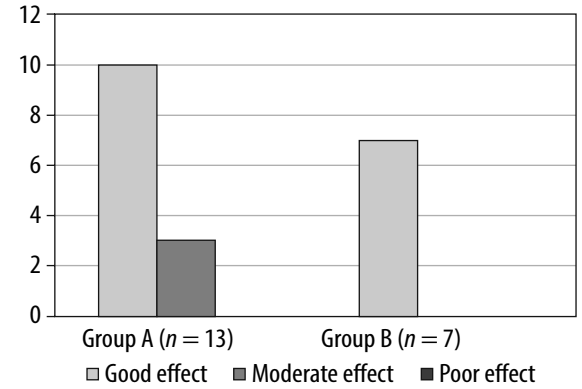

FIGURE 3. Clinical evaluation of surgical outcomes

DISCUSSION

Functional constipation in pediatric patients frequently presents a challenge to family members as well as physicians, particularly due to the long-term course of disease. In 17 to 40% of cases, the disorder develops as early as in the first year of life [11]. Also in the presented case series, 4 patients (30.8%) experienced the onset of constipation in the infancy.

Chronic functional constipation can follow a varied course – from mild disease with good response to conservative treatment to severe cases complicated by intestinal dilation [4, 7, 16]. A trend towards disturbed peristalsis can be observed in the significantly enlarged rectum, leading to difficulties with evacuation of stool and incontinence due to overfilling [4, 9]. This applies to as many as 90% of children with chronic constipation [13]. Also in the presented case series, underwear staining was one of the most commonly reported symptoms (in 92.3% of patients). Some patients also present with bladder voiding problems despite the absence of neurological disorders of spinal dysfunctions; these problems were associated with increased rates of enuresis and urinary tract infections [16]. In our study group, the problem affected 53.8% of patients.

Due to the different efficacy of the methods used to treat constipation, diagnostic and therapeutic procedures should be personalized in each case. Reduced efficacy of conservative treatment may be related to the stiffness and intractability of rectal walls, disturbed rectal contractility, reduced sensitivity threshold, and attenuation of RAIR as measured by ARM [17]. Rectoanal inhibitory reflex was present in all of the 10 patients in whom preoperative ARM was performed while being slightly reduced in 2 of these patients.

Colography is another investigation recommended in patients prior to surgical procedures. Static images visualize the anatomy and potential dilatations or stenosis of intestinal lumen; delayed images acquired after defecation can be used to assess the degree of rectal voiding [17]. Colographic results may aid the surgeon in their assessment of the necessity of colon resection as well as of the exact location of resection [7]. Colographic imaging revealed the presence of megarectum in 11 of the study patients.

In most patients, proper pattern of bowel movements can be achieved by means of lifestyle modifications and laxative agents. It should be highlighted that thorough adherence to medical recommendations is crucial to improve the child's condition. Macrogol agents are frequently discontinued after loose stools appear temporarily at the early stage of treatment. Therefore, it is very important for the physician to explain the drug's mechanism of action to the child's guardians indicating the required duration of therapy. Patients with severe chronic constipation often require very high doses of these agents; this does not always result in regular defecation while being associated with the risk of adverse effects such as abdominal pain, nausea, vomiting, reduced appetite, or bloating [4, 5]. In addition, some children, particularly older children, refuse to undergo enemas due to the embarrassing

nature of the procedure which negatively affects the treatment efficacy.

Surgical treatment of functional constipation usually starts with the least invasive procedures (myectomy, botulin toxin injections, MACE), with more advanced interventions such as colostomy formation or segmental bowel resection being undertaken if necessary [13, 14]. The injection of botulinum toxin into the internal anal sphincter results in transient inhibition of acetylcholine being released into the synaptic gap [2, 13]. Although the effect usually lasts about 6 months, the improvement in symptoms may be permanent [2, 13, 18]. Botox injections may be considered in particular in children with refractory constipation accompanied by abnormal pressure or function of the anal sphincter [5, 13, 18]. Injecting botulinum toxin to the external or internal anal sphincter may be beneficial in children with strong stool retention [14]. This approach had been undertaken in one patient within the study group whose psychological trauma due to chronic constipation was so significant that every attempt at transanal examination or ARM resulted in aggressive behavior and lack of cooperation.

In the past, sphincter myectomy procedures were performed; however, botulinum toxin injections are currently preferred due to their better safety profile and less complicated procedure being associated with similar efficacy. Sphincter myectomy or myotomy may be considered in cases of symptoms recurring despite frequent botox injections [2].

Malone antegrade colonic enema [11] is a non-invasive method for surgical treatment of functional constipation recommended by the ESPGHAN/NASPGHAN gastroenterological societies. This procedure facilitates retention enema being administered directly to colon lumen for subsequent voiding at regular intervals so as to prevent massive accumulation of stool and incontinence due to overfilling [2, 11]. For this purpose, appendicostomy is performed to connect the appendix to the umbilicus for so that retention enema can be administered thereby using a catheter [7]. The advantage of this form of treatment consists in its reversibility as no parts of the intestinal tract are removed. In the event of no improvement, the patient is qualified for resection of colostomy formation at the next stage of management [2]. The most common complications of MACE include formation of granulation tissue in the wound, leaking stoma, stoma stenosis, skin infection, or accidental removal of the catheter [2, 7,1 11]. Malone antegrade colonic edema is intended for patients with refractory constipation requiring daily enemas [1, 2, 7]. Authors of some studies suggested that MACE be performed in children above the age of 5 so that better patient cooperability can be achieved. It is also for this reason that MACE should not be considered in patients with severe behavioral or mental disorders [2]. In our opinion, none of the patients in our study group qualified for MACE treatment.

More common methods of surgical treatment of constipation complicated by rectal ectasia consist in colostomy formation and segmental resection of the colon [13]. According to many authors, temporary colostomy may be particularly effective in patients with marked colon dilatation [2, 7, 14]. Colostomy provides an alternative to MACE in non-qualifying or non-compliant patients [7]. In our study group, the decision regarding colostomy formation had been made due to the failure of conservative treatment with simultaneous segmental dilation of the colon in 7 patients; the remaining 6 children had undergone emergency surgeries due to subileus. Stoma closure with good final outcome can be achieved in as many as 46% of patients [5]. The decision regarding the closure is usually made 1–2 years after colostomy formation if an improvement in the motility of the distal part of the colon is confirmed in follow-up ARM measurements [5]. Also in the presented case series, patients were qualified for restoration of the continuity of gastrointestinal tract after 1 to 2 years from colostomy formation. Permanent colostomy is the last resort [2, 7, 14]. No decision regarding permanent colostomy had to be made in the patients within our study group. When qualifying patients with significant dilatation of the colon, one should keep in mind that colostomy formation is associated with a high rate of complications reaching up to 40%. For this reason, this option can only be taken into account in selected patients [2, 5, 14]. The most common colostomy complications include colostomy prolapse, epidermal excoriation, and obstruction due to adhesions; in most cases, these complications are transient and require no surgical intervention [2, 14]. In the presented group of patients, 2 children experienced colostomy complications as manifested by colostomy prolapse, one patient experienced recurrent epidermal excoriations, and another patient required their colostomy being repaired due to stenosis.

If conservative treatment and less invasive surgical methods are not effective, colon resection (segmental/subtotal/total) is proposed [2]. In addition to the inefficacy of previous treatment, main indications include the presence megarectum/megasigmoid or fecal incontinence [5, 14]. The objective of the surgery is to remove the dilated segment of the colon presenting with impaired motility including the rectum or a fragment thereof while retaining the sphincter function [4, 5]. Open, laparoscopic, or transrectal approach can be used.

Segmental resection may be beneficial in children with megarectum or megasigmoid requiring substantial amounts of laxative agents [2, 7]. The outcome and potential complications of the surgery depend on the extent of the resected bowel segment. Rectal resection is associated with the risk of postoperative fecal incontinence while leaving the megarectum in place may be associated with symptom recurrence or persistence in the post-operative period [2, 17]. Although sigmoidectomy alone may lead to reduction in the demand for laxatives, accumulation

of stool may still occur within the unresected megarectum, leading to incontinence due to overfilling [4, 19]. Owing to its larger extent, rectosigmoidectomy results in resolution of constipation symptoms while being associated with the risk of true fecal incontinence [2, 17, 19]. This complication is probably due to the lost ability to retain stool within the rectum [2, 4, 19]. A solution may consist in proximal rectosigmoidectomy with the distal part of the rectum being left intact [19]. Proximal rectosigmoidectomy not only reduces the patient's demand for laxative agents, but also enables the ability to control stools being regained provided that the sphincter mechanism has not been compromised [17]. Resection of the dilated rectosigmoid segment with preservation of the distal rectum was performed in 12 patients within our study group. One patient is still waiting for the resection of the dilated colon segment.

More extensive resections may be required in patients with dilatation of longer bowel segments [7]. The most radical consists in total proctocolectomy with ileoanal pouch being reconstructed using a distal segment of the ileum [2]. The procedure was not required in either of the patients in our study group.

The comparison of outcomes is hampered by the large discrepancy in the definitions of good final outcomes. In a systematic review of 45 studies involving 1157 children with chronic functional constipation, Siminas *et al.* failed to demonstrate superiority of either of surgical treatments. Five of the pediatric studies included in the review included data on 41 children in whom colostomy had been formed. Gastrointestinal continuity was restored in 19 of these children, with good final outcomes achieved in 16 (84%) cases. Similarly good final outcomes were reported in 9 out of 10 studies (84%) in which segmental bowel resection with primary anastomosis had been performed [14]. Good final outcomes were defined by the authors of studies qualified for this systematic review as an improvement in the bowel function or stool retention as well as a reduction in the use of laxatives. In our study, however, outcomes defined as good were obtained in 10/13 (76.9%) patients after colostomy formation as well as in 7/7 (100%) patients after the gastrointestinal tract continuity restoration. This outcome corresponded to the total score of 0–1 points being achieved by the patient on the basis of predefined criteria including clinical symptoms, psychological consequences of constipation, and laxative use.

Tamura *et al*. analyzed a group of 22 children in whom colon resection had been performed due to chronic functional constipation in the period of 20 years prior to the publication. Twelve out of 22 patients in this group had undergone colostomy formation prior to the resection; good outcome (proper anal defecation with no underwear staining) was achieved in 6 of these patients whereas moderate outcome (proper anal defecation with occasional underwear staining) was achieved in 3 patients and permanent colostomy was required in the remaining 3 patients. Most of these patients had undergone either pancolectomy or panproctocolectomy, with segmental resection performed in one case only [20]. In our study, good outcome was achieved in all of the 7 patients in whom a similar two-stage surgical treatment was performed with restoration of GI continuity (100%). Thus, it appears that restoration of the continuity of the gastrointestinal tract is to be aimed at in all patients in the study group.

Despite the fact that resection facilitates reduction or complete discontinuation of laxatives, patient follow-up is necessary [7]. The function of the remaining rectum probably remains disturbed and thus rectum dilatation is still possible without supervision and prompt reaction to recurrent constipation [4, 7]. In our study, laxative agents were discontinued completely in all 7/7 patients after the continuity of their gastrointestinal tract had been re-established.

Difficulties with defecation may lead to retention behaviors which additionally contribute to difficulties in bowel voiding; over time, this may lead to dilatation and disturbed motility of the bowel to further increase stool retention and pain upon defecation, thus resulting in a vicious circle [1, 2]. This psychologically conditioned aversion to defecate is considered to be the main factor contributing to the development of chronic constipation and incontinence due to overfilling. One should keep in mind that symptoms associated with chronic constipation negatively affect the quality of life of both patients and their parents [4, 21]. Children may experience mental or social problems [21]. In addition, repeated manipulations within the anal area (enemas, *per rectum* examinations, ARM, colography) may be traumatizing experiences. Colostomy formation facilitates significant reduction in the demand for such examinations and therapeutic interventions. It is therefore likely that colostomy formation in all children coping with similar problems might significantly improve their quality of life and functioning in this respect.

It seems appropriate to multidisciplinary consider indications for surgical treatment and to provide the patient's parents/guardians with available therapeutic options while informing them of the benefits and possible complications of the proposed treatment. In a center with appropriate expertise, the patient would remain under the care of a pediatrician, a gastroenterologist and a pediatric surgeon who qualify patients for surgical treatment on the basis of clinical presentation and additional investigations. Following the colostomy formation, care to the patients is provided by a stoma nurse who attends the colostomy during the child's stay at the hospital while teaching the child and their guardians to maintain proper hygiene of the colostomy. In addition, the availability of psychological care has a positive effect on the process of adapting to the new situation and accepting the colostomy. In some patients, it seems appropriate to extend the scope of

gastroenterological diagnostics and to provide specialist care with the aim of ultimately restoring the continuity of the gastrointestinal tract. The average time between colostomy formation and GI tract continuity restoration is about 1–2 years. This is a good time to prepare the patient for unassisted defecation while developing better cooperation and making the patient aware of the fundamentality of compliance with physician's recommendations.

CONCLUSIONS

Children with chronic functional constipation require multi-disciplinary treatment provided by a gastroenterologist, a surgeon, a dietitian and a psychologist. The outcomes of the treatment of chronic constipation depend on the physician as well as the patient and their parents. It is important to evaluate the effects of implemented conservative treatment and to modify it accordingly in the absence of such effects. The analysis showed that only few patients (13 out of 160) required surgical treatment of functional constipation, which was in line with the results of studies by other authors. When faced by frequent underwear staining, necessity to perform bowel disimpaction, and negative impact on the child's emotional condition, pediatricians attending to pediatric patients with functional constipation should be aware of the possibility of surgical treatment. Creation of temporary colostomy facilitates immediate improvement in symptoms and social functioning of the affected child.

The decision to pursue surgical treatment should be preceded by basic diagnostics, attempts at conservative treatment, and exclusion of any potential organic causes of constipation. In addition, potential risks and benefits that may result from possible surgical intervention should be thoroughly analyzed.

DISCLOSURE

The authors declare no conflict of interest.

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